new york state
Comprehensive Wildlife Conservation Strategy

A Strategy for Conserving New York's Fish and Wildlife Resources

FINAL SUBMISSION DRAFT

September 2005

ACKNOWLEDGEMENTS

The development of New York State's Draft Comprehensive Wildlife Conservation Strategy (CWCS) benefited from invaluable contributions of many individuals and organizations. This included a *Partnership Group*, composed of representatives of statewide conservation organizations, local government, tribal organizations, state and federal agencies, non-profit organizations, and other interested parties. Participation by several *Species Group Experts* was also an integral part in the early phases of developing the CWCS, especially developing the list of "Species of Greatest Conservation Need". These experts also assisted in the compilation and review of the Species Group Reports that are found in Appendix A and formed the cornerstone of the entire CWCS document.

These and other experts from many government agencies, universities, and non-profit organizations added valuable contributions to the development of the CWCS. We relied heavily on *Watershed Review Teams* that were responsible for reviewing and revising draft watershed chapters. These teams included state and federal agency staff as well as representatives from numerous conservation groups. A list of the individuals who participated as members of these three different groups can be found in Appendix F. Sincere thanks are due to all of them.

Much of the work completing the draft CWCS was accomplished by the staff within state agencies, principally the NYS Department of Environmental Conservation (DEC), with contribution from the Department of State (DOS) and Office of Parks, Recreation and Historic Preservation (OPRHP). This included membership on an internal DEC *Steering Committee* (later expanded to a multiple State Agency Steering Committee). Membership included: Bryan Swift, Peter Nye, Patricia Riexinger, Kim McKown, Debra Barnes, Heidi Bogner, Melissa Cohen, Douglas Carlson, Chris VanMaaren, Tom Wolfe, Harold Evans, Karl Berger, and Lisa Holst, all of DEC; David VanLuven of the New York Natural Heritage Program; Nancy Pierson (OPRHP); and Greg Capobianco (DOS). Many additional DEC personnel in the Division of Fish, Wildlife and Marine Resources, Division of Water, and Division of Lands and Forests, offered comment, further information, and on-the-spot fact checking that proved invaluable. The Division of Environmental Permits offered expert assistance in meeting the requirements of the State Environmental Quality Review Act. The Division of Public Affairs and Education provided outreach support and extensive services in the mechanics of the document presentation, both on paper and on the agency's website.

Staff from the U.S. Fish and Wildlife Service Region 5 Office and Southern New England-New York Bight Coastal Ecosystems Program Office has provided tremendous encouragement, helpful advice, and information during this process.

Lastly, special thanks go the CWCS *Core Team*: Lisa Holst, New York's CWCS Program Coordinator, Michael Schiavone, and Tracey Tomajer. Their persistence and dedication was vital to completing New York's Draft Comprehensive Wildlife Conservation Strategy. And immense gratitude goes to Steve Bender of Texas Parks and Wildlife for assistance in the final formatting of the document.

Foreword

From Denise Sheehan,
Acting Commissioner
New York State Department of Environmental Conservation

Since 1908, when New York became the first State to require hunting licenses for harvest of wildlife, our State has shown tremendous leadership in the area of natural resource conservation. Our State has some of the most diverse resources in the nation, with aquatic resources ranging from two Great Lakes to the teaming Atlantic Ocean, and from terrestrial features of ancient mountain ranges to glacial valleys and beaches. We are home to the first fish hatchery in the nation. From that one hatchery, we have expanded into a network of facilities that support, in part, restoration of amazing and ancient fishes like paddlefish and sturgeon.

We are the home of the first State Park in the nation at Niagara Falls. We pioneered forest preserves in the Adirondack and Catskill Mountains. There are now more than 172 State Park facilities and more than 700,000 acres of State forest lands that carry on that legacy. Our tremendously diverse human population complements our diverse natural resources. Our citizens and visitors alike value the natural resources held in trust for them and future generations. Even the concrete canyons of our largest cities provide a home to imperiled species like the peregrine falcon.

With the release of New York's Comprehensive Wildlife Conservation Strategy, we intend to build on the solid legacy of natural resource protection and management in this State. The strategy is a step forward into the future of healthy wildlife and habitats in New York for generations to come, but we do not take this step alone. Together with our sister agencies, especially the Department of State and the Office of Parks, Recreation and Historic Preservation, we will move forward with the help and support of many partners to fulfill the charge of preserving the vitality and biodiversity of our natural resources.

We have made tremendous strides under the leadership of Governor George Pataki in New York to protect and restore fish and wildlife, air quality, and water quality. However, our State is not an island separated from the remainder of the nation. The fate of our wildlife, particularly those species that migrate from other parts of the country and the world, relies on cooperation with our neighboring States in this important mission. As we move forward in implementing the recommendations of the strategy, we will strengthen our relationships with our neighboring States, the provincial governments of Canada, and the federal resource agencies who all share our interest in healthy populations of wildlife.

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Wildlife Conservation Funding and Protection History in New York

New York has been one of the United States' primary urban centers for centuries but it has also been a leader in conservation activities. It was the first state to declare land 'forever wild' as well as establish a state park, the Niagara reservation. As early as the seventeen hundreds, a law was passed for the protection of New York's native heath hen, though it was subsequently extirpated from the state in the 1920s. Similar laws were enacted for other species, particularly game, and through those early efforts many species were saved. Unfortunately, the early efforts to preserve species were "for the therapeutic aspects of wild nature" and not necessarily for their ecological contributions. Countless more species perished because of the unilateral efforts to conserve species while neglecting their environment. In the late nineteenth century the Adirondack and Catskill Parks were established at the start of the "Conservation Era." New Yorkers Theodore Roosevelt and Gifford Pinchot were influential in early efforts to protect the natural resources of the state and the nation. Roosevelt went on to establish the National Wildlife Refuge System in 1903, during his term as President of the United States (1901-1909). The Audubon Society, headquartered in New York, was instrumental in the passage of the New York Bird Law of 1886. This law gave early protection to all "song and wild birds.

Programs within the DEC's Division of Fish, Wildlife and Marine Resources use a number of state and federal sources of funds to manage and conserve wildlife. The Conservation Fund, which was established in 1925, is the primary source of funds for wildlife conservation programs and is comprised of license and other fees collected by the Division. Federal Migratory Bird and Hunting Conservation Stamps (Duck Stamps) were created in 1934 as federal licenses for hunting migratory waterfowl. The Federal Duck Stamp program has evolved into one of the primary funding sources for wetland conservation. The Federal Aid in Wildlife Restoration (1937) and the Federal Aid in Sport Fish Restoration (1950) provide funding for the management, conservation and restoration of wildlife and fisheries resources. These funding sources operate under the principle that the user pays for management of the resources. Funds for the management of candidate, proposed and listed endangered species are offered through grants from the Cooperative Endangered Species Conservation Fund (authorized under Section 6 of the Federal Endangered Species Act).

During the 1970s environmental laws such as the federal Clean Air Act, Clean Water Act, and Endangered Species Act were passed. These laws and the creation of the U.S. Environmental Protection Agency had a profound influence on the health of natural resources nationwide and rippled out to affect states as well. In 1970, the Conservation Department, Water Resources Commission and Air Pollution Control Board were consolidated in an effort to address all state environmental issues within one agency and the New York State Department of Environmental Conservation (DEC) was established. The agency is responsible for the State's natural resources and environmental quality, and its duties are constantly modified to meet the needs of the changing environment. Edmondson (2001), in a historical overview of environmental affairs of the State, discusses the three schools of thought that govern the management of public lands in New York; Gifford Pinchot's ideal of maximum sustained production, the recreational vision of Robert Moses and Roosevelt's love of the wild. These three seemingly different ends are all part of the DEC mission to:

"Conserve, improve, and protect New York's natural resources and environment, and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being."

In 2001, federal legislation established new funding for wildlife conservation through the State Wildlife Grants (SWG) program. SWG funding was proposed as supplemental funding to existing federal programs. These funds will be used to address species of greatest conservation need (SGCN) in each state and will provide much needed support for those species not addressed with traditional funds. States, under the SWG program, are required to develop a Comprehensive Wildlife Conservation Strategy (CWCS) for the management of SGCN and associated habitats.

Management Programs Relevant to the CWCS

There are many extant programs and initiatives in New York that could support further work under the auspices of the State Wildlife Grants Program. Activities of DEC; Department of State; Office of Parks, Recreation, and Historic Preservation; DOT; US Department of Agriculture, US Fish and Wildlife Service, and many other agencies and organizations can be coordinated with the recommendations for the conservation of SGCN and their habitats. A selection of some of these programs includes:

- **Regional Greenhouse Gas Initiative** - a cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions.
- **Bird Conservation Area Program** - established in 1997 to safeguard and enhance bird populations and their habitats on State lands and waters. The goal of the Bird Conservation Area (BCA) Program is to integrate bird conservation interests into agency planning, management and research projects, within the context of agency missions.
- **Acid Deposition Reduction Program** - requires certain electric generators in the state to reduce emissions of sulfur dioxide (SO2) and nitrogen oxide (NOx) to protect sensitive areas, including the Adirondack and Catskill mountains, from the devastation of acid rain.
- **DEC Land Unit Management Plans** - plans intended to assess the natural and physical resources present within a unit, identify opportunities for recreational use and consider the ability of the resources and ecosystems to accommodate public use. Further, they identify management objectives for public use which are consistent with the land classification guidelines and the wild character of these lands.
- **Governor's Land Acquisition Goal** – 1 million acres in this decade. The governor has announced the protection of over 920,000 acres to date.
- **Forest Land Enhancement Program** - establishes procedures and rules for the implementation of the Forest Land Enhancement Program (Program) by the NYS Department of Environmental Conservation (DEC) to promote sustainable forest management practices on nonindustrial private forest land. In addition, there are numerous sustainable forestry certification programs

discussed in the Natural History section of this document, under the *Status and Trends of Major Habitat Types* heading.

- **Brownfields Program** - program to enhance private-sector cleanups of brownfields and to reduce development pressure on "greenfields".
- **Agriculture Environmental Management Program** - helps farmers meet economic challenges and address environmental concerns while complying with regulatory requirements.
- **Quality Communities Initiative** – program tailored to working with local government leaders and community organizations to find smart, innovative solutions to strengthen our economy, environment, and improve the quality of communities.
- **EPA Phase 2 Stormwater Controls** - encourage and assist all landowners with guidance documents, incentives and funding to implement management practices to control nonpoint source pollution.

Purpose and Authority for the Comprehensive Wildlife Conservation Strategy

In 2002 Congress began funding the State Wildlife Grants (SWG) program with the intent to maintain the biodiversity of wildlife in this country and prevent new listings of endangered species. This federal grant program was the first large-scale funding program for wildlife since the Pittman-Robertson Act in 1937 and Dingell-Johnson Act of 1950 (Federal Aid in Wildlife and Sport Fish Restoration Acts, respectively). States receiving SWG funding are required to prepare a Comprehensive Wildlife Strategy that must identify and be focused on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife-related issues. Further, the strategy must include eight specific elements. These elements are:

(1) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,

(2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and,

(3) Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and,

(4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions; and,

(5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,

(6) Descriptions of procedures to review the plan at intervals not to exceed ten years; and,

(7) Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

(8) Congress also affirmed through this legislation, that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

All 50 states, U.S. territories, and the Commonwealth of Puerto Rico have committed to developing a CWCS by October 1, 2005 as required by the SWG legislation. In the State of New York, DEC has the statutory authority to manage and protect the natural resources of New York. DEC manages the fish, wildlife, and marine resources of New York, as well as protecting and managing timber and wetlands, and protecting water and air quality. By virtue of this authority, DEC has taken the lead in developing New York's CWCS. In addition, DEC is the sole eligible recipient of SWG funds from USFWS.

The responsibility to manage and protect natural resources for the benefit of current and future residents of the state is shared with two other executive branch agencies, the Department of State (DOS) and the Office of Parks, Recreation, and Historic Preservation (OPRHP). Among its many administrative functions in state government, DOS bears the responsibility of protecting New York's coastal zone and assisting local communities in watershed planning. OPRHP owns and manages public lands and facilities for New Yorkers and tourists alike. Many of our state parks have outstanding natural resources, including wildlife. DEC often works in close conjunction with DOS and OPRHP to achieve that shared responsibility for the natural resources of New York State. Both of these agencies had significant input into the development of this document.

Methods

Selection of Species of Greatest Conservation Need

The first step DEC took to fulfill the legislative requirements of the SWG program was to identify those species of native wildlife considered to be in greatest need of conservation. This process was begun in 2002 when DEC staff, in consultation with experts and scientists across the state, compiled a list of "species of greatest conservation need" (SGCN). This initial list was completed in March of 2003 and used to guide funding decisions for the SWG program for the first two years.

Once the process of developing the CWCS began, DEC staff reexamined the list of SGCN and revised it, again in consultation with species experts and scientists from across the state. The details of the selection process and a list of species can be found in chapter 3 of this document. The list currently stands at 537 species. The list will likely be revised at the time that the entire CWCS is updated.

Species form the basic building block of the CWCS. While environmental management philosophy has shifted away from "single species" management approaches during the 20th century toward the more holistic ecosystem approach, for the purposes of developing the CWCS we have chosen to begin with species. By using a small building block and identifying important common features of each, we can build from this critical assessment of each species up to an ecosystem application of remedies to the common threats and management needs of each species. These commonalities allow us to maximize effort across habitats and other suites of species. In some cases, however, the needs of a species are so specialized or acute; they may be lost in the "noise" of broader approaches. This is where we can tailor the strategy implementation to make use of the interests of agencies and organizations.

Compilation of Species and Habitat Information

Once the species were selected, DEC staff members were asked to compile known information about those species and their critical habitats into a single, standard database. DEC staff attempted to consolidate the information requested in required elements 1 through 5 of the CWCS into this database. These species reports were reviewed by peers and species experts across the state. In many cases, this information was culled from existing literature and management plans. For lesser-known species, the information was less robust.

Wherever possible, species within taxonomic groups were aggregated into groups with common habitats, threats to their survival, and management needs. These "species groups" are the basic organizing unit for the database. Examples of species groups are:

- Demersal sharks
- Grassland birds
- Odonates (dragonflies and damselflies) of lakes and ponds
- Tree bats
- Vernal pool salamanders

Each of the species groups above are made up of multiple individual species of greatest conservation need. In many cases there were SGCN with unique conservation needs due to specialized habitat or extreme rarity. These species were placed into species groups of only a single species. Examples of these groups include:

- ❖ Peregrine falcon
- ❖ Indiana bat
- ❖ Heritage strain brook trout
- ❖ Bay scallop
- ❖ Karner blue butterfly

There are a total of 128 species groups, 72 of these are single-species groups. Copies of the species group reports generated out of the CWCS planning database are available in Appendix A. Each species group report contains a list of reference materials that are the source, beyond staff expertise, of the condensed species information.

The CWCS planning database collected condensed information on each species and species group. Information collected on each individual species included:

- ❖ Migratory status
- ❖ Watershed basin distribution
    - ▪ Historic
    - ▪ Current
- ❖ Ecoregion distribution
    - ▪ Historic
    - ▪ Current
- ❖ Critical habitats associated with each life stage/activity

Information collected for each species group included:

- ❖ Threats to the species group
- ❖ Population trends for the group
- ❖ The "no action alternative" as required in NEPA[1] and SEQRA[2] evaluations
- ❖ Conservation goal for the group
- ❖ Conservation objectives for the group
- ❖ Recommended conservation actions
- ❖ References and information sources for the group
- ❖ Known conservation partners related to each group

Further specific information on the selection of species within the major taxonomic groups is found in the Species Selection chapter of this document.

Landscape Approach

The information in the database related to species and their habitats was also organized by the major watershed basins of the state. The watershed basin boundaries are taken from the U.S. Geological Survey (USGS) 4-digit Hydrologic

[1] NEPA = National Environmental Protection Act.
[2] SEQRA = State Environmental Quality Review Act

Unit Codes. The hydrologic units were compiled by USGS for every state and provide a seamless map layer across the country that will facilitate regional and national collaboration in implementing all the state CWCSs over the next decade. A map of New York's 4-digit basins is found in Introduction Figure 1.

Many of the New York State's most successful resource management programs are organized by watershed boundaries, including the state and national estuary management programs, the fisheries management program, local assistance programs through Department of State, and others. DEC made a conscious decision to avoid use of arbitrary administrative boundaries in the CWCS in order to increase the usefulness of the document and its recommendations to partner agencies and organizations across the state. In further development of the State Wildlife Grants Program, CWCS information and recommendations may be tailored to some of those major administrative boundaries like the Adirondack and Catskill Park "blue lines", Great Lakes and estuary management programs, and state agency regional boundaries.

Land Cover Information for New York

DATA DESCRIPTION:

The data used in the land cover summary compiled for the Comprehensive Wildlife Conservation Strategy(CWCS) is the USEPA's Region II Multi-Resolution Landscape Characteristics (MRLC) last revised January, 1997. The dataset consists of 30 by 30 meter cells which correspond to an area on the earth. Each cell was assigned one of fifteen Level II land cover types, descriptions of which follow.

(1) Water - All areas of open water and perennial ice or snow
(2) Low intensity residential - Areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80% of the cover, vegetation 20-70% of the cover. Most commonly include single-family housing units.
(3) High intensity residential - Areas where people reside in high numbers. Vegetation accounts for less than 20% of the cover and constructed materials account for 80-100% of cover.
(4) High intensity commercial/ industrial - Includes infrastructure and all highly developed areas not classified as High intensity residential.
(5) Pasture/ Hay - Areas of grasses, legumes or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.
(6) Row crops - Areas used for the production of crops such as corn, soybeans, vegetables, tobacco and cotton.
(7) Other grasses - recreational grasses; vegetation planted in developed settings for recreation, erosion control or esthetic purposes. For example, parks, lawns, golf courses.
(8) Evergreen forest - Areas dominated by trees where 75% or more of the species maintain their leaves all year.
(9) Mixed forest - Areas dominated by trees where neither deciduous nor evergreen species represent more than 75% of the cover present.
(10) Deciduous forest - Areas dominated by trees where 75% or more of the species shed foliage simultaneously in response to seasonal change.

(11) Woody wetlands - Areas where forest or shrubland vegetation accounts for 25-100% of the cover and the soil or substrate is periodically saturated or covered with water.
(12) Emergent wetlands - Areas where perennial herbaceous vegetation accounts for 75-100% of the cover and the soil or substrate is periodically saturated or covered with water.
(13) Barren; quarries, strip mines and gravel pits - areas of extractive mining activities with significant surface expression.
(14) Barren; bare rock and sand - perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches and other accumulations of earthen material.
Unknown - Unidentified classes were placed in this category.

LAND COVER CALCULATION METHODS

The land cover summary was compiled in ESRI's ArcView© GIS version 3.3 for Windows. Watershed specific information was obtained by overlaying Hydrologic Unit Coverage, level 4 (HUC-4) layer for New York on an EPA-MRLC layer. Attributes tables were exported to Microsoft Excel and 30x30m cell counts were converted to acres. The percentage cover for each land cover type was calculated and summary tables generated. Statewide coverage was determined from the EPA-MRLC layer in ArcView© version 3.3 for Windows but without overlaying the HUC-4 layer. 30x30m cell count data was exported to Microsoft Excel and converted to acres. The data was compiled for the fifteen land cover classes and a summary table generated for New York State.

DETERMINATION OF ACCURACY

The following accuracy assessment was taken from Yang et al. (2002) "Thematic Validation of Land Cover Data of the Eastern United States Using Aerial Photography: Feasibility and Challenges".

There are inherent accuracy problems with MRLC in that data was interpreted from satellite imagery (Landsat Thematic Mapper (TM) satellite data acquired between 1988 and 1993). Accuracy assessments made for the New York/ New Jersey region (Region II) land cover data was about 62% at Level II and 82% at Level I (Stehman et al. 2003). The inaccuracy can be attributed to several factors. There was difficulty comparing mapped land cover classes and reference data since there were time differences between Thematic Mapper (TM) imagery and National Aerial Photography Program (NAPP) photo dates. Additionally, there were issues with separating location error from mapping error. Spatial uncertainty of a given pixel can arise from geometric accuracy of satellite imagery or locating sample units from satellite data on non-georeferenced NAPP photos. Errors also arose with the inconsistency of photo-interpreters.

The most frequently confused land cover categories for Region II (New York/New Jersey) is given by the chart below. The map class name is the value assigned to a cell in the MRLC data set. The photo-interpreted land cover class is the "actual" value determined during the accuracy assessment.

Map class name	Photo-interpreted land cover class
Low intensity residential	High intensity residential
High intensity residential	High intensity commercial
High intensity commercial	Low intensity residential

Bare rock/ sand	Emergent wetland
Quarry/ strip mine	High intensity commercial
Transitional barren	Woody wetlands
Deciduous forest	Mixed forest
Evergreen forest	Deciduous forest
Mixed forest	Evergreen forest
Hay/ pasture	Row crops
Row crops	Hay/ pasture
Other grass	Low intensity residential
Woody wetlands	Evergreen forest
Emergent wetlands	Woody wetlands

Source: Yang et al. 2000

Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats

Information collected in the CWCS planning database was analyzed by DEC staff using species and species group information sorted by watershed basin. A list of SGCN that occur in each basin was compiled and the recommended conservation actions for each species and group were examined. It became readily apparent that a concise and readily implemented strategy depended upon a method to prioritize actions among a list of things that are all important. Several factors were considered in this prioritization process. The prioritization was applied to SGCN. The prioritization criteria used were: species population status; state conservation status; the number of critical habitats used by that species; the number of species found in the species group; and inclusion on the Northeast Non-Game Technical Committee list of species of conservation concern. A more lengthy list of prioritization criteria were originally considered, but resulted in no differentiation in priority among species. A brief discussion of the rationale behind each criterion is below.

❖ **Population Status:** The status of a species within a basin is indicated as unknown, decreasing, stable, or increasing in the CWCS planning database. Species with populations indicated as decreasing in the basin received 10 points, species with unknown population status received 5 points, species with stable or increasing populations received no points. Species that we know are in decline should not wait for action until we have determined the status of unknown populations. Those that are stable or increasing are not in as critical need. Those with unknown populations must be assessed as soon as possible.

❖ **State Conservation Status:** Species listed as state endangered, but not federally endangered, received 10 points. Species listed as state threatened, but not federally threatened, received 5 points. All other designations received no points. Species that are only on the state threatened and endangered lists are not receiving funding or planning from other sources and are in the most danger of extirpation in our state.

❖ **Number of Critical Habitats Used:** The CWCS planning database indicates the number of habitats deemed critical to SGCN over their life span. Species were awarded points based on a 1:1 ratio with the number of critical habitats used. Protection of species such as salamanders and tautog that use several distinct habitats over a lifetime will result in the protection of more habitats.

- **Number of Species in the Species Group:** Species were awarded points based on a 1:1 ratio with the number of species included in their species group that also occurred in that basin. The recommended actions were made by species group in the CWCS planning database and recommendations that benefited a larger group received higher priority.
- **Inclusion on the NE Non-Game Technical Committee List of species of concern:** This group works as a committee of the International Association of Fish and Wildlife Agencies. This list of species has been identified as being of conservation concern at a regional scale throughout the Northeast. Species with this designation received 10 points.

Species receiving 20 or more points based on the above criteria were considered to be of the highest priority for implementation activities over the next 5 to 10 years in New York. The "scored" lists of species were shared with Watershed Review Teams consisting of DEC regional staff and other locally interested agencies and organizations for review as part of the overall review of each watershed basin's draft recommendations. Watershed Review Teams were given the opportunity to discuss the priority of species and modify the priority based on additional criteria, including other programs and planning documents, or extenuating circumstances.

It should be noted that the overall drafting of each set of watershed recommendations was the result of a review of extant planning and assessment documents, the information contained in the CWCS planning database, and expert review. DEC staff also did synthesis and analysis of the information contained in all of these source documents to shape the final product based on experience. In many cases, actions that could benefit species of both higher and lower priority were included.

The resulting recommended conservation actions that appear in the statewide and basin sets of recommendations are the priorities for implementation over the next 5 to 10 years. The recommendations are categorized within each basin and the statewide sections, but no category of action is given priority. For example, the categories: Data Collection, Planning, Land Protection, Management/Restoration, Regulatory/Legislative, and Incentives consistently appear in this order. The order is ***not*** meant to infer a priority on the kind of actions to be taken.

Implementation

Looking ahead to implementing a new State Wildlife Grants Program in New York, there is much work to be done. The development of the CWCS is an important first step in this process, and the CWCS will be used to prioritize funding decisions related to State Wildlife Grants expenditures in the coming years.

The Monitoring section of this document begins to outline just one of the massive tasks ahead. It is likely that the DEC and others will need to redirect or dedicate new staff and resources toward implementation of the CWCS.

Many of the species included as SGCN are virtually unknown to us as an agency. Better work needs to be done to track and evaluate habitats across the state, particularly, those not protected under statute or fee title. Remaining facets of implementation will be the subject of future work planning.

Statement of Goals

From Gerald A. Barnhart, Director
Division of Fish, Wildlife and Marine Resources
New York State Department of Environmental Conservation

The mission of the Department of Environmental Conservation's Division of Fish, Wildlife and Marine Resources is to serve the interests of current and future generations of New Yorker's by using our collective skills, in partnership with the public, to describe, understand, manage and perpetuate a healthy and diverse assemblage of fish, wildlife and ecosystems.

New York is a wonderfully complex state. The diversity of our citizens is exceeded only by the richness and variety of our habitats and wildlife. Working with that diversity, of people, places and wildlife, is an amazing challenge and, when we succeed, incomparably rewarding. Our efforts to develop a Comprehensive Wildlife Conservation Strategy (CWCS) reflect the strong influence of our diversity, from the membership of many agencies, organizations and individuals in our State Wildlife Grants Partnership, to the 537 species on our listing of Species of Greatest Conservation Need, to the 11 major watersheds by which our CWCS is organized.

We developed this CWCS to help us achieve our mission and several goals. First, we wanted to develop a product that was authored, owned, and will be implemented by all segments of New York government, all of our conservation organizations, and any interested individual stakeholder. The open, collaborative processes we used to develop our listing of species of greatest conservation need; to develop, analyze and synthesize critical data; to craft species, habitat, watershed, State, and regional conservation recommendations; and bind them together in this CWCS helped move us closer to this goal.

Second, we wanted to organize our CWCS in a way that stimulates synergy between an ecosystem approach to conservation and a sense of place, that sense of belonging that weds our citizens to the landscape where they live, work and play. It is our hope that by creating this synergy we will be more effective at conserving ecological systems and the species they support, in part by increasing public support for and participation in delivering this CWCS.

Third, we wanted to craft a CWCS for conserving species of greatest conservation need that could also, over time, become the organizing force for all our other fish, wildlife and marine resource conservation programs. Our choice to use watersheds as a geographic basis for an ecosystem approach serves to unify most of our current and anticipated conservation efforts. Watersheds work as a basis for integrating individual conservation programs so that the whole is indeed greater than the sum of the parts. Achieving this goal will go a long way towards eliminating artificial distinctions based on taxonomy, or whether or not animals are hunted, fished, trapped – distinctions that hobble our progress towards true systems management and effective conservation.

Fourth, we want this CWCS to foster application of good science and the quest for new knowledge. An enormous volume of information on species status and trends; land use and habitat changes; threats to species and communities; and research questions was assembled, analyzed and integrated to produce the conservation recommendations that follow. The state of our knowledge is robust for some species, habitats, and watersheds, but for many we have much to learn before we can succeed at conservation. This strategy should nurture application of what we have learned and pursuit of that which remains to be discovered.

Lastly, where the state of the art and science of conservation allows, we wanted this CWCS to set bench marks against which we can measure the success of the conservation efforts described in the recommendations. Results matter far more than intentions or efforts. Wherever we could, we've tried to describe our desired results for this CWCS in a way that our progress can be measured. We have also committed to monitoring and measuring results so we can account for our performance, but, more importantly, so we can learn how to improve.

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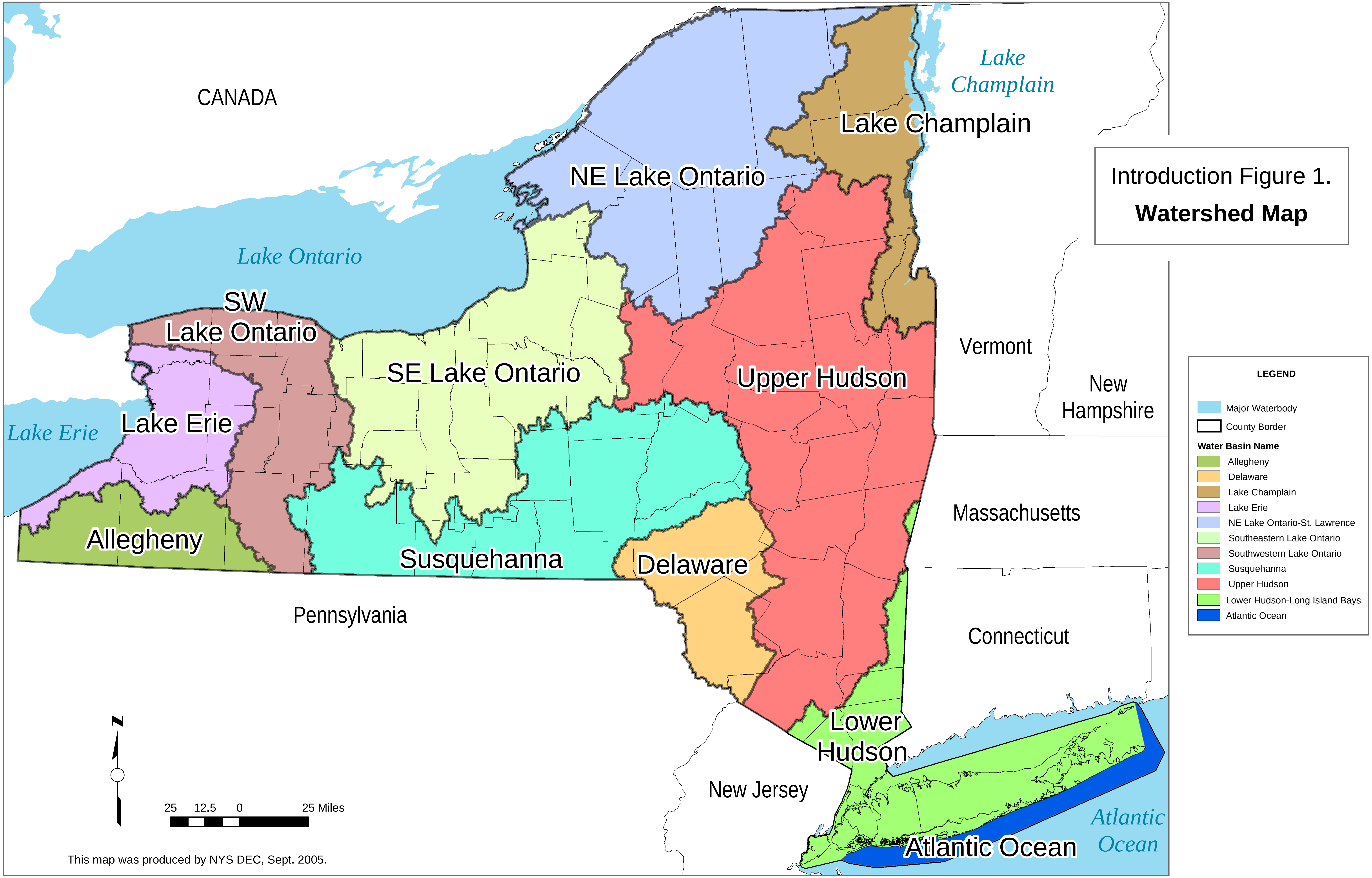
Tables and Figures



Introduction Figure 1.
Watershed Map

This map was produced by NYS DEC, Sept. 2005.

Natural History of New York

New York State covers an area of 54,077 square miles (141,229 square km), 87% of which is land. Inland lakes and rivers cover 1,894 square miles (4,908 sq. km) and the State has jurisdiction over 981 sq. miles (2,541 sq. km) of the Atlantic Ocean as well as 3,988 square miles (10,329 sq. km) of the Great Lakes.

Climate

New York State lies in the humid temperate region of the northeastern United States. Average January temperatures range from 15.8 to 33.8 degrees Fahrenheit and 66.2 to 77 degrees Fahrenheit in July. Rainfall is evenly distributed throughout the year and most parts of the State receive about 40 inches annually. Variation in topography and proximity to bodies of water causes large climatic variations and these deviations have created distinct ecological zones, which are home to a complex web of biological diversity.

The Landscape

New York's land forms were shaped by the recent glacial stage which disappeared not more than 8,000 to 10,000 years ago. Thompson (1977) identified nine major land form regions within the state. The Adirondack upland in the northern-most portion of the State includes New York's highest point, Mt. Marcy, hundreds of glacial lakes and rich mineral deposits. Other upland regions include the Tug Hill Upland which is the least settled part of the state due to its poor soils, bad drainage and excessive precipitation and the Appalachian upland which occupies nearly half the state. There are many distinct physiographic features within the Appalachian upland region. The Finger Lakes, Helderberg Escarpment, and the Catskills have been shaped by the recent glaciation but the Allegheny Mountains in the southwestern end of the State were not glaciated and its angular terrain and exposed bedrock are characteristic features. The other parts of the state are mostly low-lying regions. The Erie-Ontario Lowland has a range of features including wetlands, lakes, beaches and the drumlin belt between Rochester and Syracuse. Two terminal moraines of the great ice sheet are found on the Atlantic Coastal Lowland which occurs on Long Island and Staten Island.

New York's landscape is dominated by several unique features. The 6 million-acre Adirondack Park, in northernmost New York, was established in 1892 and is a patchwork of public and private lands. Within the "Blue Line", the park boundary, there are campgrounds, hiking trails and opportunities for water sports. The Park has a diversity of wildlife which uses the streams, glacial ponds, acid bogs, marshes, and evergreen and hardwood forests. There are 2,800 lakes and 30,000 miles of rivers and streams which accounts for the abundance of aquatic life. The area also provides habitat for mammals and hundreds of birds. For hundreds of years, wildlife and people have coexisted in this unique region.

Another of New York's mountainous regions is the Catskills. The Catskill Forest Preserve, established in 1885, has thousands of acres of forests, meadows, lakes and rivers, old farmsteads and abundant wildlife. The wetlands and intact forest of the Catskills protect the Delaware watershed, which serves as a source of drinking water for New York City. Native fish, amphibians and reptiles are abundant in the forest preserve. The deciduous forests provide homes for the State-threatened timber rattlesnake and other species.

The Finger Lakes region is located in central western New York. There are eleven major lakes in the region but only seven are considered Finger Lakes. Believed to be pre-glacial stream valleys these lakes are some of the most picturesque in the State. They provide ample opportunity for water sports and water for cities around them. The Finger Lakes National Forest, located in western New York is the only national forest in the state and the smallest in the nation. Black bears, river otters, woodland salamanders and bald eagles are characteristic of the Finger Lakes and rare species like the northern coal skink can also be found there.

The Great Northern Forest, which covers 26 million acres in the northeastern U.S., is the largest contiguous block of forest land remaining in the United States. Though most of the land is privately owned (80%), many species thrive there. Moose, marten, beaver and hundreds of bird species use the habitats in and within aspen, oak, sugar maple, white pine and beech. There are 60, 000 miles of lakes and rivers in the region which makes for excellent water sports and recreation in the winter.

It is difficult to think of New York and not think of the Hudson River. It is one of the most important commercial waterways in the country and a great environmental success story. The river, which runs the length of most of eastern New York, provides transportation, water, and vast open space. The river is home to endless aquatic life and provides the only direct connection to the Atlantic Ocean for diadromous fish. The Hudson was one of the most polluted waterways in the nation and collaborative efforts between government and citizens have resulted in a renewed river system teaming with wildlife and opportunity for recreation.

Ecoregions

These areas of ecological homogeneity which are defined by similarities in soil, physiography, climate, hydrology, geology and vegetation, are used to reference some species distribution information since distribution closely corresponds with ecoregional boundaries. The descriptions which follow are based on The Nature Conservancy ecoregional classifications for New York. A map of the ecoregions of New York can be found in Natural History Figure 1.

The Great Lakes ecoregion was recently formed during the last glacial advance 14,000 years ago and is characterized by gently rolling, low level landscapes and flat lake plains. The region's climate is influenced by the Great Lakes and has an astonishingly high level of biodiversity and unique habitats. The Montezuma Wetlands Complex is about 36,000 acres of wetlands and provides critical habitat for many bird species. It is one of the largest staging areas for waterfowl migration in the Northeast and is home to 368 species of fish and wildlife.

The High Allegheny Plateau ecoregion is defined by a broad series of high elevation hills that form a plateau rising to 1,700-2,100 feet, extending in the north from the Great Lakes Plains of Lake Ontario to the Ridge and Valley region of the Central Appalachians to the south, and from the Lake Erie Plain in the west to the Hudson River Valley. The O.D. von Engeln Preserve at Malloryville contains a diversity of wetland habitats; bogs, fens, wooded swamps which nurture a diverse group of species found in few other places in the State. Its spring-fed streams also offer pristine habitat to many clams, snails and amphipods.

Lower New England-Northern Piedmont ecoregion lies along the mid- to southeastern portion of New York. The limestone valley is defined by low mountains and lakes throughout. Thompson Pond is also part of the Lower New England/ Northern Piedmont eco-zone. It was designated a National Natural Landmark by the National Park Service in 1973 and is a prime example of a unique habitat in New York. The Pond is only 75 acres, but is home to 387 plant species, 27 mammals and 162 birds. It is one of the best places to observe king and black rails; endangered, ground-dwelling marsh birds.

The North Atlantic Coast ecoregion includes marine, estuarine and coastal components. The region which covers Long Island is characterized by grasslands, shrublands, vast pine barrens, coastal plain ponds and dunes and extensive salt marshes. It is particularly diverse since many species here are at the northern or southern edge of their range. This area is home to 1 of the 2 largest colonies of the endangered roseate tern (*Sterna dougallii*) in the western hemisphere and a very rare natural community of dwarfed pines and scrub oaks known as the Long Island Pine Barrens (The Nature Conservancy, 2004).

Northern Appalachian - boreal forest ecoregion which covers a large portion of northern New York covers most of the Adirondacks and Tug Hill Plateau. The region is defined by matrix forest communities and several large-scale wetland and remote pond complexes. The area contains the largest mature secondary forest in the northeastern United States. Central Tug Hill Forest is one of the few unfragmented large expanses of forest in the state. It is home to many large mammals including bobcats and black bear and forest dwelling birds like the Blackburnian warbler and goshawks.

The St. Lawrence-Champlain Valley ecoregion is characterized by mountain streams, deltas and marshes that line the shores of the St. Lawrence River and Lake Champlain. The ecoregion is largely defines by its aquatic features. Gadway Sandstone Pavement Barrens near the Canadian border is a unique natural community known from fewer than twenty sites world-wide. Few animals have established homes there but moths, butterflies and other invertebrates utilize the jack pine and its associated understory plants.

Western Allegheny Plateau ecoregion has a glaciated and unglaciated portion. Located in the southwestern-most end of the State the unglaciated portion is hilly and home to the Allegheny Mountains. The glaciated portion is characterized by low, rounded hills, and wetlands. The Nature Conservancy calls French Creek in the Western Allegheny Plateau the most biologically diverse aquatic system in the Northeast. It is located in the non-glaciated portion of the Erie Drift Plain and is home to 89 species of fish and 27 species of mussels. French Creek is the last refuge for many rare riverine species.

Status and Trends of Major Habitat Types

FOREST

The forests of New York cover over 60% of its land area and contribute significantly to the diversity of its wildlife. Large expanses of forests in most parts of the state protect watersheds and preserve areas for recreation. The forests contribute to the economy of the state through timber production and tourism related activities. There are several distinct land type associations developed by the USDA Forest Service. The coniferous forests of the Catskills and Adirondacks are mostly second growth sugar maple, balsam fir, birch and red spruce. There are also areas of north talus slope and white ash woodlands. The forests in the upper elevations are being affected by acidic, atmospheric deposition which is changing the composition of these forests and their associated wildlife. On the coastal plain on Long Island pine dry forests, hemlock-white pine forests and maritime dune complexes dominate. These forested ecosystems are being affected by disease, development activities, pollution and urban runoff. The forests in other parts of the state are mixed forests of sugar maple, oaks, pines and other hardwoods. Since these are not climax communities the tree species will change and will affect the wildlife population.

In the deciduous forests of the state, two major species of trees have virtually disappeared during the 20th century due to disease. The American chestnut and American elm both succumbed to fungal diseases area are exceedingly rare in New York forests. Other non-indigenous species like black locust and Norway maple have been introduced and rapidly colonized deciduous forests. Tree-of-heaven has become well established in disturbed areas and urban settings around the state.

About 72% of New York's forests are privately owned. It is critical that organizations interested in conserving forest habitats and forest-dependant wildlife species focus on working collaboratively with the approximately 500,000 private forest and owners in the state to engage them in forest management decision making in a landscape context. This will require examination of their individual ownership objectives and education about the forest habitat needs of wildlife in their area of the state.

In light of the majority private ownership of forest lands in the state, it is fortunate that numerous sustainable forestry certification programs have developed over the past several years. Most of these initiatives build of the principles of forest sustainability originally outlined in the "Montreal Process", and have developed into credible systems that generally involve third-party auditing and verification, and chain-of-custody procedures. The Montreal Process, and similar initiatives in other regions of the world, came in response to 1992 Earth Summit or United Nations Conference on Environment and Development (UNCED), where participants called upon all nations to ensure sustainable development, including the management of all types of forests.

The sustainability guidelines, principles and criteria used in these systems all address conservation of biological diversity, maintenance of forest ecosystem health and vitality, conservation and maintenance of soil and water resources. The major programs operating in New York (by enrolled acreage) include the American Tree Farm System, Sustainable Forestry Initiative® (SFI®) and Forest Stewardship Council® (FSC®). Other, comparable, internationally-accepted certification programs include the Canadian Forest Standards program and Pan European Forest Certification System.

Hundreds of thousands of acres of New York's forested land are enrolled in one or more forest certification system(s), and can be deemed to be managed with wildlife habitat and biodiversity consideration in mind (although not necessarily as a primary management objective). Latest enrollment statistics indicate the following for New York:

American Tree Farm System: 911,694 acres
Sustainable Forestry Initiative®: 863,000
acres Forest Stewardship Council®: 204, 095
acres.

In addition, over 1.4 million acres of New York forest land are enrolled in either the Fisher Forest Tax Law Program (Real Property Tax Law (RPTL) § 480), or its successor, the Forest Tax Law, RPTL §480-a. While management explicitly for wildlife species or habitat is not an authorized objective under either Forest Tax Law[3], both programs facilitate the retention and management of large, unfragmented blocks of forest land. This protection of large forest blocks can promote the diversity of active, environmentally-sound, silvicultural practices that have been elsewhere identified in the CWCS as being important to maintaining desirable wildlife habitats. Efforts have been made in recent years to broaden the scope of the current Forest Tax Law program to accommodate more generic "open space" conservation objectives. Changes to this law could also be considered that would more specifically benefit landowners who intentionally manage their forests for wildlife.

Finally, under the Division's Forest Stewardship Program (formerly known as the Cooperative Forest Management Program, we have completed sustainable forest management plans covering 1.5 million acres of land since 1990. In many cases, these management plans are the primary vehicle for communicating wildlife habitat needs and strategies to private forest landowners. (Note: the acreages listed are not cumulative, as some lands are enrolled in more than one program.)

WETLANDS

New York has diverse wetland resources including freshwater and estuarine wetlands of several types. There are major fringing marsh types in the coastal areas of the state along both Great Lakes and the Atlantic and estuarine shorelines. New York has typical temperate emergent and submergent vegetation in the freshwater and estuarine wetlands.

Historically, New York is thought to have lost 60% of its total wetlands since 1780 (Dahl, 1990). About 300,000 acres of that loss is thought to be due to agricultural drainage of freshwater wetlands, especially in the Great Lakes Plain in western New York. Local areas of the state suffered much more severe losses of wetlands. In Bronx County, a US Fish and Wildlife Service (USFWS) report indicates a 90% loss of large wetland complexes in just a 10 year span from 1954 to 1964. Wetland losses nationwide appear to have hit a peak between 1954 and 1974.

Sportsmen and hunters were among the first wetland preservationists, recognizing the value of wetlands for waterfowl and fisheries habitat. The first federal duck stamp was issued in 1934 to generate revenue for wetland preservation. Wetlands were first protected by state and federal law in the mid-1970s. The passage of the federal Clean Water Act in 1972, the state Tidal Wetlands Act in 1973, and the state Freshwater Wetlands Act in 1974 virtually

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[3] This program is managed with a timber production focus.

halted these large-scale losses, although agricultural activities are exempt from these laws.

New York wetland cover has increased in the last decade but there has been a change in the wetland types. There are about 2.4 million acres of wetland in the state. The most common wetland type is forested (66%) followed by scrub/shrub (19%), emergent marsh (10%), and wetland-associated open water (5%). Forested wetlands and open water have increased as cover types while there has been a decrease in the scrub/shrub and emergent marsh types. The main causes of wetland loss have been agriculture, urbanization and mining. The statewide wetlands status and trends study determined that there was a gain of just over 39,000 acres and a loss of just less than 22,000 acres resulting in a net gain of about 18,000 acres. About 68% of the gains in wetlands acreage have been from reverting agricultural land and the remaining gains resulted from increased runoff and altered hydrology.

While large losses of estuarine wetlands due to construction and development in New York have been halted with regulation and enforcement, continuing trends of loss of estuarine (tidal) wetlands in the state have recently been documented by DEC staff. Clear causes for these losses have not yet been established, but several factors, including rising sea level are thought to be responsible. In Jamaica Bay in Queens County, wetland losses have been documented at a rate of 44 acres per year.

WATER

The State's aquatic resources have helped define its landscape and economy. The 52,000 miles of rivers and streams which include the Hudson, Mohawk and Genesee rivers provide critical habitat for wildlife. There are about 7,900 lakes and ponds which cover 790,000 acres. The 600 miles of Great Lakes coastline provide recreational opportunities as well as lacustrine and beach habitat for many species. In the southernmost portion of the state, 1,530 square miles of estuaries and 120 linear miles of Atlantic Ocean provide a diverse group of habitat types for many species. The rivers and streams are in relatively good condition. About 50% of lakes and reservoirs and 40% of estuary waters have been characterized as impaired or threatened. Most of the Great Lakes shoreline (70%) has been characterized as impaired. Human activity is the major stressor of aquatic systems. Erosion, agriculture, toxic pollution and urban runoff all impair waters and reduce the integrity of habitat for aquatic species.

GRASSLANDS AND SHRUBLANDS

Most of the grassland habitat of New York lies in the Great Lakes Plain consisting of active and abandoned agricultural lands. Large tracts of important natural grasslands are found in Jefferson County and Long Island. The alvar grasslands and shrublands found in Jefferson County are unique to the state and represent some of the finest examples of alvar grasslands worldwide. The remnant Hempstead Plains on Long Island, sandplain grassland formed from a terminal moraine, are considered a globally rare community by the Nature Conservancy. Additional extensive grasslands are found on the south fork of Long Island. The pine barrens of Long Island, Albany and Saratoga are globally rare ecosystems with unique wildlife. The pine barrens in the Albany area provide critical habitat for the federally endangered Karner blue butterfly. Suppression of fire in these ecosystems has caused a change in plant species composition and their associated wildlife.

CULTURAL LANDSCAPES
Land utilized for agricultural cultivation has decreased to twenty five per cent of the State's land cover, down from forty five per cent in 1960. Agriculture is concentrated in the central and western portions of the State. The number of major urban centers has changed little the past century. Albany, Binghamton, Buffalo, Rochester and New York City are the principal cities.

New York Natural History Table 3 displays an estimated acreage of each land cover type in the state taken from the EPA MRLC data.

Land Cover Changes across the Landscape

In three hundred years since the start of agricultural intensification, the face of the State's landscape has changed tremendously. Prior to European settlement the state was predominantly forested but by the 1890s, 85% of the land was being utilized for agricultural pursuits. According to the U.S. Environmental Protection Agency Multi-Resolution Land Classification, 62 % of the state is forested, most of which is second growth forest. This rapid change in land use and land cover has had a tremendous effect on the native wildlife; and has created a haven for opportunistic non-native species. Many of the extirpated species were at the edge of their range and/ or associated with specialized habitats that are now rare, as are those associated with natural fire regimes. The decline in loggerhead shrike population is directly linked to reduction and changes in agriculture.

The increase in forest cover can be somewhat misleading as it pertains to the health of wildlife populations, as the forests of today are very different from those pre-European settlements. In the Catskill forests sugar maple is replacing American beech and the nitrogen dynamics in those forests have been severely altered. American beech promotes nitrogen retention in soils, increasing fertility, whereas sugar maple promotes its loss from soils. This seemingly small alteration of the ecosystem can have a cascading effect on the entire system with potential negative effects for certain wildlife species. Lack of credible quantitative historical data makes it difficult to discuss longer trends but qualitative information provides us with ample evidence that we are losing biodiversity at an alarming rate. The Nature Conservancy estimates one third of all species in the United States to be at risk of extinction (Sierra Club, 2004).

New York Demography

New York State has a total population of over 19 million residents. Over 12 million of those residents live in the New York City metropolitan region. Most of the remaining residents are clustered in the other large cities of upstate New York; Albany, Binghamton, Buffalo, Rochester, Syracuse, and Watertown. Many of these upstate cities have experienced flat population growth, or reduction in populations over the past decade (U.S. Census Bureau, 2005).

An assessment of New York GAP Analysis landscape associations of species and population trends show that population growth is fastest in regions of highest diversity (Smith et al., 2001). The Lower and Upper Hudson are home to most of the state's amphibians and reptiles and much of the recent population growth is centered in those two watershed basins. Though human population is not directly correlated to any ecological processes, consequences of human dominance in landscapes have well been documented. Loss of biodiversity is primarily traceable to land transformation, particularly fragmentation of natural habitat. The land use changes associated with sprawl are another hindrance to conservation efforts. Despite a population growth rate in upstate New York of only 2.6% between 1982 and 1997, there was a corresponding 30% increase in urbanization. The consequences of this conversion of farming towns into suburban settlements have been documented. Continuous tracts of land are being fragmented, water quality has deteriorated and wildlife populations are suffering as a consequence.

Biological Diversity

New York State has a rich biological diversity (biodiversity). There are more dragonfly and damselfly species than any state but Texas and more mammal species than any state in the northeast (Johnson, 2001). However, only 55% of the State's plants and vertebrates are considered secure and the status of most invertebrates remains unknown according to the New York Natural Heritage Program (NYNHP) database. The biological diversity of the state is threatened by the demands of a sprawling human population. Species are threatened by habitat degradation and loss, non-native invasive species, pollution and climate change. Natural History Table 2 summarizes what is known about the State's biodiversity.

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Tables and Figures

Tables

Figures

New York Natural History Table 1. The estimated acreage of land cover types across the state taken from the EPA MRLC data.

Land Classification	Acreage	% cover
Forest	20,316,472	43.9
Wetland*	1,022,747	2.2
Residential	1,860,889	4.0
Commercial/ Industrial	385,810	0.8
Agriculture	8,014,022	17.3
Barren	65,369	0.1
Water	4,823,680	10.4
Parks, golf, lawns	270,906	0.6
uncoded	9,539,402	20.6

* Wetland estimates performed by the DEC staff indicate that actual wetland acreage is much higher

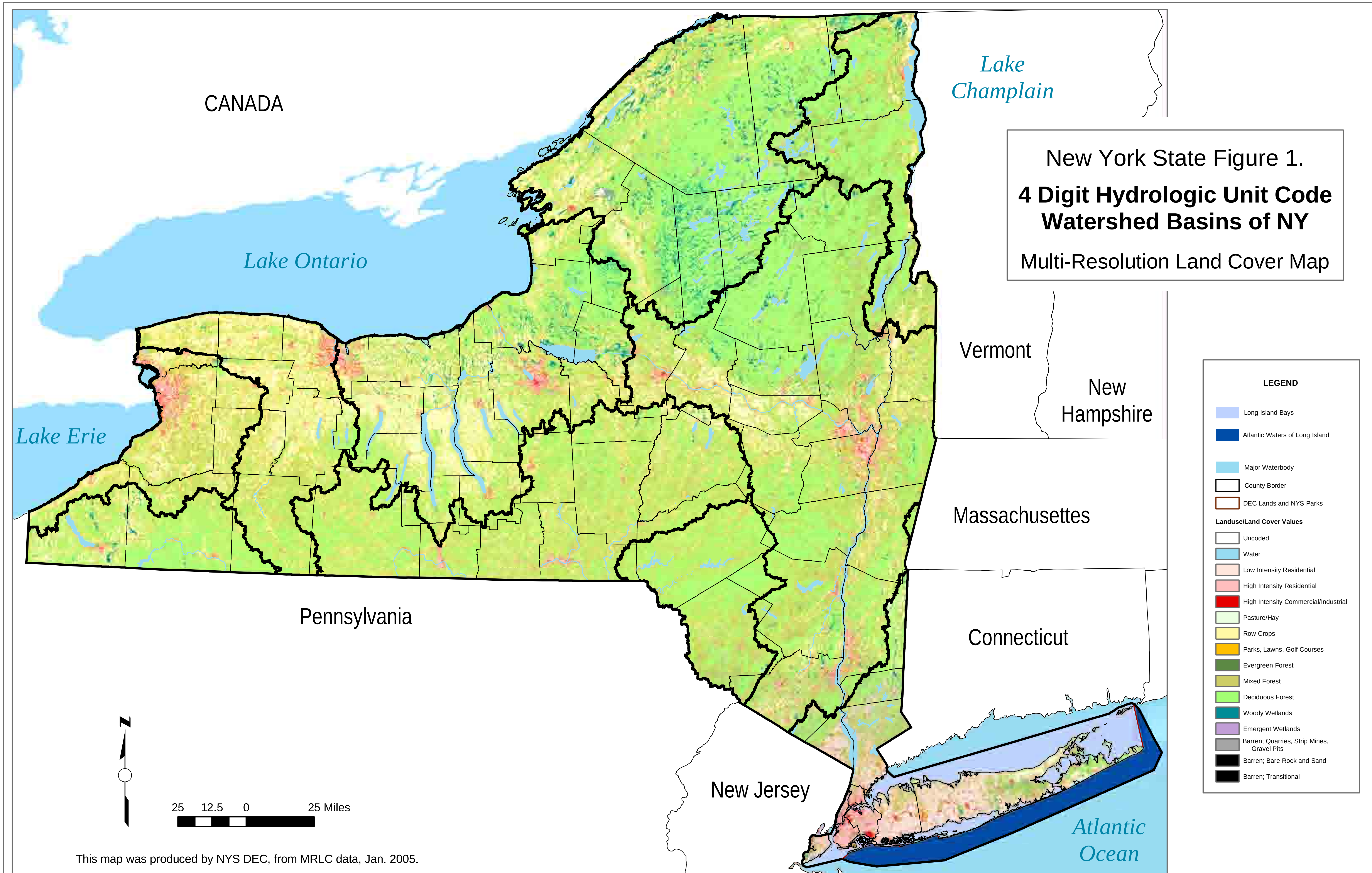
Table Natural History 2. New York State biodiversity of known species and the percentage of those species considered to be at risk for extirpation. The number in parentheses indicates the nationwide risk ranking for these species.

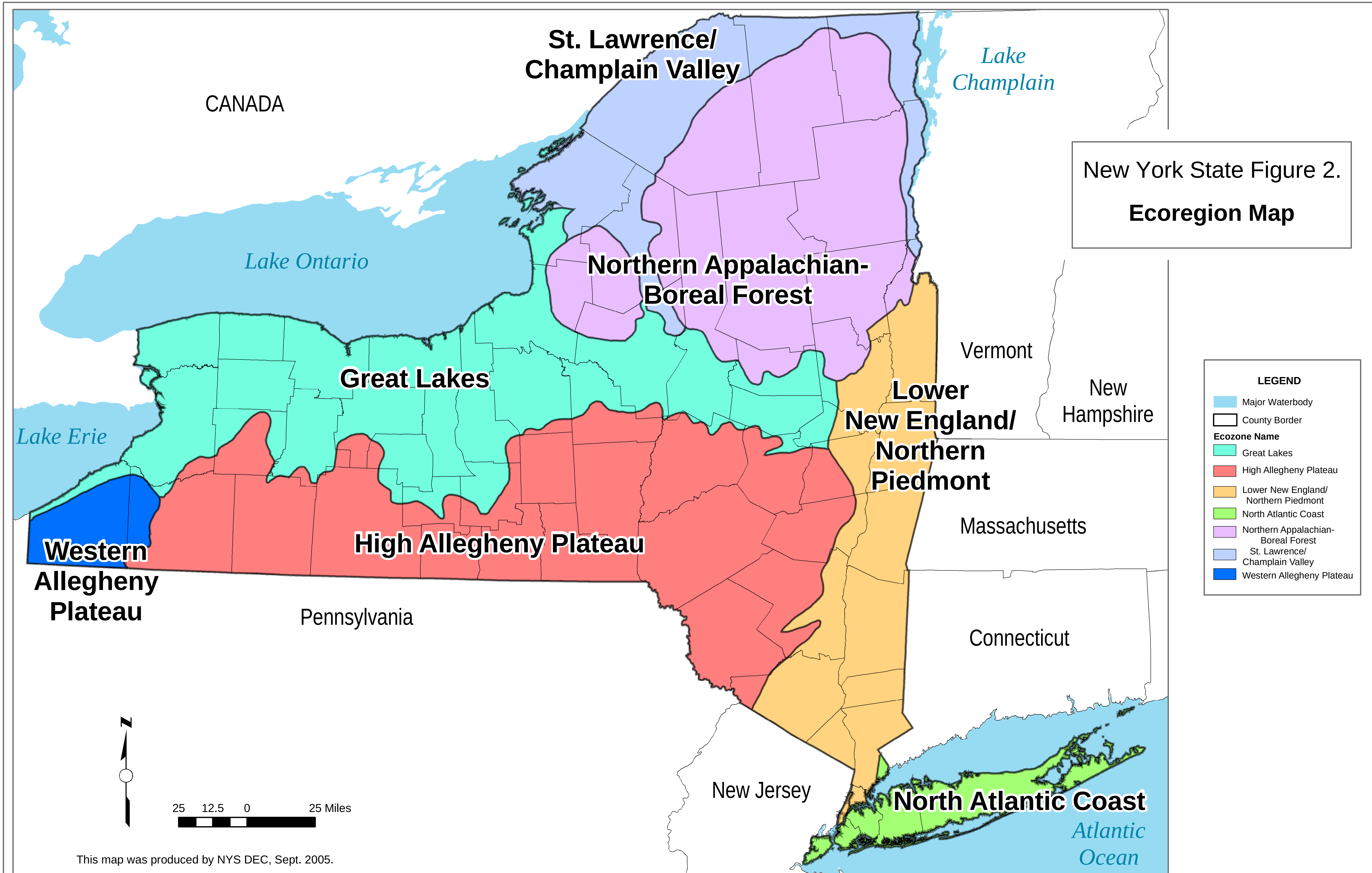
Category	# of species	Species at risk (%)
Total species diversity	3333 (22)	4.9 (27)
Endemism	9 (27)	N/A
Extinctions	10 (20)	N/A
Vascular plants	2215 (24)	3.7 (25)
Mammals	91 (18)	6.6 (25)
Birds	327 (16)	1.2 (44)
Reptiles	35 (32)	14.3 (8)
Amphibians	32 (22)	3.1 (29)
Freshwater fish	159 (16)	7.5 (33)

Natural History Table 3. Species listed on New York State and Federal Endangered Species lists (New York species)

Taxonomic Group	NY Endangered	NY Threatened	NY Special Concern	**NY Total**	**NY SGCN**	Federal Endangered	Federal Threatened	**Federal Total**
Mammal	10	1	3	**14**	21	5	1	**6**
Mollusk	6	3	3	**12**	59	1	1	**2**
Insect	10	5	15	**30**	198	1	-	**1**
Fish	8	11	5	**24**	91	1	-	**1**
Amphibian	2	-	7	**9**	14	-	-	**-**
Reptile	7	5	6	**18**	30	3	3	**6**
Bird	10	10	19	**39**	118	2	2	**4***
Total	**53**	**35**	**58**	**146**	**538**	**13**	**7**	**20**

* Great Lakes piping plover population is listed as endangered, and the population outside the Great Lakes is listed as threatened.


New York State Figure 1.
4 Digit Hydrologic Unit Code Watershed Basins of NY
Multi-Resolution Land Cover Map
CANADA
Lake Ontario
Lake Erie
Lake Champlain
Vermont
New Hampshire
Massachusettes
Connecticut
New Jersey
Pennsylvania
Atlantic Ocean
N
25 12.5 0 25 Miles
LEGEND
Long Island Bays
Atlantic Waters of Long Island
Major Waterbody
County Border
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
This map was produced by NYS DEC, from MRLC data, Jan. 2005.


New York State Figure 2.
Ecoregion Map
St. Lawrence/ Champlain Valley
CANADA
Lake Champlain
Lake Ontario
Northern Appalachian-Boreal Forest
Great Lakes
Vermont
New Hampshire
Lower New England/ Northern Piedmont
Lake Erie
Massachusetts
High Allegheny Plateau
Western Allegheny Plateau
Pennsylvania
Connecticut
New Jersey
North Atlantic Coast
Atlantic Ocean
N
25 12.5 0 25 Miles
This map was produced by NYS DEC, Sept. 2005.
LEGEND
Major Waterbody
County Border
Ecozone Name
Great Lakes
High Allegheny Plateau
Lower New England/ Northern Piedmont
North Atlantic Coast
Northern Appalachian-Boreal Forest
St. Lawrence/ Champlain Valley
Western Allegheny Plateau

New York State Species of Greatest Conservation Need Selection Process

The selection of Species of Greatest Conservation Need (SGCN) is required as part of the development of the Comprehensive Wildlife Conservation Strategy (CWCS). An initial list of SGCN was developed in 2002-2003 to determine which species were appropriate for funding under the State Wildlife Grants Program in New York. A list of about 350 species was generated by DEC staff and public and peer review was completed in March 2003. This list was later revised during the drafting of the CWCS to include more than 600 species using the following criteria:

- Species on the current federal list of endangered or threatened species that occur in New York (Taxa-Specific Information Table 1.)
- Species which are currently state-listed as endangered, threatened or of special concern
- Species ranked S1 or S2 by the New York Natural Heritage Program. Typically these are species with 20 or fewer populations that are known in the state and tracked by the New York Natural Heritage Program
- Estuarine and marine SGCN as determined by New York Department of Environmental Conservation, Bureau of Marine Resources staff
- The ecosystem approach to this conservation plan necessitated that some species in neighboring states be included. Species identified as Wildlife Species of Regional Conservation Concern in the Northeastern United States (Therres, 1999) were included.

Subsequent consultation with the public and revision by DEC Division of Fish, Wildlife and Marine Resources staff produced a list of 537 SGCN. The list of species is not exhaustive but includes those species for which systematic assessments had been made by staff of the DEC Division of Fish, Wildlife and Marine Resources and the New York Natural Heritage Program. Some species were removed from the list because there was no clear conservation need. Others were not included because they were extirpated long ago, are rare but expanding their range in New York, or they are introduced species. Other species were added based on information from other sources, listed below:

- NatureServe Explorer
- Audubon WatchList
- Partners in Flight Concern Species
- Species included in the U.S. Shorebird Conservation Plan
- Input from experts in academia and research agencies outside DEC

The best available information was consulted to compile this list of species, and their inclusion will possibly aid in achieving sustainable populations. Species selection methods were refined for some major taxonomic groups. More detailed information for each of the taxonomic groups is found below.

Mammals of New York

A total of 92 mammals live in New York. The most familiar of these occur in a variety of habitats. Of the 92 species, 25 are marine, and 3 are introduced species. Common and widespread species include the gray squirrel, raccoon, and white-tailed deer. The current white-tailed deer population is an example of a conservation success. Nearly extirpated in 1900, there are now about 1 million deer in New York. Regulations to manage harvest, along with a reforested landscape, have brought New York's deer population back to a sustainable level. Deer management now focuses on meeting population objectives within specific areas of habitat, "wildlife management units," and considers habitat conditions along with human tolerance and expectations for deer numbers.

Most mammals are widely distributed within the state, but some, like American marten, are at the southern edge of their range. A few southern species are at the northern edge of their range in New York (e.g., least shrew). The New York Natural Heritage database indicates that the Adirondacks and habitats along the Hudson River and the Susquehanna watershed are hotspots for mammals in the state. Several species are federally threatened or endangered, including the Indiana bat, gray wolf, fin whale, humpback whale, and right whale. Of the 92 mammals, 56 (60%) are protected by federal or state law or both. Legal protections include (1) protected as a state game species; (2) protected as a state endangered species; (3) protected as a marine mammal.

Mammal species introduced to New York include the house mouse and Norway rat. Coyotes represent one of the more successful recent natural mammalian expansions, and it has established populations all over New York, except Long Island, since the 1930s. Expansion of the coyote's range may have limited ecological effects because it appears to be filling the niche vacated by the gray wolf (Kays and Bopp, n.d.). Exotic mammals do not pose a huge conservation problem in the state, but efforts to control any further introductions have to be continuous. Some native mammals like the skunk and raccoon have adapted well to urban and suburban environments and their populations have grown to nuisance levels. These species are known to prey on the eggs and young of SGCN.

Twenty-two of New York's mammal species have been designated SGCN. Six species–the Indiana bat, eastern cougar, gray wolf, finback whale, humpback, and northern right whales–are federally listed as endangered or threatened. Eleven species are state listed as endangered or threatened, and 3 are 'special concern' species which currently have no legal protection[4] but are monitored by DEC.

The mammalian SGCN are all on the decline for a variety of reasons. Though many of the species are large, charismatic species which receive warranted attention from scientists and the general public, some of the smallest and least-known species, like least shrew, are most at risk. For all these animals, human manipulation of their environment, climate change, and disease threaten to reduce their numbers. Many of these species can recover to sustainable levels with vigilant monitoring and management of their habitats.

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[4] Legislation to afford protection to Special Concern designated species in New York is approved pending the governor's signature.

Selection of the Mammal Species of Greatest Conservation Need

The 22 mammalian SGCN include six species that are threatened or endangered (federal or state listing or both), as well as species of historical importance and those whose ecological requirements are unknown. Species whose habitats are at risk are also included here. Species whose habitats are at risk are also included here.

The American marten, which reaches the southern end of its eastern range in the boreal forest of the Adirondacks, is a harvested/protected furbearer species. American marten has been listed primarily because the New York population is not contiguous with the nearest population in Maine, and their boreal forest habitat may be threatened by climate change. The small size of a marten's territory (about 3 square kilometers) means that the populations in New York and Maine are independent of each other, and careful management is imperative. Harvest data for marten have thus far proved inconclusive for effective population assessment.

Another furbearer, the river otter, occupies most of New York, but only populations in the eastern half of the state are thought to be secure. The species was listed primarily because population trends are unknown, even after an extensive reintroduction program. Anecdotal reports and road-kill data have not provided reliable population and distribution information for otters in New York.

Little is known about the abundance and distribution of New York's marine mammals (SGCN), but known threats to their populations are increasing. Degradation of water quality, boat and other collisions, as well as entanglement, threaten marine mammals.

The gray wolf, Canada lynx, and Eastern cougar are species historically present in New York but extirpated because of unregulated harvest and habitat change. Current habitat conditions in New York may support the occurrence of gray wolf and cougar, but the social acceptability of doing so must be assessed first. Their listing as SGCN will facilitate that evaluation. Canada lynx may eventually expand to parts of New York from Canada or adjoining states, and if documented, they will need careful monitoring and management. The Algonquin population of gray wolves presently ranges 50 miles north of New York's border with Canada. Biologists have already documented the movement of large mammals like moose across this divide in recent years (A. Hicks, personal communication, September 23, 2005).

Birds of New York

The more than 450 bird species which occur in New York are the most widely documented vertebrate group in the state. All of these species receive some state or federal protection, including 20 that are listed as endangered or threatened. These 450 species represent a myriad of resident and migratory species which make homes in the varied habitats found all over New York. Ubiquitous species include the common raven, and the veery, and blue-headed vireo. Parts of Long Island, the Catskills, lower Hudson Valley, and central Adirondacks have high breeding-bird diversity, largely because of the diversity of habitats in those areas.

Species that have been brought back from the brink of extinction in New York include the peregrine falcon and bald eagle. DEC records indicate the bald eagle population in New York reached a low of one infertile breeding pair in the 1960s. Chemical bans, DDT in 1972 for example, and being listed as a federally endangered species have helped restore bald eagle nesting populations to 84 pairs in New York in 2004 (NYSDEC, 2004). Nationwide, bald eagles declined from hundreds of thousands of nesting pairs in the 1800s to 417 nesting pairs in 1963 (Smithsonian Institution, 2005). After 22 years on the federal endangered species list, the status of the bald eagle was downgraded from endangered to threatened. In 1983, only 2 breeding pairs of peregrine falcons could be found in New York State (DEC, 2004). The peregrine falcon population plummeted after World War II, and its decline is directly attributed to the use of organochlorine pesticides, particularly DDT. The most significant factor in the recovery of the falcon was the restrictions placed on the use of organochlorine pesticides in the early 1970s, but the work of the Peregrine Fund assisted in restoring the New York population. From 1972-1992 the Peregrine Fund conducted captive breeding and reintroduction of peregrine falcons in the northeastern US. Today, 45 breeding pairs of peregrine falcons reside in New York State (DEC, 2004), and though there has been a decline in the quality of natural habitat, the population appears to have adapted to the urban landscape, and numbers are increasing.

Three species, the bald eagle, roseate tern and the piping plover are listed as federally endangered or threatened. Twenty bird species are state-listed endangered or threatened and 19 are listed as ‘special concern’. All of the SGCN are protected by the federal Migratory Bird Treaty Act or New York’s Environmental Conservation Law, and most of these species are well known, even if not well understood. The bird populations of New York have been studied by both amateur and professional ornithologists for centuries. The Atlas of Breeding Birds of New York (Andrle and Carroll, 1988) is the most-detailed account of its kind for any region of similar size in the world and represents the efforts of thousands of amateurs and professionals alike.

Introduced bird species include the European starling, house sparrow, and mute swan. The major problem with these species is the increased competition with native species for critical habitats. Other species are threatened by loss of genetic integrity through hybridization with other species. Evidence shows that the decline in American black duck populations may partly be due to hybridization with and competition from mallards (Heusmann, 1988). Introduced house sparrows compete with the state bird, the eastern bluebird for nest box space.

A few breeding species have been lost from New York in recent years, including the golden eagle and loggerhead shrike. Reasons for the decline in many species include contaminants, disease, and loss or change in habitat condition due to urbanization and declining agriculture. These and other threats have put about 10% of the bird species of New York in imminent peril. Other threats to bird species include pollution and climate change, which may alter the ecological signals migratory birds receive for their journey, or change the availability of critical habitats in the state.

Birds are seen as excellent indicators of ecosystem health because they select habitat based on suitability and not just mere absence or presence (Furness and Greenwood, 1993). There are 118 bird SGCN and they represent a mix of resident breeding birds and species that simply rely on New York habitats during their migration. The recent trends of decline for most of the SGCN indicate that bird habitats are of diminished quality. Increasing and improving suitable habitat for birds may prove to be a challenging goal.

Selection of the Bird Species of Greatest Conservation Need

A variety of criteria was used to identify the 118 bird SGCN. Status assessments made for other bird conservation efforts were consulted, including the North American Waterfowl Management Plan, the US Shorebird Conservation Plan, Waterbird Conservation for the Americas, and “Partners in Flight” assessments for land birds. All species on the current federal list of endangered and threatened species that occur in New York, as well as those listed by DEC as endangered, threatened, or of special concern. In addition, species listed as Birds of Conservation Concern by the U.S. Fish and Wildlife Service are included. All bird species listed as Species of Regional Conservation Concern by the Northeast Endangered Species and Wildlife Diversity Technical Committee (Therres, 1999) were included as SGCN except the Appalachian Bewick’s wren, which is not known to occur in New York.

The Natural Heritage Program database was consulted, and bird species with 20 or fewer occurrences were added to the list. National Audubon Society 2002 WatchList species that were documented as breeding species in New York during the first Breeding Bird Atlas and are not considered accidental were also included. Generally, this includes species not historically found in New York, but whose ranges are expanding into the state. Eight waterfowl species listed in the North American Waterfowl Plan (2003 update) for which long-term trend was indicated as “decreasing” and which regularly occur in New York, were added to the list. Upland and migratory game birds that had declined in New York by at least 50% based on the Breeding Bird Survey and other long-term surveys are also part of the list.

Species listed as ‘high’ and ‘moderate concern’ in any of the North American Waterbird Conservation regional plans covering New York were included. Highly imperiled and species of high concern in either of the regional shorebird conservation plans were included, as well as those species of moderate concern which depended on critical habitat in New York. Breeding land birds identified by Partners in Flight are also included on the list of species of greatest conservation.

Partners in Flight priority species for New York include those of high continental concern, high regional concern and high responsibility species.

The final list of 118 species includes those species that met one or more of the above criteria. These species were sorted into 20 species groups in order to make the planning process more efficient. The species groups, which are a basic organizing unit of the CWCS, include one or more species that have similar conservation status, needs, threats, habitat use and recommended actions.

Freshwater Fish of New York

New York's 7,800 lakes and ponds and more than 50,000 miles of rivers and streams are home to more than 160 species of fish. Eighteen of these receive legal protection from New York State, and the shortnose sturgeon is listed as federally endangered. The freshwater fish species listed as SGCN are distributed in waterways all over the state, but French Creek in the Allegheny watershed is undeniably one of the most diverse waters with 89 species of fish, including darters and mountain brook lamprey (The Nature Conservancy, 2005). Trout, walleye, bass and other more common species are abundant and enhance the state's sport fishing industry, which contributes $1.4 billion a year to the economy (DEC, 2005). None of the fish found in the state is endemic, but most are native to some part of the state. Intentionally introduced fish species are primarily game or bait species and include brown trout and common carp from Europe, and rainbow trout, Chinook salmon, and green sunfish from other parts of the United States.

The fish of New York have been widely studied, and the distribution and status of most species is known from status reports produced at 50-year intervals, starting in 1842 with the work of J.E. DeKay. C.L. Smith offers a comprehensive treatment of the fish of New York in his 1985 work, *The Inland Fishes of New York State*. Though information is available for the more visible species, little is known about the obscure, lesser-known species which inhabit the waters of New York. Establishing the status of many historical species has proved difficult considering that deepwater sculpin, mud sunfish, and longear sunfish were recently collected after not having been reported for more than 50 years (Carlson, 1998).
Several species of fish are presumed extirpated from New York and include paddlefish, kiyi, and Atlantic salmon. Hatchery supported populations of paddlefish and Atlantic salmon remain in limited areas of the state as part of an effort to re-establish these species. Commercial over-exploitation and loss of habitat have contributed to the loss of fish species in New York. These and other pressures threaten the present freshwater fish population. Altered hydrology of waterways, primarily the building of dams, has affected the movement of fish along and between waterways. Sedimentation, pollution, and other degradation of water quality are other prominent threats to freshwater fish in the state.

Selection of the Freshwater Fish Species of Greatest Conservation Need

The freshwater fish species designated as those of greatest conservation need were chosen according to several criteria and by using the most recent data available from a variety of sources. Existing species lists such as the New York Natural Heritage database and the species listed as Northeast Species of Conservation Concern (Therres, 1999) were consulted but did not provide the only basis for the list. New York State fishery biologists used their most recent data and surveys. The New York Biological Surveys of 1926-1939 served as a baseline to which to compare more recent data. Changes in population were determined from these analyses and were used as goals to steer conservation measures developed through the Comprehensive Wildlife Survey Strategy.
Endangered and threatened species of fish were included as separate species unless they were extirpated. They were placed in the extirpated species group. These were treated as a separate group because efforts would be aimed at re-

introduction rather than conservation. Many of the species in need of conservation were described by D. Carlson (2000) and Smith (1985).
The following four criteria were used in addition to listing endangered and threatened fish. Species meeting any one or more of the criteria below were included:

- Native species known to inhabit fewer than three waters
- Species with evidence of decline exceeding more than one quarter of the watersheds (as delineated up to 18 by the DEC Bureau of Fisheries) or one quarter of its historical range
- Species sensitive to environmental perturbation
- Species living in only one watershed
- Extirpated species

Diadromous Fish of New York

Sixteen diadromous fish species inhabit the waters of New York. These species inhabit waters all over New York, but the Hudson River is the most important access to inland waters from the Atlantic Ocean for most fish. The St. Lawrence River is a historically important passage for adult American eels moving to the ocean to spawn. The Anadromous Fish Conservation Act (1965) provided funds for monitoring most of these species, and trends indicated most were on the decline (Buck, 1995).The shortnose sturgeon is federally listed as endangered, and though its population has increased in New York (DEC) since the 1970s, threats to the population have not been eliminated. Other species, including blueback herring, alewife, and Atlantic sturgeon, have decreased mainly because of pollution and dams. Though populations of most species are on the decline, the 8-fold increase in striped bass biomass over the past 20 years provides some hope for the recovery of other species.

The condition of the Hudson River has influenced the status of diadromous fish populations. The Hudson serves a key link between inland waters and the Atlantic Ocean and is home to a diverse population of organisms and ecosystems. From about 1947 to 1977, about 650 tons of PCBs were discharged into the Hudson, and sediment contamination from that era continues to compromise the health of fish and wildlife populations (USEPA, n.d.). Improvements have been made in the health of the Hudson through advances in sewage treatment and the ratification of the federal Clean Water Act, but PCBs, though they are somewhat transformed in nature, persist in the environment, and all forms are deemed harmful by USEPA.

There are many other persistent pollutants found in sediments of the fresh and marine waterbodies of the state. DEC has led a project to determine the sources and extent of major sediment contamination in New York Harbor. Dredging activities to clean up the Hudson are ongoing, but sediment contamination statewide remains a major challenge to the sustainability of diadromous fish populations.

There are 8 species of diadromous fish listed as SGCN. All of these species are affected by alterations in natural watercourses, such as dams and culverts, and all are susceptible to pollution in both the coastal zone and inland waters of the state. Persistent contaminants like PCBs, pesticides, and heavy metals accumulate in the tissues of these fish and can in turn be consumed by humans. Long-lived species like American eel and Atlantic salmon accumulate more toxins over the course of their lives than shorter-lived species like herrings. Loss of spawning habitat and increases in predator populations are also thought to play a role in the decline in diadromous SGCN.

Selection of Diadromous Fish Species of Greatest Conservation Need

The diadromous fish listed as SGCN were deemed as in need of conservation by DEC fishery staff based on trend data which suggests that most of the species are declining in numbers. American eel stocks in the Great Lakes and St. Lawrence River have crashed in the past 20 years (de la Fontaine et al., 2003). The marine district populations of returning juveniles are also thought to have declined due to a targeted fishery for glass and yellow eels. Fish populations are threatened by dredge and development activities in spawning and nursery areas. The prevalence of other threats to fish populations; over-harvest, loss of access to historic spawning grounds, and climate change also necessitated conservation action.

Marine Fish of New York

The marine fish of New York include a variety of pelagic and demersal[5] species which inhabit the Atlantic Ocean and Lower Hudson-Long Island Bays basins. New York's position at the edge of the northern and southern temperate ranges and at the apex of New York Bight results in a diverse and seasonally variable marine fish community. Eighteen species groups are listed as being in need of conservation. Critical inshore habitats for the juvenile stages of many marine fish species have been lost or degraded due to the dense human population of New York's coast. Salt-marsh losses, eelgrass declines, and alteration of benthic habitats by dredging are common threats to marine fish species. Restricted harvest, as well as efforts to manage pollutants entering the Atlantic, has allowed for increases in some populations, but recent reports indicate that sharks especially are on the decline (Baum et al., 2004). There are many marine fish species that play important roles in ecosystem function in the marine district, including oyster toadfish. Oyster toadfish are thought to be significant predators on crabs which, in turn, eat juvenile shellfish. Many of the smaller, schooling forage species of marine fish like sand lance and bay anchovy provide critical food resources to coastal birds and seal populations.

Selection of Marine Fish Species of Greatest Conservation Need

The 18 marine fish finfish groups were selected based on the recommendations of DEC staff in consultation with fisheries management partners. Many of New York's marine fish stocks are experiencing a prolonged period of declining abundance that is not responding to traditional fishery management techniques. Many of these species, except for shortnose sturgeon, are not state or federally listed as being endangered, threatened, or of special concern, but a few are listed on the World Conservation Union Red List 2004. Many of the marine fish species included as SGCN are harvested species regulated by the state under the authority of the Atlantic States Marine Fisheries Commission. Many of these harvested species require fisheries independent assessment of their status that is not adequately performed under existing programs. The threats of climate change and loss of habitat have reduced many populations to historically low levels.

In addition, the shift in distribution and abundance of many forage species like menhaden has significant ripple-effects on predatory fish like striped bass in New York. Forage species are often associated with critical habitats known to be in decline, such as submerged aquatic vegetation (SAV) beds and coastal salt marshes. These species are not adequately monitored under the current sampling regime and inadequate funds have heretofore existed to enhance that sampling. New ecosystem-based approaches to fishery management advocated by the National Marine Fisheries Service (NMFS) require examination of issues related to fishery health including the state of habitat and health of forage base populations.

Sharks are included as SGCN because of persistent population declines and the poorly understood significance of New York's statutory ocean waters as pupping

[5] Demersal = fish that are primarily bottom-dwelling, or their eggs that are deposited or sink to the bottom.

grounds for them. In addition, the status of skates and rays in New York waters is almost completely unknown.

Herpetofauna of New York

The herpetofauna of New York includes the frogs, toads, turtles, salamanders, lizards, and snakes which inhabit terrestrial and aquatic environments in and around the state. Seventy species reside in habitat complexes all over, but the New York Natural Heritage database indicates that the Lower Hudson and Susquehanna watersheds are hotspots for herpetofauna. The New York Herpetofauna Atlas summarizes the results of surveys conducted in 1990-1999 and chronicles the distribution of the species. Some of the more common species include the northern two-lined salamander, bullfrog, northern brown snake and the common snapping turtle.

All the herpetofauna species listed as federally endangered or threatened are turtles. Five sea turtles–green, hawksbill, Kemp's ridley, leatherback and loggerhead–have been on the list since the 1970s, and the bog turtle was recently added in 1997 when it was reported as historical or extirpated from 9 of the 19 counties from which it was known (USFWS, 2001). Fourteen species receive legal protection from the state, and 13 are listed as 'special concern' species. These special-concern species are monitored by DEC, but laws have not yet been enacted for their protection.

Introduced amphibians and reptiles in New York have been brought in mainly through the pet trade but have not caused any significant problems for native populations. The Italian wall lizard can be found in the Long Island/ New York City area, and two turtle species that are fairly widespread are the slider and the red-bellied turtle. No significant problems have been reported with any of the introduced species.

Herpetofauna populations are also at risk from unregulated and illegal harvest. Disease and deformities are on the increase, especially in amphibians, and several reports of frogs with supernumerary limbs have been made recently. Habitat loss and alteration, in addition to disturbed predator/prey cycles, also threaten populations. Forty-four herptile species are listed as SGCN.

Selection of the Herpetofauna Species of Greatest Conservation Need

The 44 SGCN include species listed as federal and state endangered or threatened, as well as those listed as New York 'special concern' species. Other species were included based on the following criteria.

Species with 20 or fewer occurrences in the New York Natural Heritage Program database were added as species with small populations. Several of the species identified by Therres (1999) as Northeast Species of Conservation Concern were also included. The marine species listed were identified by the DEC Bureau of Marine resources staff as species in need of conservation for a variety of reasons, one of which is the prevalence of known threats to their population. In addition, those species reported to the New York Herpetofauna Atlas as having a significantly smaller or more disjunct range than indicated in standard field guides were added to the list. Species known to be collected for food or pets that were unprotected in New York were included. Because more than half of the amphibians and reptiles are listed as SGCN, it is hoped that conservation actions taken for the listed species will benefit all the herpetofauna of New York.

Marine Mollusks of New York

The species of marine mollusks which inhabit the estuarine and marine ecosystems around Long Island have not been fully enumerated. Common species include mussels, clams, oysters, chiton, abalone, and octopus. Trade in these species contributes significantly to New York's economy. Marine mollusks are threatened for the most part by the degradation of their habitats and water quality around Long Island. Illegal and unregulated harvest has also contributed to the decline of populations.

Loss of eel grass habitat has contributed to the decline of the bay scallop population, and the loss and degradation of salt marshes may have contributed to a suspected decline in ribbed mussels. The eastern oyster population has been affected by several oyster diseases. A poorly understood failure of juvenile hard clam recruitment in Great South Bay and elsewhere has led to a decline in their numbers. These species are important not only to New York's economy, but to the ecological functioning of the estuarine waters of the state. These species are all filter feeders that pump large volumes of ambient seawater every day. This filtration action can reduce the suspended matter in the water column and contribute to overall water quality in New York's bays and estuaries.

Selection of Marine Mollusk Species of Greatest Conservation Need

The five marine mollusks of greatest conservation need–bay scallop, blue mussel, eastern oyster, hard clam, and ribbed mussel–were selected based on recommendations from DEC Bureau of Marine Resources staff. Records indicate declining populations for most species and an increase in the types and intensity of threats to their populations. Diseases and harmful algal blooms are contributing to the decline of these species. There is a clear need for fishery-independent monitoring of these species in New York based on their role as primary consumers and transformers of carbon and nitrogen in the estuarine environment.

Freshwater and Terrestrial Mollusks of New York

Fifty species of mussels, 32 fingernail clams, and 10 families of freshwater snails inhabit the rivers and lakes of New York (Strayer, 2000). The 9 mollusk species listed as federally and state endangered or threatened are all freshwater mollusks. Many of the species are widely distributed, but some very rare populations are found only here in New York. The only global population of the Chittenango ovate amber snail is found in the Chittenango Falls State Park, near Syracuse. The world's healthiest population of dwarf wedgemussels and 29 other globally rare species thrive in the Neversink River, while the federally endangered clubshell is found in French Creek. The dwarf wedgemussel and Chittenango ovate amber snail are federally listed because of the small, isolated populations which exist in the state. Seven additional species are state-listed as endangered or threatened, and three are of special concern.

Introduced species are numerous and are causing economic and ecological problems in the state. Of the 35 mollusks known to be introduced to the northeast United States, 26 can be found in New York waters, more than in any other state (USGS, 2004). Zebra and quagga mussels are two of the more notorious and have altered aquatic ecosystems and caused millions in mechanical damage. Hudson River hydrology has been severely altered by the efficient filtering done by zebra mussels. These species compete with native pearly mussels and have significantly reduced their Hudson population (Strayer, et al., 1999). Competition from non-indigenous species is a serious threat to native mollusk populations. Other pressures on the mollusk populations are generally anthropogenic in nature and include, habitat loss, disease, degradation of water quality, and contaminants and pesticides.

Of the freshwater mollusks native to New York, 55 species are listed as being in greatest conservation need.

Selection of Freshwater and Terrestrial Mollusk Species of Greatest Conservation Need

The freshwater and terrestrial mollusks of greatest conservation need were species which met the criteria of being federally or state-listed as threatened or endangered. Those species listed as Northeastern Species of Conservation Concern were also added. Species with 20 or fewer occurrences in the New York Natural Heritage database were included, as were species deemed by DEC staff to be in greatest need of conservation.

Crustacea and Meristomata of New York

The crustacea and meristomata of New York have not been fully described, but they are abundant and widely distributed. Some of the marine species are well studied because of their economic importance to many of the northeastern states. New York State fisheries contributed about 150 million dollars to the economy in 1999 (Gall, 2002). It is estimated that 27 species of shrimp and crab and five species of crayfish inhabit New York waters (Daniels, 2004). The horseshoe crab is the only living species in the subclass meristomata, and hundreds of species make up the marine zooplankton group. Five crustacea groups and one meristomata are listed as SGCN, but none is under legal protection by New York State or the federal government.

Selection of the Crustacea and Meristomata of Greatest Conservation Need

The seven Crustacea and Meristomata species of greatest conservation need were selected based on recommendation from DEC staff. The American lobster population has declined due to a combination of disease, modification of water quality, and pollution, and though the population is not at immediate risk of extirpation, it is an important resource requiring conservation efforts. The blue crab has declined recently, and a specific cause has not been identified, but it is at the northern end of its range in New York, and cold winters are a known threat to its population (Williams, 1974). Recent climatic changes may be contributing to the decline of the blue crab, and efforts to conserve it are necessary at this stage.

Fiddler crabs are a key indicator of the health of salt marshes and are sensitive to environmental contaminants. The link between fiddler crab decline and the degradation of their habitat is one of the unanswered questions in their ecology. Because they are essential to the integrity of salt marshes, it is unclear whether loss of salt marshes has led to their decline, or whether their decline has resulted in the degradation of salt marshes. The horseshoe crab is an interesting species because it has evolved little in the last 250 million years. It is used widely in medical research, harvested as eel bait, and its eggs are an important spring food source for migratory shore birds. Zooplankton represents the juvenile stages of crustacea and are listed here as a precautionary measure in conservation of their population. The freshwater crustacea species listed here have not been well described, and their status in New York is unknown.

Dragonflies and Damselflies of New York

The dragonflies and damselflies of New York represent 10 families and 190 species (P. Novak, personal communication, August 4, 2005). Three of these species are listed as threatened and 6 as special concern on the list of endangered, threatened and special concern fish and wildlife species of New York State. The little bluet is at the southern end of its contiguous range in New York (a disjunct population is known from North Carolina), and though it is abundant in some parts of its range, it is rare in New York. The pygmy snaketail, which is listed as vulnerable on the IUCN red list of threatened species is found only in two counties (Saratoga and Warren) in New York. Little is known about the status and habitat requirements of many of the dragonflies and damselflies of New York. The New York Natural Heritage Program has started an inventory of the odonates to determine their status in New York.

Selection of Dragonflies and Damselflies of Greatest Conservation Need

Nine of the 49 odonates of greatest conservation need met the criteria of being state-listed as threatened or of special concern. Other species of odonates were added to the SGCN list based on NY Natural Heritage Program ranks of S1 or S2, typically species with 20 or fewer populations recorded in the state. Many of the threats to the odonata populations have been described and include habitat degradation through channelization, conversion of wetlands, and dredging. Toxic pollution from agriculture, industry and municipal discharge also jeopardize odonata populations. It is hoped that the inclusion of these species as part of the SGCN will support inquiry into their biology and their importance to New York ecosystems.

Mayflies and Stoneflies of New York

The mayflies and stoneflies of New York, like many other insects, are not well known. There are more than 30 stonefly and more than 150 mayfly species in New York. The Tomah Mayfly is state-listed as endangered and is the only representative of its genus worldwide. Other species of mayflies and stoneflies have not been fully described mainly because of the rarity of larval associations with adults (Peckarsky, pers. com.). Though mayfly and stonefly larval forms are important indicators of water quality (used in the EPT[6] test), their biology is not well understood.

Selection of Mayflies and Stoneflies of Greatest Conservation Need

Twenty-eight species of mayflies and stoneflies are listed as SGCN. Only the Tomah Mayfly meets the criteria of being listed as endangered, threatened, or of special concern. Other species were included because they had global population ranks of G1-G3, typically species with fewer than 80 populations documented in the world. These species are included in the New York Natural Heritage Program because at least one record is known from New York. Little is known about these species distribution and status, and threats to their habitats have been well documented and are intensifying. These include alteration of rivers and streams, pollution, and the introduction of non-native plants and animals. Inclusion of these species as SGCN will warrant investigation into their biology and should assist in establishing guidelines for their protection.

[6] **EPT**, or Ephemeroptera: Plecoptera: Trichoptera, uses the presence or absence of these three pollution sensitive organisms to measure water quality

Other Terrestrial Insects of New York

Beetles make up about one quarter of all described animal species (Bellamy, et al., 1996). Of the more than 350,000 species of beetles that have been described, the number resident in New York has not been established. Beetles are fascinating insects in that they inhabit every possible habitat and vary greatly in size, from the large African goliath beetle to the minute feather-winged beetle. The American burying beetle population, federally listed as endangered, has collapsed dramatically. The population has been reduced to less than 10% of its original range and less than 1% of its original occupied habitat (NatureServe, 2005). Though the species is thought to be extirpated from New York, plans for reintroduction to the state are under consideration. One group of beetles, the tiger beetles, are fairly well known and two northeastern species, the northeastern beach tiger beetle and the Puritan tiger beetle, are federally-listed as threatened species.

Selection of Terrestrial Insects of Greatest Conservation Need

Species currently listed by the federal government or DEC as endangered, threatened, or of special concern are included as SGCN. Other species deemed rare, those with decreasing populations, and those with at-risk habitats were also included. These additions are principally tiger beetles for which sufficient information is available to support NY Natural Heritage Program rankings of S1 or S2, typically 20 or fewer populations documented in the state. The ten beetles of greatest conservation need cover a wide range of habitats, and it is anticipated that strategies for their conservation will influence other species in the ecosystem.

Lepidoptera of New York

The 500 species of moths and butterflies of New York reside in a wide range of habitats all over the state. Ubiquitous species include the black swallowtail, orange sulphur, and cabbage white. Some species such as Olympia marble, bog elfin, and Karner blue have a narrower range and much smaller populations. Nine species receive some federal or state protection, and 9 others are New York special concern species. The Karner blue is listed as endangered on the federal list of endangered and threatened species, and its Albany Pine Bush population has decreased from 80,000 butterflies in 1979 to less than 200 in 1990 (Save the Dunes Council, 2000). Efforts to restore the globally rare inland pine barrens of the Albany Pine Bush include a successful Prescribed Fire Management program and Karner blue butterfly habitat restoration. Since 2000 the Albany Pine Bush Preserve Commission has planted more than 200 acres of wild lupine, the obligate host plant of the Karner blue, and other locally-derived native grasses and wildflowers essential to restoring suitable Karner blue butterfly habitat. These efforts are proving successful, but the high level of habitat fragmentation within the Preserve poses many short- and long-term challenges to re-establishing a large viable population.

Selection of Lepidoptera of Greatest Conservation Need

A variety of criteria was used to identify the Lepidoptera of greatest conservation need. All species on the current federal list of endangered and threatened species that occur in New York, as well as those state-listed as endangered, threatened or special concern, were included. The 18 butterfly species included as species of greatest conservation need are those with 20 or less elemental occurrences in the state, as well as those whose life histories, status, and distribution are not well understood. Most of the 91 moths were included because fewer than 20 populations have been documented in the state, little is known about their physiology, life history, or ecology. It is hoped that the inclusion of these species as SGCN will encourage research and result in strategies for their conservation.

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Tables and Figures

Tables

Species Selection Information Table 1.	The list of state and federally listed threatened and endangered SGCN.

Figures

None

Species Selection Information Table 1. Species listed on New York State and Federal Endangered Species lists (New York species)

Taxonomic Group	NY Endangered	NY Threatened	NY Special Concern	**NY Total**	**NY SGCN**	Federal Endangered	Federal Threatened	**Federal Total**
Mammal	10	1	3	**14**	21	5	1	**6**
Mollusk	6	3	3	**12**	59	1	1	**2**
Insect	10	5	15	**30**	198	1	-	**1**
Fish	8	11	5	**24**	91	1	-	**1**
Amphibian	2	-	7	**9**	14	-	-	-
Reptile	7	5	6	**18**	30	3	3	**6**
Bird	10	10	19	**39**	118	2	2	**4***
Total	**53**	**35**	**58**	**146**	**538**	**13**	**7**	**20**

* Great Lakes piping plover population is listed as endangered, and the population outside the Great Lakes is listed as threatened.

Threats to Species of Greatest Conservation Need and their Habitats in New York State

The DEC staff members who compiled the information about Species of Greatest Conservation Need (SGCN) in the Comprehensive Wildlife Conservation Strategy (CWCS) planning database were asked to indicate threats to SGCN and their habitats. A list of threats for each SGCN occurring in New York State was extracted from the database. The threats and summary figures compiled here (Statewide Threats Table 1.) are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and other rationales. The information provided does not quantify the magnitude of a particular threat. The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the database. The purpose of this information is not to compare the severity of one threat against another.

The most significant threats were determined by reviewing information from the CWCS database, scientific literature, and conservation plans for regions throughout the State. Prominent threats to species of greatest conservation need in New York State are discussed in the sections that follow.

Habitat Loss and Fragmentation

Anthropogenic changes like development (residential and commercial, roads, power lines), dredging, changes in farming practices, wetland draining, and natural changes such as succession reduce not only habitat quantity, but the quality of habitat as well by disrupting the function of remaining habitat patches. Examples of the loss of habitat function include loss of connectivity to patches of similar habitat (or different yet complementary habitats), loss of metapopulation dynamics in small, isolated patches ("sink" habitats[7]), increased negative edge effects (increased susceptibility to predation), and reduction in the types of species the patch can support ("area sensitive" species[8]).

Despite the relatively small human population in much of upstate New York, human population growth and the development (e.g., residential, industrial, roads) that accompanies it are still a problem for some upstate areas, particularly in central and northern New York. Pendall (2003) concludes that, as land consumption has outpaced population growth, upstate New York has urbanized hundreds of thousands of acres of farm and forest land since 1980, this trend nationwide has been termed 'suburban sprawl'. Since1990 over 13,000 new houses have been built in the Adirondack Park, many of which are secondary

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[7] Population sinks are areas of low quality habitat that do not support self-sustaining populations of wildlife. They may attract individuals from source areas of higher quality habitat and higher animal populations, but the sink population will not survive without immigration from outside sources.
[8] Area sensitive species are those that occur more frequently, or increase in density, as habitat patch area increases.

residences (Resident's Committee to Protect the Adirondacks, personal communication, September 16, 2005). Other popular second home regions in the state include the Finger Lakes, Hudson Valley, Tug Hill, Catskills, among others.

While development may bring economic prosperity to a region, development without growth can actually be economically detrimental (Pendall, 2003). Furthermore, it is important that any development that occurs be sustainable and compatible with wildlife. Sprawl that has occurred throughout the State has fragmented sensitive habitats and threatens the rare species that depend upon them.

About 30% of New York State is comprised of habitats that have been significantly altered by humans [residential and commercial development, agriculture (row crops, hay lands), parks and golf courses, and barren habitats (quarries, strip mines, gravel pits)]. Many of these habitats are maintained by suppressing ecological processes such as vegetative succession and fire. However, active management of vegetative succession is also needed. Late and early successional forest habitats may suffer because of negative public perceptions related to timber cutting. The result is large, homogenous forest tracts with lower structural, vegetative, and species diversity than would be encountered in forests with both natural disturbances (e.g., fire, wind throws) and active management (variable cutting regimes). In truth, sustainable forestry practices, when implemented in accordance with NYS silvicultural best management practices (BMP), improve forest health and resilience.

Active management of state-owned forest lands that are not in the Forest Preserve are also an important aspect of wildlife habitat across the state. A potential goal for the some SGCN may be to incorporate more structural and vegetative species diversity into forests and other habitats. But it is also important to maintain the contiguity of large blocks of habitat where they exist, and to increase the size and connectedness of habitat patches where feasible. Landscape scale planning, state forest unit management plans, and just as importantly, implementation of those plans are a major component of habitat maintenance for all forest-dependant wildlife in the state.

This management concept also applies to grassland habitats. For example, the St. Lawrence Plain and Lake Ontario Plain represent one of the most important agricultural grasslands in the northeastern United States. It is important that extensive grassland habitats remain unfragmented, and that small patches of remnant grassland be evaluated to determine whether they are sink habitats to help guide further management actions. Further, there is a critical need to counter the detrimental effect of more intensive agriculture on habitat quantity and quality for grassland-dependent wildlife. Restoration of some grassland habitat may also be necessary to support healthy populations of some grassland-dependent species.

Early successional forest and shrubland habitats are also in serious decline throughout the State. Land development is reducing habitat, natural succession is turning many of these habitats into forests, and shrublands are sometimes converted into agricultural fields. A traditional source of shrubland habitat has been the succession of abandoned farm pasture and crop fields into shrublands. The rate of farmland abandonment has slowed from peak rates in the mid-20th

century, further reducing the potential for new habitats to form. There is a critical need to increase active management for these habitats and the species that rely on them. Perhaps the most serious threat to these habitats and the species that rely on them is the lack of adequate management due to misconceptions about the benefits of sustainable forestry practices for wildlife. Much of New York State's forest lands are in private ownership, making public outreach and education and important tool in addressing this threat.

Wetland habitats declined dramatically in the New York State from 1900 until the 1970s. During this time it was common practice to drain marshes for agriculture and other land use practices. The New York State Freshwater Wetlands Act (1975) protected many of these habitats, and wetland losses have been slowed dramatically. With the exception of the Adirondack Park, only wetlands larger than 12.4 acres, or certain wetlands of unusual local significance, are regulated under state law. In addition, draining wetlands for agriculture is generally exempted from state law and still occurs. Under the federal Clean Water Act, §404, wetlands are protected by regulations promulgated by the US Army Corps of Engineers. In spite of these protections, wetlands are incrementally destroyed, and wetland complexes fragmented, by smaller, more numerous projects. Many remaining wetland communities have been reduced to small, isolated fragments whose quality is threatened by siltation, runoff from agriculture and development, and introduction of invasive species.

Degraded Water Quality, Atmospheric Deposition, and Altered Hydrology

Many of the SGCN in New York State rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites). Conservation partners have identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality includes siltation, nutrient runoff, temperature increases, toxics (e.g., pesticides, heavy metals), lowered dissolved oxygen, and altered hydrology (dams, water withdrawal, ground water extraction). Additionally, contaminants enter aquatic and terrestrial systems through atmospheric deposition and have both habitat and population-level effects.

Water quality for humans and wildlife in the State ranges from pristine, such as the headwaters of streams in the Catskills, to poor in some urban centers. Some of the significant water quality issues in New York State include polychlorinated biphenyls (PCBs) in major water bodies such as the Hudson River, Lake Champlain, the Great Lakes, and the St. Lawrence River. PCBs enter many aquatic systems through direct discharge from industrial sites. They are persistent in the environment, attach strongly to soils and river sediments, and readily accumulate in fish, wildlife, and humans (National Research Council, 2001). PCB contamination negatively affects reproduction and survival of fish such as tomcod, mammals such as river otter, and raptors such as bald eagles. One of the more prominent cases of PCB contamination is the Hudson River. PCBs entered the river system through direct discharge from factory sites from the 1940s until 1977 (Baker et al., 2001). Levels of PCBs in the Hudson River are among the highest in the United States (Baker et al., 2001), so in an attempt to correct this problem, the Environmental Protection Agency has ordered dredging the Hudson River to remove some of the contaminated sediments.

There are several water quality problems in the Great Lakes and their tributaries and nearshore waters related to eutrophication and siltation caused by excess nutrients and runoff from agricultural operations and on site disposal systems. Levels of toxic contaminants in the Lake Ontario ecosystem, for example, have decreased significantly, and wildlife such as colonial waterbirds have overcome most of the contaminant induced effects of the 1970s and 80s; however, bioaccumulative toxics persist in sediment, water, and biota at levels of concern for some fish species such as lake trout and salmon, and for predators such as bald eagles, snapping turtles, mink, otters, and humans (Lakewide Advisory Network, 1998). Unfortunately, these problems are not unique to the Great Lakes and can be observed at many lake systems across the State.

Another water quality issue in several basins is nutrient loading. Elevated nutrient levels contribute to excessive algal and vegetative growth, thus exacerbating the spread of aquatic nuisance plants and diminishing the value of aquatic habitats for fish and wildlife. Nutrient loading is often the result of point and non-point source pollution. The primary nutrient of concern in freshwater systems is phosphorus; the primary nutrient of concern in estuarine and marine systems is nitrogen. Programs such as the Lake Champlain Basin Program have initiated efforts to reduce point and non-point sources (Lake Champlain Basin Plan - Opportunities for Action, 1993, 1996, 2003) to reduce excess phosphorous loads by 25% every five years for a 20-year period. Similar goals have been established for the Great Lakes and many smaller inland lakes. Nitrogen reduction targets have been set for all of the estuaries in the state, as well. The establishment of total maximum daily loads (TMDL) for streams and coastal waters, and planned improvements to point sources such as sewage treatment facilities, hold hope of further reductions.

A significant threat that has negative consequences for wildlife in several basins, particularly those that encompass the Catskill and Adirondack Mountain ranges, is the declining pH of water bodies due to acid rain. Utility plant pollution laden with nitric and sulfuric acid from industrial sites in the Midwestern United States (Ohio, Illinois, Indiana, Pennsylvania) is carried northeast via wind currents, and deposited in the form of precipitation onto the Catskill and Adirondack Mountain ranges. The thin, acidic soils and the nutrient-poor water bodies in these areas make them particularly susceptible to acidification. Despite the reductions in emissions that have resulted from the Clean Air Act, the Adirondacks are now more sensitive to acid deposition due to the accumulation of acids and the loss of buffering capacity in the soil (Schoch, 2002). The effects of acid rain can be seen in the damaged spruce-fir forests of the high peaks of the Adirondacks, reduced fish numbers and reproductive success in ponds with a pH of <5, and decreased foraging and reproductive success of nesting common loons (Environmental Protection Agency, 2004; Schoch, 2002). Acid deposition (nitrogen oxide compounds) products are also a significant source of nitrogen loading to coastal waters.

Mercury contamination poses a substantial threat to SGCN and is thought to be a result of atmospheric deposition. Mercury is released from anthropogenic sources (e.g., coal burning power plants) and is carried via wind currents from sources in the Midwest and deposited onto terrestrial and aquatic habitats through rain, snow, or dust. If mercury is converted to methylmercury, it can be consumed by organisms, move up the food chain, and increase in concentration as it does so

(Evers, 2005). Traditionally, high levels of mercury were correlated with decreased productivity and survivorship of common loons (Schoch and Evers, 2002), but recent findings suggest that mercury contamination is a much larger threat to human and ecological health. A recent report by Evers (2005) compiling data from 21 peer-reviewed journal articles shows elevated mercury levels in almost every taxa including fish (e.g., brook trout, yellow perch), crayfish, salamanders, waterbirds (e.g., common loon), forest songbirds (e.g., Bicknell's thrush), and furbearers (mink and otter). The report goes on to state that not only does mercury pose a threat to fish and the humans consuming them, but also to wildlife living in habitats as diverse as mountain tops and small headwater streams. Particularly high mercury levels were observed in the Adirondack Mountains. Mercury can have adverse effects on individual animals living in this region, as well as population-level effects through changes in behavior, reproduction, and body chemistry (Evers, 2005). Mercury concentrations are such that consumption advisories have been expanded within several regions across the State.

Altering the flow of riparian habitats with dams and bridges, and for flood control, agriculture, and development (roads, residential, commercial) can directly and indirectly affect fish and wildlife. Movement of populations of aquatic species such as fish and freshwater bivalves are inhibited, and habitat for all species dependent on lotic systems is lost outright or degraded through decreased conveyance and increased sedimentation. Changes in water levels and flows resulting from the construction and operation of various dams across the State are implicated in the impairment of critical fish habitats in the river habitats. Flooding of fast water river stretches impairs spawning habitat for species such as lake sturgeon (LaPan et al., 2002). In addition, manipulation of water levels in major lake systems such as Lake Ontario results in substantial water level changes, discouraging the establishment of wetlands and submergent aquatic vegetation in the nearshore zone (LaPan et al., 2002). Throughout the State, wetlands and tributaries that are flooded by dams have diminished value as spawning and nursery habitats for warm water fish.

Stream and road bank erosion, erosion of coastal soils, and erosion from agricultural fields are significant sources of sand/sediment. Once in lotic habitats, sediment fills in gravel spawning beds, decreasing salmonid spawning success, limiting macroinvertebrate production, and increasing winter mortality of fish and invertebrates such as mussels. Excessive sand and sediment loads also contribute to the formation of significant sedimentation deltas at the mouths of many tributary segments. Such deltas can restrict fish migration into the tributaries and present opportunities for the establishment of non native aquatic vegetation.

The placement of shoreline structures like bulkheads, groins, and jetties can seriously alter the coastal habitat by modifying biological resources and habitat structure, causing cumulative ecological effects and changing physical and ecological processes such as the distribution of sand on beaches. Shoreline engineering, such as jetties, bulkheads and repeated beach nourishment are short-term strategies that weaken barrier islands and other coastal habitats. These elements as well as construction in the beach and dune areas affects the ability of the system to respond naturally to human induced threats as well as storm events and sea level rise and therefore threatens the viability of all species who utilize the area throughout their lifecycle.

Aquatic and semi-aquatic invasive plants such as purple loosestrife, Eurasian water milfoil, water chestnut, Japanese knotweed, yellow iris, and invasive animals such as zebra mussels and sea lampreys are also an increasing threat to aquatic habitats statewide. This is discussed in more detail in the following section.

Invasive Species

Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout New York State. In wetlands and other aquatic habitats, species like purple loosestrife, Eurasian water milfoil, water chestnut, Japanese knotweed, and *Phragmites australis* with little value to wildlife, displace native plant species, and disrupt ecological processes. Purple loosestrife thrives on moist, disturbed soils, and often invades following construction activity. It can form dense, impenetrable stands that are unsuitable as cover, food, or nesting sites for a wide range of wildlife. It also out-competes many rare wetland plants. Eurasian water milfoil occupies an extensive range throughout the State. This species forms dense mats of vegetation that degrades the structure and function of aquatic habitats. Similarly, dense mats of water chestnut have infested many water bodies statewide. While mechanical control of water chestnut has met with some success, water milfoil has been more difficult to control. Japanese knotweed is now forming dense riparian stands of vegetation along many river systems and tributaries to large lakes such as the Lake George. Knotweed is quickly replacing native vegetation along these waterways with little or no benefit to fish or wildlife resources. Mechanical and chemical control of knotweed has proven to be extremely difficult.

Invasive aquatic animals degrade habitat quality and/or directly affect fish and other aquatic species. Zebra mussel densities have increased dramatically in many water bodies throughout the State including the Great Lakes and Lake Champlain. Zebra mussels have affected water supplies, crowded out native mussel species, reduced the biomass of other benthic animals in many areas, and may be linked to outbreaks of Type E Botulism. Since 1999, a severe outbreak of Type E botulism has been documented along the shores of Lake Erie, and more recently, Lake Ontario. The severity of Type E botulism-caused mortality documented during the current outbreak along Lake Erie and Lake Ontario could threaten, or eliminate, sub populations of common loon with fidelity to these water bodies for migration. It is suspected that invasive exotic zebra and quagga mussels are ingesting botulinum bacteria, and then in turn, are being eaten by an exotic fish species, the round goby. Common loon and lake sturgeon feed on round gobies, thereby becoming infected with botulism. In the Hudson River, zebra mussels have caused a 57% reduction in the biomass of other benthic animals (Bode et al., 2004). From Yonkers to Troy, zebra mussels have consumed more oxygen from the Hudson River (from their respiration) than was added back to the river as a result of the post Clean Water Act improvements in sewage treatment plants (Strayer et al. 1996, D.L. Strayer pers. comm., May 2005). Although this oxygen depletion probably does not impair water quality (unlike sewage discharges), it demonstrates the magnitude of effects that can be posed by some invasive species. In all habitat types, new residential and commercial development increases the risk of new occurrences of invasive exotic plants and animals.

Sea lampreys, a parasitic invasive fish that feeds on the body fluids of other fish, have a significant effect on native fish populations. Organizations such as the Lake Champlain Fish and Wildlife Management Cooperative (DEC, Vermont Fish and Wildlife, USFWS) are currently implementing sea lamprey management programs to combat this threat. The intentional or unintentional introduction of non-native fishes have occurred in lakes and ponds statewide, causing drastic declines in native species such as round whitefish and brook trout. Numerous invasive non-native aquatic organisms can move among watersheds through canals systems such as the Erie and Champlain Canals. Potential measures to restrict or prevent introductions of such invasive species via canals should be evaluated and, if viable, implemented. Many other invasive species exist in major lake systems in New York, including the spiny water flea (*Bythotrephes cederstroemi*) and fish hook water flea (*Cercopagis pengoi*), Rusty crayfish (*Orconectes rusticus*), common carp, and alewives (Manninen, 2005).

In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. For example, exotic insects like viburnum leaf beetle lack any natural predators and threaten to alter the composition of young forest stands. Beech bark disease, a fungal disease of the genus Cryptococcus, is having devastating effects on American beech trees within the Adirondack Park and across the state. American beech is the primary source of tree mast for use by wildlife within the Park. Total loss of mast in localized areas may, in turn, have significant effects on wildlife populations that utilize this food source. There are several forest pathogens and insect pests that may affect forested habitats. For example, *Sirex noctilio,* an introduced siricid woodwasp, recently discovered in upstate NY, threatens significant mortality to conifer forests. It is a threat to primarily pine forests, but also threatens spruce and fir forests. Some of these pests have yet to reach the northern portions of NYS (e.g., hemlock wooly adelgid, Asian long-horned beetle), but northward movement of the distribution of these species from New York City and vicinity has been observed.

Upland plants such as garlic mustard, bush honeysuckle and others continue to replace native plants. A species that is becoming an increasing problem is black swallow-wort (a.k.a. “the dog strangling vine”). This species has the potential to cause major disruptions to upland plant communities. Investigations into chemical and biological control mechanisms for this nuisance plant species are ongoing.

Native species present in locations or numbers not historically found can be detrimental to some SGCN. These invasive or overabundant native species can out compete the species of concern for forage or nest sites (e.g., sand shiner vs. comely shiner, or blue winged vs. golden winged warblers), can pose a predation threat (e.g., perch preying upon round whitefish), or can reduce habitat quality by altering vegetative composition and structure (e.g., black locust invading Karner blue butterfly habitat). This type of expansion of range by native species causes concern when there are unbalanced negative effects on other sensitive wildlife species. A case in point is double crested cormorants on Lake Ontario and other water bodies such as Lake Champlain. This species was first documented breeding in New York State in 1945 on Gull Island in eastern Lake Ontario as part of a natural range expansion. During the 1960s cormorant populations in the Great

Lakes were devastated by the effects of chemical contaminants (primarily pesticides) on reproduction. Pollution control, in addition to the protective status granted by the Migratory Bird Treaty Act, has allowed populations of cormorants to soar to historic highs. Cormorant populations have increased in abundance to the point where they are affecting other colonial nesting waterbirds by taking over nest sites or by destroying woody vegetation needed for nesting. Affected species include common terns and black crowned night herons. In addition, DEC and Cornell University have conducted long term studies linking cormorants to declines in small mouth bass in eastern Lake Ontario. In response to concerns about conflicts with other colonial nesting birds, DEC initiated cormorant control measures at several locations during the 1990s. As part of the Final Environmental Impact Statement on Double crested Cormorant Management in the United States (2003) prepared by the USFWS and the Management of Double crested Cormorants top Protect Public Resources in New York: Statement of Findings (2004) prepared by DEC, cooperating agencies are working to evaluate the effect of cormorant control measures and to monitor the status of island nesting colonial waterbirds and native fish species relative to the abundance and distribution of double crested cormorants.

Another example of overabundant native species has been white-tailed deer in some areas of the state. Abundant deer populations in the Adirondacks are implicated in the damage to economically important tree species like sugar maple. Browsing by deer can alter the density and species diversity and composition in forests throughout the state in areas where the population exceeds management targets.

Incompatible Silvicultural and Agricultural Practices

Farm and forest products are both important to the economy of New York State. Unfortunately, trends in modern farm operations (increased field size, loss of edge habitats, erosion due to conventional tillage, intensive grazing, poorly timed mowing/haying of fields) can have negative consequences for wildlife and their habitats in regions where agriculture (e.g., row crops, pasture/hay land) makes up a significant portion of the landscape as seen in the Lake Plains, the St. Lawrence Valley, and portions of the Lake Champlain, Mohawk River, and Hudson River valleys. Additionally, runoff from agricultural operations can increase contaminant, nutrient, and sediment loads in adjacent aquatic habitats negatively affecting the SGCN that reside there. In the forested landscapes that predominate most of the state, forestry operations that do not comply with best management practices and that are poorly planned and executed can damage habitat function and reduce habitat quality for some SGCN that reside there. It is important to develop and implement farm and forestry practices that are both ecologically and economically sustainable. The vast majority of both of these habitat types are in private ownership and require expanded outreach and coordination regarding the needs of SGCN on private forest and agricultural lands.

Human-Wildlife Interactions

There are a variety of threats to SGCN in the state from direct interactions with humans. These include vehicle and structure collisions, and illegal and unregulated harvest. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines and roads, are a significant source of mortality.

Anecdotal evidence and preliminary data gathering efforts have suggested that wildlife collisions with human-created structures (e.g., wind turbines, communications towers, and power lines) can have significant population-level effects. USFWS and others are currently investigating the effects of these types of structures on wildlife populations (specifically, migratory birds), but as human populations within the state continue to increase, these structures will become a more significant hazard to SGCN.

Many of the amphibian and reptile species of conservation concern have no protected status. Killing, collection/translocation, and illegal sales of herpetofauna in the pet trade have posed a significant threat to rare and declining reptile and amphibian species. Pending state legislation will convey protected status on many previously unregulated herptile species. Furthermore, public fears and misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals.

Climate Change

The threat with the greatest potential to affect fish and wildlife on a scale beyond the boundaries of New York State is climate change. Large quantities of carbon released into the atmosphere by human activities have increased the amount of carbon dioxide in the air and trapped the sun's heat. This has resulted in an increase in the global temperature at a rate faster than anything that has been observed for at least 10,000 years (Millennium Ecosystem Assessment Board, 2005). Habitats in the Adirondacks such as lowland boreal systems may be particularly susceptible to climate change. Warming trends may affect the distribution patterns of plants and animals that inhabit boreal habitats and may extirpate some plants and animals that cannot adapt or move to more suitable areas. However, researchers studying this issue in the Adirondacks have not been able to reach consensus on the methods used to study climate change at a local scale, thus making predictions about future effects difficult (Jenkins, in review; Stager and Martin, 2002).

An additional effect of climate change with relevance to SGCN is the rate of severe storm and other weather driven events. By virtue of the small and isolated populations of many of New York's SGCN, they are particularly vulnerable to coastal storms like hurricanes and nor'easters that cause erosion and flooding even after they move inland. Coastal erosion heavily affects beach and salt marsh habitats already under stress from rising sea level. Winter storm events with excessive ice can cause forest habitat damage, and heavy snowfall results in spring meltwater flooding and erosion.

Research on the effects of climate change on local wildlife populations and their habitats must continue, but this threat will need to be addressed on a much larger scale than just the state or the Northeast. It will take a coordinated global effort to devise a solution to this global problem.

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Tables and Figures

Tables

Figures

None

Statewide Threats Table 1. A summary of threats for all Species of Greatest Conservation Need (n=537) in New York State. The threats and summary figures compiled here are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and others . The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the CWCS database. The purpose of this information is not to compare the severity of one threat against another.

Threat Code	Threat Description	# of Species Groups Affected	% of All Spp Groups Statewide	% of All Threats Statewide
6	Habitat Loss - cultural (e.g., development)	75	58.6	12.6
2	Contaminants	56	43.8	9.4
13A	Degradation of Water Quality	52	40.6	8.7
1c	Human Disturbance - illegal/unregulated harvest	40	31.3	6.7
10A	Barriers to Movement in Aquatic Habitats (e.g., dams, weirs, culverts)	33	25.8	5.5
1a	Human Disturbance - collisions	27	21.1	4.5
9A	Sedimentation/Erosion (impacts on aquatic habitats)	27	21.1	4.5
4c	Interspecific Competition for Resources	26	20.3	4.4
4b	Disrupted Predator-Prey Cycles	25	19.5	4.2
3	Disease	21	16.4	3.5
7T	Habitat Loss - natural (e.g., succession)	18	14.1	3.0
12A	Competition from Invasive Exotics	14	10.9	2.3
14T	Fragmentation	14	10.9	2.3
1	Human Disturbance - general	13	10.2	2.2
5b	Susceptibility to Stochastic Events (isolated pop'ns)	13	10.2	2.2
19T	Active Alteration/Suppression of Natural Processes (e.g., fire)	12	9.4	2.0
7A	Climate Change (change in water level, temperature)	12	9.4	2.0
1b	Human Disturbance - entanglement, entrainment, impingement	11	8.6	1.8
12T	Habitat Composition Altered by Terrestrial Invasive Species	10	7.8	1.7
5a	Susceptibility to Stochastic Events (weather, storms)	10	7.8	1.7
U	Unknown Threats	9	7.0	1.5
18T	Insensitive/Unsustainable Agricultural/Silvicultural Practices	8	6.3	1.3
5c	Susceptibility to Stochastic Events (rare species)	8	6.3	1.3
14A	Altered Hydrology (water level management/extraction)	7	5.5	1.2
8A	Aquatic Habitat Altered by Natural Processes (e.g., beaver)	6	4.7	1.0
8T	Climate Change (change in species range, distb'n, migration)	6	4.7	1.0
11A	Loss of Streamside Buffers	5	3.9	0.8
15A	Habitat Composition Altered by Aquatic Invasive Species	5	3.9	0.8
15T	Reduction of Patch Size, Shape, Area	5	3.9	0.8
17T	Loss of Connectivity/Metapopulation Dynamics	5	3.9	0.8
4d	Detrimental Hybridization	5	3.9	0.8
11T	Pollution (e.g., acid rain, soil contamination)	4	3.1	0.7
4e	Parasites	4	3.1	0.7
4a	Loss of Host Species	3	2.3	0.5
10T	Barriers to Movement in Terrestrial Habitats (e.g., roads, powerlines)	2	1.6	0.3
13T	Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	1.6	0.3
9T	Impacts of Erosion on Terrestrial Habitats	2	1.6	0.3
16A	Aquatic Habitat Composition Altered by Overuse (e.g., swans, muskrat)	1	0.8	0.2
16T	Negative Edge Effects (i.e., increased predation, "ecological traps")	1	0.8	0.2

Priority Strategies/Actions for Statewide Implementation

This chapter of the CWCS outlines recommendations that are of statewide priority or are of statewide scale. In many cases there are components of these recommendations that will be carried out in an individual watershed basin, or at smaller scales. For planning recommendations, statewide restoration and management plans will likely be built from components at a watershed scale. The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction.

Data Collection Recommendations

Understanding the abundance and distribution of SGCN is perhaps the single most important factor in their effective protection and management. Knowing the condition of New York State's natural resources is fundamental to DEC's ability to carry out its legislated function to "monitor the environment to afford more effective and efficient control practices, to identify changes and conditions in ecological systems and to warn of emergency conditions" (Environmental Conservation Law, §3-0301).

FILL GAPS IN INFORMATION ON SGCN WHOSE STATUS AND DISTRIBUTION ARE UNKNOWN

There are many SGCN that have been selected for inclusion in the program due to poor understanding of their natural history, population information, threats, and other information necessary for their effective management. While it is not practical to expect that all the needed information can be gathered in the next 5 years, a network of professional and volunteer data collectors, a repository for the data, and a means to share it as it becomes available can be established using the SWG funding as a catalyst. There is more written about the establishment of a monitoring program for SGCN in the Monitoring chapter.

Some specific programs already exist that can be adapted, expanded, or improved to help in the effort to better understand SGCN. For example, the Rotating Intensive Basin Survey (RIBS) program led by DEC's Division of Water samples streams across the state for aquatic invertebrates as part of their water quality classification requirements under the Clean Water Act. The existing survey efforts could be enhanced through SWG funding to include a broader sampling for SGCN like odonates, stoneflies, mayflies, freshwater bivalves, and gastropods. Other existing water quality sampling programs should be adapted to include data on aquatic habitat quality as well.

Two statewide partnership programs, the NY Breeding Bird Atlas and NYS Amphibian and Reptile Atlas Project (Herp Atlas), have been tremendously successful in collecting a large amount of distribution information on broad classes of animals, including SGCN. In the case of the Herp Atlas, there is a need to develop standard survey methods for the herpetofauna SGCN in order to enable more organizations and volunteers to collect data about them. Both of these atlas projects should be continued for their benefit to SGCN and other management efforts.

Under the guidance of the recommended monitoring plan in the Monitoring chapter, other programs need to be developed and coordinated with implementation of the CWCS. A specific example is the Governor's Invasive Species Task Force. There are many aquatic and terrestrial invasive species already in the state that cause adverse effects on SGCN. There is the potential for the introduction of many more species due to the prevalence of interstate and international shipping and trans-boundary waterways. There is further discussion of this issue in the Planning Recommendations section of this chapter.

Some specific SGCN are of statewide importance and recommendations related to data collection specific to those species are highlighted here.

American eel

Data collected from fishery dependent and fishery independent data in the Lake Ontario/St. Lawrence River estuary and Lake Champlain/Richelieu River systems point to a reduction in eel abundance and localized recruitment failure. Most eels from these two river systems are female and thought to contribute the majority of female biomass to the eel spawning stock. There is little data available for other areas in the state, including the marine district, where coastal streams are vital to stock recruitment along the coast.

Commercial eel fishing has been eliminated in the Province of Ontario, by the Ministry of Natural Resources, which directly affects the Lake Ontario/St. Lawrence River stock. This will reduce fishery-dependant information available about American eel stocks. Specific recommendations include:

- Develop methods of determining age and identifying sex of American eel.
- Determine fecundity at age, maturation mechanisms, and recruitment to spawning stock.
- Develop population life history models for all watersheds of the state, beginning with the Great Lakes and St. Lawrence River populations and the Marine District populations.
- Monitor populations for abundance by age, size, and sex of intermediate and adult life stage members.

Birds

- Survey grasslands and agricultural areas of the state for barn owls and investigate the feasibility of nest box deployment to augment declining populations.
- Continue participation in sampling the Great Lakes for Type-E botulism and research into its causes and disease cycle in fish and wildlife species. Use this information to more effectively manage susceptible species and minimize risk of disease spread through the state.

- Develop comprehensive and periodically implemented surveys for birds under-surveyed by other programs. Examples include: secretive marsh birds like rails and bitterns; nocturnal birds like owls and whip-poor-wills; and salt marsh birds like salt marsh sharp-tailed sparrow and seaside sparrow.

Crustacea/Meristomata

- Inventory and survey aquatic caves of the state for devil crawfish and Piedmont groundwater amphipod.

Freshwater Fish

- Conduct workshops for DEC and other fisheries sampling staff on the identification of freshwater fish SGCN to assist in data collection for these species. Expand specialized surveys for these species, especially:
  - Blackchin shiner
  - All species in the “extirpated fishes” species group
  - Iowa darter
  - North American ninespine stickleback
  - Sauger
  - Swallowtail shiner

- Continue the hatchery rearing programs for lake sturgeon, Atlantic salmon, and paddle fish, and expand the restoration of these fish to suitable historic waters.

- Survey waters where freshwater fish SGCN were historically found for remnant populations, habitat suitability, and restoration potential.

- Continue to sample moribund and dead lake sturgeon in the Great Lakes for type-E botulism.

Herpetofauna

- Complete and analyze data from the Herp Atlas project. The Amphibian & Reptile Atlas Project (Herp Atlas) was a ten year survey that was designed to document the geographic distribution of New York State's herpetofauna in order to monitor changes in populations and to make sound management decisions. Using the Herp Atlas data (1990-1998) we have produced a map (19kb) that shows our progress by indicating the number of species reported in each of the 979 survey blocks (7.5' topographic quadrangles.) This survey effort should be repeated at 10 year intervals.

- Select sites to follow up on sampling for rare herp species especially:
  - Hellbender
  - Mudpuppy
  - Eastern spadefoot toad
  - Four-toed salamander
  - Fowler’s toad
  - Wood turtle
  - Spiny softshell
  - Northern map turtle
  - Eastern ribbonsnake
  - Coal skink
  - Common five-line skink
  - Stinkpot
  - Northern copperhead
  - Smooth greensnake

- Determine threats to rare herpetofauna species.

- Develop standard survey protocols for all herpetofauna SGCN within the next 10 years. This will increase the ability of other agencies, organizations, and volunteers to assist in gathering data on herptile SGCN.

Insects

There is little information to support effective management of most insect SGCN in New York. Specific recommendations include:

- Widen the suite of aquatic insects sampled and recorded by the Division of Water's Rotating Intensive Basin Survey to include more SGCN insect species.

- Inventory publicly owned lands for insect SGCN species whose status are unknown including:
  - Barrens buck moth
  - All tiger beetle SGCN
  - American burying beetle
  - Bog buckmoth
  - Regal fritillary
  - Gorgone checkerspot
  - Persius duskywing
  - Southern grizzled skipper
  - Brazilian skipper
  - Henry's elfin
  - All species in the group "other moths"

- Continue to support the Odonate Atlas project.

Mammals

Several species have little data to support protection and management efforts. Specific recommendations include:

- Implement harvest-independent monitoring of American marten.

- Expand monitoring of river otter across the historic and expanded populations and increase monitoring and reporting accuracy in the marine district.

- Implement a monitoring protocol for New England cottontail in New York in consultation with the states of Connecticut and Massachusetts, resolve its taxonomic status, and identify specific threats to its continued existence in New York.

- Improve monitoring capacity for marine mammals in the Atlantic Ocean and Long Island Sound using satellite telemetry and aerial surveys. Coordinate this work with the federal government and adjoining states.

- Survey likely habitat for small-footed bat, tree bats, least weasel, and least shrew in the state to determine their population status.

Marine Fish

There are many marine fish species whose populations and habitat needs are poorly understood and not measured. Recreational and commercial harvest regulations of several of these species do not include reporting requirements. Due to their importance in coastal food webs specific recommendations include:

- ❖ Develop fishery-independent sampling program for river herrings (American shad, alewife, blueback herring), rainbow smelt, and estuarine forage species (killifish and silversides) and calculate abundance indices.
- ❖ Document life history of river herrings, rainbow smelt, and estuarine forage species in New York and their habitat usage.
- ❖ Attempt to identify the predators on river herrings, rainbow smelt, and estuarine forage species, and the relative energetic importance of these species to those predators.
- ❖ Map remnant spawning runs of river herrings and rainbow smelt and identify candidate sites for fish passage structures in the Hudson, Susquehanna, and Delaware River systems and in coastal streams on Long Island.
- ❖ Improve the capacity to sample and quantify demersal and pelagic shark populations in New York at all life stages and the role New York's waters play in their life cycle.
- ❖ Conduct literature reviews to determine habitat suitability of New York's coastal zone for shark pupping and nursery areas.
- ❖ Improve harvest reporting on skates and rays in marine waters of New York. Use these data to determine the health of New York's population of these animals.
- ❖ Expand fishery-independent surveys for juvenile winter flounder in New York's marine district. Correlate juvenile indices with temperature data to determine if this species may be experiencing a range reduction.

Mollusks

- ❖ Expand toxicity testing for pesticides and ammonia on freshwater mussels. Update water quality guidance and BMPs as appropriate.
- ❖ Continue research into the efficacy and optimal placement of spawner sanctuaries and reef sites for marine bivalves. Work with local governments in the marine district to manage marine bivalve populations.

Improve mapping and understanding of habitat distribution and condition in New York State.

Knowing the condition of the natural resources of the state is a fundamental responsibility of DEC. Given the vast area and diversity of natural resources found in our state, this daunting task will require the cooperation of many partners in order to effectively manage our SGCN across the state. Improvements in remote sensing and GPS technology have reduced the potential costs of landscape-scale mapping.

One of the first attempts at statewide habitat condition analysis was carried out in the New York GAP analysis project (NYGAP) (Smith et al. 2001). This project predicted the distribution and abundance of certain wildlife species across the state based on remote sensing imagery. The GAP analysis project used the same remote sensing imagery as the US Environmental Protection Agency's (EPA) Multi-Resolution Land Classification (MRLC) project. While MRLC was simply a land cover classification mapping project, the NYGAP went a step further and predicted the habitat value and corresponding wildlife distribution of terrestrial vertebrates across the state. There is an aquatic GAP analysis project underway in New York as well. As with NYGAP, the aquatic GAP project is being led by Cornell University's Cooperative Fish and Wildlife Unit. The last comprehensive statewide aquatic surveys were carried out by New York Conservation Department staff in the 1920s and 30s. The New York Natural Heritage Program has completed a baseline inventory of natural resources on state park lands and is in the process of inventorying state forests. The Heritage Program inventories include habitat and fauna information.

Unfortunately, there are no plans to update NYGAP at this time. The MRLC maps are now being updated by EPA and will provide a comparable data set at a 10 year interval from the initial MRLC data used to develop the CWCS. Further habitat mapping and habitat data collection should be carried out as part of the recommended monitoring program in the Monitoring chapter of this strategy. There is a need to improve the accuracy of habitat mapping statewide. Ideally those habitat maps will be indexed with the native fauna associated them.

General

- Identify and map large blocks of unfragmented habitat cover types. This should include roadless forest tracts, grasslands, shrub lands, riparian areas and free-flowing streams. Wherever possible, these mapping efforts should extend across watershed and state boundaries, and both public and private lands, especially in the case of forested and aquatic habitats.

- Develop methods of invasive plant detection and mapping to track their extent and spread across the state.

- Identify spatially-explicit critical habitat maps for SGCN statewide and determine their protective status. Use this information to inform the Open Space Conservation Plan and other land protection and acquisition programs, including the Land Owner Incentive Program, Forest Stewardship Program, Farm Bill programs, and others.

- Use the above information to identify the publicly-owned lands that support SGCN and provide that information to land managers.

Wetlands and Aquatic habitats

- Complete an update of all state wetlands regulatory mapping under both Article 24 and Article 25. Use this data to conduct a status and trends analysis of wetlands in the state since inception of protective legislation. Priority should be placed on areas with known or suspected net loss of wetlands.

- Document the use of wetland habitats by SGCN in wetlands smaller than 12.4 acres and not currently protected under Article 24. Of particular priority are amphibian SGCN.

- Continue and expand benthic habitat mapping and indexing efforts in the Marine District. Develop analogous mapping procedures in larger freshwater systems of the state.

- Expand habitat condition information collected during water quality surveys, and expand the Division of Water's ongoing Rotating Intensive Basin Survey to include information on a wider suite of aquatic species.

Forests

- Continue to improve and upgrade forest health and composition mapping efforts on state forest lands.

Planning Recommendations

- ❖ Build on the existing "fine-filter" draft of the CWCS to generate "coarse filter" recommendations for identification of priority habitats and threat assessments. Work with conservation partners and existing GAP project information to generate these new products.

- ❖ Conduct statewide goal setting for maintenance and restoration of terrestrial habitats, specifically mature forests, early successional shrub lands and forests, and grasslands. Several species-based management and recovery programs set competing goals of increasing one or another type of habitat. These goals should be coordinated and set based on a mosaic management approach of these habitats on public lands in the short-term and expanded to voluntary private lands participation in the future.

- ❖ Develop stepped-down watershed management plans for each of the watershed basins in the next 5 years. This process should include refinement of the vision, goals, and objectives in each watershed.

- ❖ Develop a statewide, standardized GIS layer of all protected lands in New York. This should include information on all levels of protection, including easements, and integrate information from the new Landowner Incentive Program, where appropriate.

- ❖ Create a statewide strategy to address the threat of atmospheric deposition of mercury and nitrogen and sulfur compounds. Build on the existing efforts of the DEC's Acid Deposition Reduction Program.

- ❖ Develop a statewide assessment of the effects of global climate change on New York's natural resources. Build on existing efforts of the Regional Greenhouse Gas Initiative, Long Island Sound Study Tidal Wetlands Workshop recommendations, and boreal species research in the Adirondacks.

- ❖ Develop a statewide eel management and recovery plan. Build watershed components of this plan beginning with the Great Lakes and St. Lawrence River and the Marine District of the state. Include the data collection and management recommendations cited in this section and in the species group report for American eel found in Appendix A.

- ❖ Update the 1979 Keller brook trout management plan for New York to include current recommendations for heritage strains of trout.

- ❖ Develop management or recovery plans for high priority SGCN in the state where such plans do not yet exist.

- ❖ Develop statewide goals for bird SGCN in decline including grassland species, early successional forest and shrubland breeding birds, and boreal forest species. Integrate these goals with habitat planning goals above.

- ❖ Develop recommendations for expansion sites to establish new populations of Karner blue butterflies in suitable habitats.

- Update and expand the existing DEC Aquatic Nuisance Species Plan with a comprehensive terrestrial invasive species plan statewide. Incorporate the recommendations and findings of the Governor's Invasive Species Task Force. Develop regional approaches to implementation of these recommendations that will be effective in containing and reducing the abundance of the most invasive of the plant species.

- Update state land unit management plans, state park master plans, national wildlife refuge comprehensive plans, and other appropriate planning documents to include information and management needs of SGCN statewide.

- Develop a statewide map of avian and bat migration routes for use in wind turbine and communications structure placement.

Land Protection Recommendations

- Implement the recommendations of the NYS Open Space Conservation Plan that fulfill habitat protection needs of SGCN. The Open Space Conservation Plan has a well established collaborative process for determining regional land acquisition priorities among state and local governments and stakeholder groups. By informing the Open Space Conservation Planning process of the needs of SGCN in each region, the CWCS can effectively integrate land protection needs into the existing land acquisition mechanism for the State of New York.

- Improve mapping accuracy and availability for sensitive habitats like wetlands and riparian zones. Use this information to identify buffer parcels and inform landowners and local planning and zoning boards of their value.

- Implement the new Landowner Incentive Program and support existing private lands cooperative management programs to improve habitat for SGCN on private lands. Grassland and early successional habitats are of particular priority.

- Develop land protection strategies for large blocks of unfragmented forests by working with private land owners and public land managers, transportation planners, and local government to reduce planned fragmentation. Development of tax incentives and disincentives, easements, and cooperative management programs is crucial to the achievement of this task.

Management and Restoration Recommendations

- Develop an "Urban Wildlife" pilot program for chimney swift and common nighthawk. These bird species are uniquely suited to urban environments and have potential for educational involvement at public school buildings. Large cities in the state should be examined for potential inclusion in the pilot program.

- Use data collected for SGCN through the SWG funding stream to update appropriate New York Natural Heritage Program records.

- Incorporate tabular and spatial data collected for SGCN and their habitats into DEC's Master Habitat Data Bank and the Natural Heritage Program Database, as appropriate.

- Develop monitoring program outlined in the monitoring chapter and develop data standards for research projects funded by SWG. Institute peer review of monitoring protocols for SGCN.

- Develop experimental forest management areas within publicly-owned forest lands to determine appropriate forest management parameters for SGCN, especially forest-breeding raptors.

- Improve the management of the state's grassland and pine barrens areas by introducing or continuing the use of prescribed fire.

- Implement large-scale shellfish restoration with accompanying sustainable management and enforcement procedures.

- Improve management, conservation, and encourage restoration of riparian buffers for the state's waterbodies.

- Expand and support existing efforts to implement BMPs on farms along stream corridors statewide to protect water quality, reduce excessive soil erosion, protect habitat, and improve nutrient management.

- Work with land owners to increase percentage of streams statewide that have vegetated buffers of more than 50 feet.

- Implement management recommendations of the Governor's Invasive Species Task Force. Develop means for early detection and response to invasive exotic plant and animal species statewide.

- Expand capacity of agencies and non-governmental organizations to work with private land owners who have habitat for SGCN on their property to manage it for the benefit of SGCN.

- Develop and improve appropriate volunteer data collection for SGCN.

- Develop and improve remote data collection and processing abilities within agencies and non-governmental organizations.

- Update and maintain the CWCS planning database in anticipation of the redrafting of the CWCS in 5 years.

- Develop a statewide in-stream flow policy that allows for management of the quantity and temperature of flows that mimic natural conditions to te extent possible wherever possible. Examination of existing flow rate agreements must be a component of this task.

Information Dissemination Recommendations

- Expand forestry practices information sheets to include information related to SGCN and watershed protection. Support the outreach efforts associated with the "*Wildlife and Forestry in New York Northern Hardwoods, A Guide for Forest Owners and Managers.*" Participate in future revisions of this document to include the needs of SGCN.

- Work with governmental agencies and trade associations to educate garden wholesalers and retailers about invasive plants and discourage their sale and use in New York State. Develop similar outreach to private citizens.

- Develop fact sheets regarding all SGCN for distribution to the public. Include steps that the public can take to protect and enhance wildlife.

- Work with the US and state departments of transportation to incorporate SGCN-friendly components into road maintenance and renovation work. Specific examples include wildlife underpasses, median and right-of-way mowing, tree-cutting schedules and plantings, sand and salt use runoff reduction measures, and new road location planning.

- Make information available to public and private land managers regarding the benefits and need for reducing fragmentation of mature forests. Also provide for early successional habitat, including even-aged forest stand management and sustainable forestry practices where it is deemed appropriate or desirable.

- Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrub land birds. Utilize existing information and education resources, such as SUNY Environmental Science and Forestry School's *Shrubs on Rights-0f-Way* guide.

- Develop an outreach program for public and private land managers to increase awareness of the benefits of managing the land with wildlife-friendly agricultural practices. Species groups that will benefit include fish, freshwater marsh nesting birds, amphibians, and grassland birds.

- Promote the establishment of vegetated buffers between agricultural fields and wetlands and streams to protect them from runoff and benefit fish, bivalves, and freshwater marsh nesting birds.

- Provide information about negative effects of human disturbance on wildlife. Human behavior can be altered by education and outreach and can help reduce detrimental interactions.

- Enhance public education to curtail collection and translocation of fish, or killing of hellbenders and snakes. This includes dispelling common myths about dangers posed to people and pets by native snakes.

- Develop an outreach and education tool to highlight the possible detrimental effects of human disturbance on wetland dependant wildlife, especially SGCN. An example could be off-road vehicle effects on vernal pool and marsh nesting species.

- Develop outreach material to educate the public about the benefits of grasslands, freshwater mussel life history, and at-risk Lepidoptera.

- Share information on lands that provide critical habitat for SGCN with county and town planning boards to assist them in steering development and growth away from critical areas.

- Develop a report on the "State of Wildlife in New York." This document should be public-friendly, and could serve the additional purpose of an executive summary. The document should be updated with each update of the CWCS.

- Continue to update the State Wildlife Grants web pages on the DEC website to inform interested parties of projects funded by State Wildlife Grants.

Regulatory and Legislative Recommendations

- Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN.

- Explore the issuance of general permits for regulated activities under ECL §608.5 (navigable streams) for those stream segments that provide habitat for SGCN.

- Work to strengthen existing support programs for local government planning and zoning boards to incorporate water quality and land side habitat protections into local regulations. An example of this type of program is the Local Waterfront Revitalization planning process administered by Department of State.

- Explore the need for extending regulatory authority over SGCN and/or their critical habitats where it does not exist. For example, legislation extending protection as ‘special concern’ species is pending for many of the herptile species. This protection would be based on data collection activities proposed elsewhere in this CWCS.

- Implement reporting requirements for sharks, rays, and other marine SGCN that are harvested and not currently reported.

- Explore an amendment of §480a of the Real Property Tax Law that may provide for wide-ranging holistic stewardship on eligible tracts of private property. Consider the establishment of a Habitat Reserve component to encourage land owners to voluntarily conserve and manage significant habitats for wildlife and fish located on their lands through Real Property Tax exemptions.

- Implement the regulatory recommendations of the Regional Greenhouse Gases Initiative and Acid Deposition Reduction Program.

- Review and respond to project applications involving tall structures such as cellular transmission towers and wind turbines that may adversely affect migratory birds and tree bats.

- Conduct a statewide reinventory of wetlands and update the state Freshwater and Tidal Wetland maps.

Incentives

Only about 15% of the land area of New York State is in public ownership. In order to effectively maintain viable wildlife habitat for healthy and resilient populations of SGCN in New York, cooperation with private landowners is a necessity. An effective conservation incentive program must have clear goals, adequate funding, strategic delivery, efficient communication and coordination among conservation partners, and monitoring and adaptive management of the ecological outcomes of the program. DEC and other partners should collaborate to create a habitat incentive program to encourage private land owners to make land use decisions which protect and preserve SGCN habitat.

In order to attract participants, the program must provide clear benefits that are desirable to the land owner. The process must be accessible and understandable and keep decision making at a local level. The most effective use of SWG toward incentive programs will be to provide the strategic vision and technical guidance to existing incentive outlets like the federal Farm Bill programs, Landowner Incentive Program, Partners for Wildlife, and others.

Implementation of incentive programs will be strengthened by expanding guidance to local governments regarding effective zoning statutes, technical and financial assistance to watershed protection and development planning, and effective enforcement techniques for existing statutes.

Some specific recommendations include:

❖ Explore an amendment of §480a of the Real Property Tax Law that may provide for wide-ranging holistic stewardship on eligible tracts of private property. Consider the establishment of a Habitat Reserve component to encourage land owners to voluntarily conserve and manage significant habitats for wildlife and fish located on their lands through Real Property Tax exemptions.

❖ Develop other incentives for private land owners to incorporate protections of SGCN into their land management.

❖ Work with the Forest Certification Program, Forest Stewardship Council®, and Sustainable Forestry Initiative® across the state to incorporate BMPs sensitive to the needs of SGCN.

❖ Work with local governments to develop effective zoning statutes, technical and financial assistance to watershed protection and development planning, and effective enforcement techniques for existing statutes. Explore the development of state incentives for local government to undertake Quality Community or Smart Growth initiatives and create local open space conservation plans.

Description of the Basin

The Allegheny Basin covers an area of approximately 1,900 square miles (1.2 million acres) in the southwestern corner of New York State, just north of the state line with Pennsylvania. The Allegheny River itself originates in Pennsylvania. It enters New York State at the Cattaraugus-Allegany county borderline, continues westward for about 48 miles and returns to Pennsylvania, where it empties into the Ohio River and, eventually, into the Mississippi River.

In New York, the Allegheny flows through unglaciated land that extends to the south in Pennsylvania. This is the largest area of unglaciated land in New York State (NYS) and soils above the river valley are residual soils derived from shales and sandstone, lacking limestone. This makes them deficient in lime. This area is the northernmost extension of the unglaciated upland of the Allegheny Plateau (Muller, 1977).

Aquatic habitat in the basin is comprised of 3,945 miles of streams and rivers but is also provided by extensive wetlands, some large lakes, and a reservoir. The headwaters of the Allegheny have a rich geologic history, including glaciations on 4 separate occasions, which has led to diverse plant and animal life. Because of its geology and connection to the Ohio and Mississippi Rivers, the basin supports one of the most biologically diverse aquatic systems in the northeastern United States. The basin provides critical habitat for many species, including Species of Greatest Conservation Need (SGCN). According to the Ohio River Basin Commission, as of 1980, the Allegheny basin sustained 288 bird species, 38 mammals, 114 fish, and 64 reptiles and amphibians.

The basin is within the Appalachian Highlands, or Western Allegheny Plateau ecoregion, and includes 3 sub-watersheds: French Creek, Chautauqua Lake, and the Allegheny River. The major municipalities within the basin are Jamestown, Salamanca, and Olean. Parts of 3 counties comprise the basin (Chautauqua, Cattaraugus, and Allegany) and had an estimated population of 200,000 people basin-wide in 2000.

The Allegheny Basin varies from the rugged, heavily wooded Allegheny Hills along the Pennsylvania border to the flatter lands in the north and west. The predominant land-cover classifications are deciduous and mixed forest (67% combined) and agricultural lands, according to the US. Environmental Protection Agency's (USEPA) Multi-Resolution Land Classification (MRLC) map information (Allegheny Table 1, Allegheny Figure 1). Approximately 27% of the land area of the basin was classified as row crops or pasture/hay lands based on MRLC interpreted data. The MLRC national data distinguishes between natural grassland and old fields, hay, pasture and row crops. No lands are classified as natural grasslands in the basin. In New York, pasture/hay lands and row crops are often referred to as grasslands by many management agencies, including the New York State Department of Environmental Conservation (DEC). Just over 2 percent of the basin is classified as developed land. As land use changes, urban areas are expected to develop primarily on agricultural land (Allegheny River Basin Comprehensive Coordinated Joint Plan, 1980). The data provided here relates to the entire Allegheny basin, but, where available, more detailed information is provided below for the 3 sub-watersheds.

The sub-watershed of French Creek drains approximately 100 square miles in New York before flowing into Pennsylvania. This sub-watershed is characterized by a variety of land uses and cover, including pasture and cropland (47%), mixed hardwood forests (45%), wetlands (6%), and residential areas (2%). It is primarily rural-agricultural, with dairy agriculture being the dominant land use. Other primary activities include forestry, oil and gas production, and recreation (NYS Water Quality Report, October 2002(305b)). Even though this sub-watershed constitutes only 6 percent of the Allegheny basin, quite a bit of information is available. Due to the area’s rich biological diversity, a number of studies have been conducted in the French Creek area.

The Nature Conservancy (TNC) teamed with many partners in 2002 to launch a single, sub-watershed-wide conservation program. One of the principal strategies of this group is to implement best management practices (BMP) on farms along streams to reduce runoff of sediment and effects on aquatic organisms. With 56 species of fish and 13 species of mussels, the entire French Creek drainage (including those portions in Pennsylvania) contains half again more than the average number of native species than are found in most other New York streams in the Atlantic coastal drainages (TNC, 2004). Many of these species disappeared from similarly small waterways of the US, but French Creek continues to provide one of the few remaining riverine refuges. TNC also conducts water quality monitoring to evaluate the benefits of these BMPs. The French Creek project was initiated in 1994 by TNC. The primary goal of the project was to guide conservation management by providing predictions of faunal diversity and habitat integrity. Such conservation efforts need to be conducted in other sub-watersheds of the Allegheny Basin and coordinated with efforts in the French Creek system.

The Chautauqua Lake sub-watershed drains approximately 765 square miles and has similar land cover to the French Creek sub-watershed. Even though it comprises 40% of the basin, very little is known about overall wildlife populations in this area. Fish habitats are best suited for lowland species associations, but cold-water streams also flow from the low hills. The largest water body in the basin, Chautauqua Lake, is located in this sub-watershed. The Chautauqua Watershed Conservancy’s mission is to preserve and enhance the water quality, scenic beauty, and ecological health of the lakes, streams, and watersheds of the region by conserving key sites. Development and other land uses threaten the region’s resources; only 13% of the lake’s shoreline remains in a natural condition. Conewango Creek has a meandering channel with substrates of clay and sand, and the lower section, near Jamestown, has flooded backwaters that have remained un-compromised by farming.

The Allegheny River sub-watershed makes up about 54% of the basin, and drains 1,050 square miles of land. The land cover of this sub-watershed is distinctly different from French Creek and Chautauqua. It is comprised of mostly deciduous and mixed forest, especially in and adjacent to the Allegany State Park. Substantial areas along the middle section of the Allegheny River remain wild, due to management practices of the Seneca Nation of Indians (SNI). Approximately 33,000 acres within the basin are owned by the SNI. Farming is also absent from the adjoining lowlands of most of the downstream segment, because those lowlands were flooded to form the Allegheny Reservoir. More investigations are needed to provide a better understanding of the ecology and habitats in this sub-watershed area.

Two state parks are operated and administered by NYS Office of Parks, Recreation, and Historic Preservation (OPRHP) in the basin, which totaling more than 65,000 acres in DEC's Region 9 (Allegheny Table 2). Region 9 consists of Allegany, Cattaraugus, Chautauqua, Erie, Niagara and Wyoming counties. Allegany State Park provides primarily upland habitats for many SGCN. Long Point State Park, on Chautauqua Lake, provides about 2 miles of undeveloped shoreline as well as upland habitat on 360 acres of parkland.

Audubon New York designated 2 areas within the Allegheny basin as draft important bird areas (IBA) (Allegheny Table 3). The Allegheny Forest Tract IBA is located in Cattaraugus and Chautauqua Counties. It was designated for 11 species at risk; the high percentage of the state's population of bald eagles and cerulean warblers; and forest cover, which includes sugar maple mesic, oak, deciduous wetland, evergreen northern hardwood; and successional hardwoods. This site includes the Allegany State Park and extensive surrounding forested land. The Kinzua Dam creates the Allegheny Reservoir, and water level varies from season to season and from year to year. This site is listed in the 2002 NYS Open Space Plan (OSP) as a priority site and supports long-term research and monitoring projects.

The Chautauqua Lake IBA, located in Chautauqua County, was designated for species at risk (pied-billed grebe and common tern) and waterfowl congregation areas. Owned by the State of New York, the lake is accessible to public use, while the shore areas are mostly in private ownership. This site is listed in the 2002 OSP as a priority acquisition. Pollution could have negative effects on this aquatic system, as could the heavily developed (89%) lakeshore.

There are approximately 6,695 acres in 9 DEC wildlife management areas (WMA) in the basin (Allegheny Table 4). They range in size from 31 acres to almost 2,011 acres. These WMAs provide multiple habitats for fish and wildlife, including upland and wetland systems. These lands should include habitat management regimes for SCGN. There are 28 state forests in the Allegheny basin, totaling 45,108 acres. These forests are also prime areas for protection and management of multiple species.

Critical Habitats of the Basin and the Species That Use Them

DEC staff compiled the SGCN information in the State Wildlife Grants (SWG) database and was asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in Allegheny Tables 5 and 6. The last column of these tables indicates the number of species that use each System-Subsystem as critical habitat. The habitat classifications in the database were adapted from the New York Natural Heritage Program's (NYNHP) *Ecological Communities of New York State*, second edition. In most cases, the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the Lacustrine and Riverine systems, the subsystems were modified to reflect the classifications most often used by DEC fisheries managers, e.g. "cold water – shallow." Three aquatic habitat systems support 55 species in the Allegheny basin (Lacustrine, Palustrine, Riverine) and those are further refined into 14 subsystems. Within the terrestrial habitat system 3 subsystems support 63 SGCN in this basin.

Each of these systems and subsystems is further refined into a habitat category in the SWG species database and can be viewed in the taxa reports in Appendix A. The habitat categories are excluded here for the sake of simplicity but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. These critical habitats are not a comprehensive listing of all the habitat associations found in the basin, but rather a subset of the habitats deemed critical to SGCN that occur in the basin (Allegheny Tables 5 and 6). In addition, a single species may require multiple habitats throughout its life cycle, so the total of the final columns may exceed the 109 SGCN that presently or historically occurred in the basin.

Overall Trends in the Basin

The Nature Conservancy recently assessed the landscape condition of New York via a watershed approach (Stratton and Seleen, 2003) and depicted relative quality at the US Geological Survey's 11-digit scale watersheds on a map of New York State. Six indicators of watershed condition were used in the analysis: population density, road density, protected lands, dam density, natural land cover and interior forest cover. The landscape condition of the Allegheny basin is rated as quite good, second only to the Adirondack and Catskill mountain areas of the state. Landscape condition tends to be better in the Allegheny and French Creek sub-watersheds, with condition declining in the Chautauqua Lake sub-watershed around the highly developed lake. Correspondingly, the water quality of the basin, predicted by percent forest cover and impervious surface, is rated as good to excellent when compared to the rest of the state. This directly correlates to the high forest cover (67%) and relatively low human population.

Agricultural lands constitute an average of 27% of the Allegheny Basin. As noted earlier, that percentage is much higher (47%) in the French Creek sub-watershed. No estimates of agricultural lands were found for the Chautauqua Lake sub-watershed, but given the similarities in land cover (Allegheny Figure 1) between it and the French Creek sub-watershed it is likely the Chautauqua sub-watershed also contains approximately 50% agricultural lands. There are no major grassland wildlife zones as defined by the US Department of Agriculture (USDA) in the Allegheny Basin, but with the amount of land in pasture and hay, it is likely that individual areas can be managed to support grassland habitats and the SGCN that depend on them in these 2 sub-watersheds. The same situation applies to preserving high grassland related biodiversity areas in the French Creek and Chautauqua Lake sub-watersheds.

According to DEC data, wetland types of the Appalachian highlands during the 1990s were 59% forested, 22% shrub, 11% emergent and 8% open water. These wetland areas, totaling 446,000 acres, provide critical habitat for many SGCN in the basin. It is estimated that the Chautauqua sub-watershed supports the greatest amount of wetlands in the drainage. In the Appalachian highlands, there has been a balance of gains and losses, but there have been losses of shrub and emergent marsh systems, with corresponding increases in forested and open water wetlands. Because it is a large geographic area, the Appalachian highlands area contains about 19% of all the state's wetlands, but at a fairly low density: only 3.8% of the ecozone is wetland, compared to about 8% statewide. Because of wetland scarcity on the landscape, wetland conservation should be considered a priority in this basin.

NYNHP's database indicates the Allegheny Basin is biologically diverse for a number of taxa groups tracked by that program: mollusks, herpetofauna, and fish. Allegheny Table 9 provides a summary of species diversity in the Allegheny Basin relative to the total number of SGCN statewide: herpetofauna and fish are particularly high, at 30 percent. Studies of biodiversity should continue in the basin to assess SGCN and their habitats and to recommend appropriate conservation actions.

There are 86 SGCN that currently occur in the basin and 23 species that historically occurred in the basin (Allegheny Tables 8-9). In this chapter, species that historically occurred, but for which there are no recent confirmed records, will be referred to as "having no recent record." Current data is lacking or insufficient to determine whether those historically occurring species still exist or have been locally extirpated. Thorough literature searches, field surveys, and monitoring are required to establish a current status of the population of most, if not all, species in the basin. Establishing baseline species and population records should be a priority, as those data can be used to guide future studies and management practices.

Of the 86 SGCN currently occurring in the basin, it is believed that the populations of 29 species are decreasing, 5 are increasing, 6 are stable, and 46 are of unknown status. Given the fact that loss of species has occurred in alarming numbers (36%) in this basin, priority must be given to conserving the remaining species in the Allegheny Basin. Some species, such as bigeye chub, mountain brook lamprey, Ohio lamprey, river redhorse, hellbender, short-headed garter snake, mucket, streamline chub, spotted darter, blue breast darter, longhead darter, and gilt darter are found in very limited distribution statewide. A few of these species occur only in the Allegheny Basin, and the rest are found in only 1 or 2 other basins statewide.

The human population of the Allegheny Basin has not changed significantly since the 1950s, but, like most parts of the state, sprawl is increasing. Only 2 percent of the basin is classified as developed land. As land use changes, however, urban areas are expected to develop primarily on agricultural land (Allegheny River Basin Comprehensive Coordinated Joint Plan, 1980).

The changes and/or reduction in agriculture have been and continue to be a major event in the basin, both in terms of economics and the environment. Reduction of agricultural land results in loss of grasslands used for haying and pasture. The amount of land in agriculture in this basin has been reduced from about 85% of the total land cover in 1900 to 27% in 2002. However, agricultural land use has essentially remained the same between 1968 and 1995 (NY Aquatic Gap Analysis, 2004). The nature of the remaining agriculture has changed as well. In some instances, smaller farms have consolidated into larger units and monocultures have become more expansive. It is difficult to generalize about the effects of farm consolidation, but it can result in better financial resources, improved farming practices and less effect on natural resources, although this does not always occur. Regardless of farm size, it should be noted that financial health and security are not the only factors that determine the type and quality of stewardship of natural resources. Cropland diversity has decreased, as row crop monocultures have become the dominant agricultural land-use practice. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species, such as Neotropical migratory birds, that breed in the basin.

The basin, especially in the Allegheny River sub-watershed, was predominantly a forested ecosystem and is now dominated by deciduous and mixed forest cover. Increases in mature secondary growth forest cover have been accompanying the decline in agricultural acreage in this basin and statewide as one would expect. However, where mature forest stands exist with “old-growth” characteristics efforts should be made to move toward maintaining and expanding these types of stands. Not surprisingly, fish and early successional forest/shrubland birds are declining; approximately half of the forests breeding birds are believed to be stable as forests mature in this basin. Management efforts for grasslands and wetlands should be concentrated where they exist as inherent natural communities of the landscape.

Emergent marshes in the Appalachian highlands have declined since the 1900s. Wetlands in the entire region increased by an estimated 3,000 acres between the 1980s and 1990s according to DEC Bureau of Habitat information on statewide wetland trends. However, there were notable changes in the wetland plant communities in wetlands in this region of the state as the cover type on wetlands shifted. Shrub swamp as a cover type declined by approximately 5,000 acres, and emergent marsh as a cover type declined by an estimated 16,000 acres during that same period. Open water associated wetland and forested wetland increased as cover types by an estimated 7,000 and 17,000 acres, respectively. Not surprisingly, populations of freshwater marsh nesting birds, grassland birds, lizards, and salamanders in the Allegheny Basin are generally in decline, while species associated with forest habitat are more secure.

Lakes have become more affected by shoreline development. Chautauqua Lake has extensive beds of aquatic plants that prompt control programs every year. Stream quality was assessed using macroinvertebrate indicators for 30-year trends by DEC Division of Water staff, and the French Creek sub-watershed was found to be the least degraded. Large river habitats continue to improve due to point source water pollution abatement, which began in the 1970s.

Upland/riparian land use adjacent to stream corridors has resulted in degradation and loss of aquatic habitats throughout the basin. These land uses negatively affect the diversity and populations of both fish and amphibians.

Threats

DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate threats to SGCN and their habitats. During the analysis for the basin, a listing of threats for each species occurring in the Allegheny Basin was extracted from the database. The threats and summary figures compiled here are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and other rationales. The information provided does not quantify the magnitude of a particular threat. The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the database. The purpose of this information is not to compare the severity of one threat against another.

General Discussion

The major environmental stressors in the Allegheny Basin are related to residential development, oil and gas production, agriculture, forestry practices, streambank erosion, altered hydrology, and gravel mining. The negative effects of these stressors on natural resources include loss of natural habitat to development, riparian buffer loss resulting in excessive nutrient and sediment loading to water bodies, reduced water quality, and contaminants and non-point source pollution from abandoned and active oil and gas wells. These major stressors are mentioned in the DEC Division of Water 305(b) report and a joint project of the Western Pennsylvania Conservancy and French Creek Project: *French Creek Watershed Conservation Plan 2002*.

The above stressors affect the 3 sub-watersheds of the basin differently. In the more densely populated areas of the basin, degraded water quality from nutrients and toxic substances and habitat destruction are of greater magnitude and are related to residential, commercial and industrial development. Oil and gas wells can release oil and brine into streams, causing negative effects on aquatic organisms. Heavy metals and polychlorinated biphenyls (PCBs) have affected fish propagation and macroinvertebrate populations in the Chadakoin River, which flows through Jamestown.

In areas of the basin dominated by agriculture, fertilizer, pesticide, and herbicide runoff and soil erosion are of greater magnitude. In these more rural areas, too, on-site septic systems leach nutrients into aquifers and surface waters. Lakes in the basin have increased nutrient levels from agriculture and on-site septic systems. These rural areas within a short distance of urban centers are also most prone to sprawl, a driving factor in habitat loss. In the heavily forested areas of the basin, unsustainable forestry practices can result in loss of or degraded habitats, particularly aquatic habitats that support SGCN.

Specific Threats to Species of Greatest Conservation Need

The most frequently cited threat to species groups occurring in the Allegheny Basin was outright loss of habitat via conversion to human-dominated land use.

This threat was the most frequently listed for both terrestrial and aquatic species. It includes hardening of the landscape with buildings and roads, but also includes activities such as clearing land, channelizing streams, removing gravel from streams, creating dikes, and draining wetlands. Complicating the picture is the habitat function provided by much of the agricultural lands in the basin at this time. Pasture and hay lands provide a surrogate for natural grasslands in the Western Allegheny Plateau ecoregion. When managed appropriately, these agricultural uses may actually be beneficial to wildlife. But when agricultural management activities, such as mowing of hayfields, occur at the wrong time of year, grassland-nesting species may be disturbed or killed.

The second most commonly cited threat to SGCN in the basin is toxic contaminants. Contaminants affect both terrestrial and aquatic species in the basin. Degradation of water quality, which may also include contaminants, was the third most common threat listed to aquatic species groups in the basin. Heavy metals from oil and gas production and PCBs from disposal of industrial waster negatively affect aquatic life in the Chadakoin River (DEC, 2002).

Pesticide use on agricultural lands is of concern to herpetofauna, insects, mussels and freshwater crustaceans. Agricultural pesticides are generally non-specific in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Amphibians are particularly susceptible to pesticides and other toxins.

Degradation of water quality also comes from soil erosion and runoff (the fifth most common threat), nutrient-induced algal blooms, and reduced dissolved oxygen caused by excessive algae decay or increased temperatures. Lakes in the basin (including but not limited to Bear, Findley, Case, Harwood, New Albion, Upper, Middle, Lower Cassadaga) are affected by high algae and weed growth due to excessive nutrients from on-site septic systems. Siltation negatively affects fish populations by decreasing spawning areas and nursery habitat. The Allegheny Reservoir is operated with aggressive winter water releases for flood control around the reservoir. This diminishes the capacity to sustain fish abundance. Altered hydrology is associated with water quality degradation, which is the sixth most common threat to aquatic resources. Alterations to water flow can be caused by barriers (dams like the Kinzua, weirs, culverts, bridges, and beaver dams), water level management and withdrawal, and floodplain alteration. Ultimately, loss of aquatic habitat quantity results from alterations to water flow.

Human disturbance is considered a significant threat to both aquatic and terrestrial species in the Allegheny basin. In-stream gravel removal and upland mining directly affect a number of species. The development of roads and utility rights-of-way directly affects the number of species struck by cars on roads or which collide with power lines, cell towers, and wind mills. To protect roads, highway departments often straighten stream channels and remove gravel bars, contributing to stream instability. In the aquatic arena, collisions can also occur with boats and personal motorized watercraft. Both terrestrial and aquatic SGCN are affected by illegal or unregulated harvest by humans. “Fugitive” all-terrain (ATV) and/or off-road vehicle (ORV) use must be monitored and assessed.

Priority Issues in the Basin

Management Collaboration

- Establish mechanisms to use a landscape or ecosystem approach and to work with neighboring agencies and organizations. SGCN and habitats do not follow political boundaries; their study and management should not be restricted by artificial limits. Valuable working partnerships may potentially be formed to study, manage, and protect SGCN if a landscape or ecosystem approach is utilized.
- Establish multi-level, collaborative efforts on issues including, but not limited to, species reintroduction, habitat restoration, and education.

Baseline Status Information for SGCN

- Conduct thorough literature searches and field surveys to determine the current “baseline” of species within the basin. Monies can then be directed to fund studies to fill data gaps.
- Determine the “historical baseline” to which species diversity, population numbers and habitats should be restored.

Land Use Practices

- Improve education of agricultural community regarding the needs of SGCN on or bordering farm lands in the basin, especially aquatic species.

Vision, Goals and Objectives for the Basin

Vision

The Allegheny Basin will remain one of the more pristine areas of the state, as evidenced by landscape condition and predicted water quality. Its rich mosaic of habitat types will continue to support many SGCN. Essential habitats of the basin will be perpetuated via the following objectives:

Goals and Objectives

- ❖ Determine the status and trends (e.g. quality, quantity, and spatial connectivity) of grasslands, early successional forest and shrub, deciduous/mixed forest cover, late successional forests (with potential to become mature), wetlands, and aquatic systems in the basin.
- ❖ Assess the current condition of these habitat types in the French, Chautauqua Lake and Allegheny River sub-watersheds.
- ❖ Set goals for these habitat types (e.g., restore large blocks of mature native forest; maintain X acres of wetlands). Where possible, goals should be spatially explicit (e.g., address issues such as connectivity).
- ❖ Monitor the quality and quantity of habitats on a 10-year rotational cycle.
- ❖ Set nutrient and sediment reduction targets by 2010 to protect water quality and quantity.
- ❖ Implement BMPs on farms along stream corridors to protect water quality, reduce excessive soil erosion, protect habitat, and improve nutrient management (on-going by the French Creek Watershed Management Group).
- ❖ Use the best fluvial geomorphic technology available to establish normal stream conditions and reduce excess erosion and provide riparian habitats. Create riparian buffers and restore historic riparian conditions in some areas.
- ❖ Identify specific threats to SGCN in order to prioritize habitat protection and restoration efforts.
- ❖ Identify barrier mitigation opportunities in the basin.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations for Critical Habitats

AGRICULTURAL LANDS

Trends in modern farm operations toward increased field size and loss of adjacent edge habitats may negatively affect certain terrestrial and aquatic species. Additionally, farm management practices, such as conventional tillage, may have negative consequences such as loss of food source, waste grain and wheat seeds from post-harvest fields, increased soil erosion, and loss of cover. Large row-crop monocultures and decreased crop diversity negatively affect wildlife and their habitats in agriculturally dominated ecosystems.

❖ Specific recommendations for grassland birds include a recommendation to evaluate the effects of specific farming and management practices on productivity of grassland birds. Specific investigations should include: timing and frequency of mowing; intensity of grazing; comparative effects of management regimes (such as mowing, haying and prescribed fire) and buffer strip characteristics. The highest priority species are Henslow's sparrow, upland sandpiper, Northern harrier and sedge wren.

❖ Evaluate effects of local agricultural practices on aquatic habitats and develop feasible alternative practices where needed.

FORESTS

Habitat management for forest breeding raptors is largely unknown. Sustainable timber harvest is a way to manage for these species, however, harvest practices (such as high-grading) and the absence of soil retention measures can negatively affect all forest wildlife and aquatic resources.

❖ Specific recommendations for forest breeding raptors include a recommendation to experiment with different management techniques to provide the critical habitat needs of this suite of species. Investigations may include different cutting regimes, different buffer distances and fire management for forest breeding raptors. The highest priority species is long-eared owl.

FRAGMENTATION

Fragmentation and loss of habitats in the basin is a common threat to all aforementioned species groups. There are many issues that influence the effects and severity of fragmentation on given species groups. These include patch size and shape, edge effects and connectivity of remaining habitat patches. Juxtaposition of wetland and grassland habitats has been shown to positively influence wildlife species diversity. This basin contains significant amounts of both habitat types and provides opportunity for landscape management of species that depend on these systems. Fragmentation is a threat to aquatic species as well. Altered hydrology in the watershed prevents or hinders migration and dispersal of a variety of aquatic species including freshwater bivalves. Isolated populations are more vulnerable to extirpation by both natural and anthropogenic events.

- Specific recommendations for freshwater marsh nesting birds and grassland birds include demographic studies to identify source and sink populations; metapopulation dynamics focusing on survival; and age at first breeding, recruitment, and dispersal. Controlled experiments to identify management actions effective in producing suitable habitat should also be conducted. Invasive species that may affect marsh birds need to be identified. High priority species for freshwater marsh nesting birds are pied-billed grebe, least bittern and American bittern. High priority species for grassland birds are Henslow's sparrow, upland sandpiper, northern harrier, and sedge wren.

- Specific recommendations for freshwater bivalves include investigations into the flow requirements of freshwater bivalves and modeling the effects of flow changes both in volume and timing. Additional research is needed on population dynamics of listed mussel species (including connectivity of habitat and genetic distinctiveness of populations and subpopulations) and controlling exotic bivalve species. The highest priority species within this group are mucket and rayed bean mussel.

- Specific recommendations for early successional forest/shrubland birds include development of guidelines for habitat management for golden-winged warbler, research into causes for declines of Canada warbler, and potential for beneficial forestry practices such as opening up the canopy and promoting ground growth and thickets. The effects of viburnum leaf beetle on applicable habitats and species utilizing them also needs to be determined. High priority species within this group are golden-winged warbler and Canada warbler.

- A specific recommendation for fish is to investigate habitat requirements, demographics and population dynamics of mountain brook lamprey, spotted darter and blue breast darter.

HUMAN-WILDLIFE INTERACTIONS

Human effects on species and their habitats are a threat to 2 species groups in the basin. Human disturbance may be caused by collisions with artificial structures, vehicles, illegal or unregulated harvest, or entanglement.

- A specific recommendation for forest breeding raptors is to monitor wind farms for mortality. High priority species within this group is long-eared owl.

INTERSPECIFIC INTERACTIONS

Interspecific interactions are a common threat to 5 species groups in a number of taxa. Such interactions result in loss of host species, disrupted predator/prey cycles, competition for life support from non-native species or species in places or numbers not historically found, detrimental hybridization, and parasites. As an example, beaver activity (past and present) on streams and stream inhabitants should be surveyed and monitored.

- A specific recommendation for freshwater marsh nesting birds is to investigate diet and nutrition in relation to breeding habitat quality and prey populations. High priority species within this group are pied-billed grebe, least bittern and American bittern.

- A specific recommendation for lake/river reptiles, lizards, and woodland/grassland snakes is to document life history parameters, including predator/prey relationships. High priority species within the lake/river reptiles group are eastern ribbonsnake and wood turtle. High priority (and the only) species within the lizards group is coal skink. High priority species within the woodland/grassland snakes group are timber rattlesnake and short-headed garter snake.

- Specific recommendations for early successional forest/shrubland birds are to monitor status and trends and develop habitat management guidelines for golden-winged warblers, including those techniques that favor golden-wings over blue-wings.

- A specific recommendation for hellbenders and stream salamanders relating to susceptibility to random disturbance events is to periodically evaluate the status of rare species to determine appropriate status listing. High priority species are hellbenders, longtail salamanders, and red salamanders.

Data Collection Recommendations for SGCN

A number of priority species and groups need population, habitat, and life history research to address critical data gaps. This information will help more clearly identify threats and establish baseline information for these "most critical" species. Only those "most critical" species not yet identified in text will be listed here within each group; the reader can refer to previous sections for "most critical" species already identified. The research items are listed below by species group. This type of data collection will address multiple threats to many species.

It is also strongly recommended that a portion of applicable funds be used to conduct surveys of abundance, distribution, and status for all those species that are not listed as high priority because sufficient information about them is lacking to make status determinations. Absent sufficient baseline research on these species' current condition in the basin, it will never be possible to elevate them to "most critical or critical" for the purposes of directing future conservation actions, or to remove them from the list of SGCN because their status is secure.

General Data Collection

Contaminant monitoring in fauna is recommended for 3 species in 2 taxa. As outlined in the Threats section of this document, contaminants (pathogens, metals, PCBs) and pesticides are of concern. Due to a number of land uses in this basin, such as power lines and agriculture and mining activities, monitoring the effects of pesticides on sensitive species is warranted. A thorough literature review should be conducted to better understand what information is already known about pesticide use in the basin.

- A specific recommendation for freshwater marsh nesting birds is to periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. The highest priority (and only) species within this group are pied-billed grebe, least bittern and American bittern.

- A specific recommendation for freshwater bivalves is to research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, and adults. The highest priority species within this group are mucket, elktoe, and rayed-bean and wavyrayed lampmussel. It is recommended that this item be done on a statewide basis.

EARLY SUCCESSIONAL FOREST/SHRUB LAND BIRDS

- Complete an inventory and analysis for high priority species that identifies core habitats within the basin.

- Monitor trends of all species.

- Develop a long-term monitoring program for golden-winged warblers.

- Encourage full completion of Breeding Bird Survey (BBS) routes.

FRESHWATER MARSH NESTING BIRDS

- Initiate a baseline population survey to determine abundance and distribution of these species in the basin. Refine monitoring techniques to better detect population trends.

- Inventory breeding sites and map at a coarse scale to select key monitoring locations. Analyze habitats at multiple scales to better understand characteristic important to nest site selection. Identify key migratory staging, molting and wintering areas.

- Investigate aspects of life history such as mate selection, coloniality, dispersal and foraging habits.

- Conduct studies of habitat use, prey availability, and diet at migratory staging, molting and wintering areas to assess threats and limiting factors.

- Assess and monitor the effects (past, present and future) of West Nile Virus on birds in the basin.

GRASSLAND BIRDS

- Complete an inventory of potential grassland habitat including species present, distribution, and relative abundance of priority species.

- Develop and implement monitoring program to supplement BBS for grassland bird species to determine population trends and evaluate effectiveness of conservation efforts in the basin.

HERPETOFAUNA

There are a number of high-priority species of herpetofauna that require similar types of data collection. They are:

- All species of lake and river reptiles in the basin
- Blue spotted and Jefferson salamanders
- Hellbender
- Coal skink
- Longtail and red salamanders
- All species of woodland and grassland snakes in the basin

Specific data collection recommendations for these species are:

- Document life history parameters specific to these species in New York, including age and sex ratios; longevity; age at sexual maturity; survivorship of young; predator-prey relationships; and wetland-upland habitat requirements.

- Periodically re-survey areas of known occurrence to detect population trends.

- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat. Especially document juvenile habitat use by hellbender.

- Conduct research to document the extent of upland habitat required by vernal pool breeding salamanders.

- Determine significance of specific threats to populations of these species and develop management recommendations to address significant threats.

FRESHWATER BIVALVES

- Evaluate threats to mussels and prioritize areas within the basin for remedial action.

- Develop standard survey protocols for development projects in the basin

- Investigate the best survey methods to detect rare species and evaluate status and trends of all species that occur in the basin. Determine population distribution and abundance of freshwater bivalve species in this basin and consider listing as a species at risk.

- Conduct research to determine the habitat parameters necessary to sustain populations of at risk mussel species including temperature, substrate, flow, fish hosts and forage base.

- Determine breeding phenology necessary for successful mussel reproduction including mussel density, abundance and diversity of fish hosts, water temperature and flow.

BIGEYE CHUB

- Continue sampling for these fish in the Allegheny Basin and assess population levels.

BLUEBREAST DARTER, GRAVEL CHUB, LONGHEAD DARTER, RIVER REDHORSE, AND BLACK REDHORSE

- Inventory the habitat requirements of these species and their co-inhabitants in the Allegheny basin and outside New York. Continue sampling via State Wildlife Grant (SWG) projects started in 2004.

MOUNTAIN BROOK LAMPREY, OHIO LAMPREY, SPOTTED DARTER

- Inventory the habitat requirements of these species and protect critical areas via SWG projects started in 2003.

- Gather information on their life history and abundance in the French and Olean Creek systems.

- Research long term population trends of spotted darter and interactions with other fish species.

BATS

High priority species are tree-roosting bats, eastern red and hoary bats; and the cave-roosting Indiana bat.

- Research threats to critical bat habitats and populations.

- Conduct surveys of migrants to determine timing, distribution, species composition and elevation of migrating bats.

Planning Recommendations

There are no known landscape management plans that address comprehensive natural resource conservation issues within the Allegheny basin, though the Ohio River Basin Commission and the Lake Erie Management Plan address certain components related to water quality. The French Creek Project strives to maintain aquatic biodiversity in the French Creek, but does not include issues of upland and wetlands SGCN. The Department entered into a contractual agreement with The Nature Conservancy in 2005 to develop a watershed level natural resources plan for the Allegheny basin. This plan, when completed in 2008, will provide additional in depth information about how to improve natural resources conservation in this basin.

There is a clear need for a habitat management plan for the basin that focuses on the natural restoration of large patches of mature forest and protection of existing wetlands while facilitating the management of grassland, shrublands, and early successional forests where opportunity provides, and when such efforts to retard natural succession do not interfere with re-establishment of healthy forests. Of the 86 SGCN occurring in the basin, 30 depend on grasslands, 8 depend on barrens and woodlands, 25 depend on forested habitat and 13 depend on wetlands. Some species depend on all 5 of these habitat types at some point in their life cycle. The balance and active cooperative management of all of these habitat types is the key to the health and abundance of many of the SGCN currently living in this basin. However, declines of some SGCN, most notably the early successional species, is the result of natural changes in the landscape. Management of these species should be focused in areas where their management is not inconsistent with trends toward re-establishment of the forested landscape.

The management of all public recreation lands needs to be carried out with the cooperation of many agencies. Key partners to include are DEC, NYS Office of Parks, Recreation and Historic Preservation (OPRHP), NYS Dept. of Transportation (NYDOT), US Fish and Wildlife Service (USFWS), National Park Service, Natural Resources Conservation Service, and local governments.

Private lands comprise 85% of the total land area of the state. Use of cooperative management programs, like the Landowner Incentive Program (LIP), the Wildlife Habitat Improvement Program (WHIP), and others, will be important to achieve effective habitat protection and enhancement for many SGCN. Partners in these efforts should include but are not limited to: New York State Agencies, the Seneca Nation of Indians (SNI), Audubon New York, TNC and the Natural Heritage Program (NHP), local land trusts, New York Forest Owners Association, Trout Unlimited, Ducks Unlimited, Inc., Pheasants Forever, National Wild Turkey Federation, private landowners, interested individuals, and other interested organizations.

Allegheny River Sub-watershed

The Allegheny River sub-watershed is dominated by deciduous and mixed forest cover. Trends toward afforestation are resulting in opportunities for reducing fragmentation of the forest and this trend should be encouraged with good silvicultural practices. However, where appropriate, it may be desirable to integrate the needs of early successional forest/shrub land birds, forest breeding raptors, tree bats, woodland snakes and vernal pool salamanders that need heterogeneous forest structure during different life stages. Herpetofauna also need wetlands within the forest in order to breed.

The most critical bird species mentioned previously all require varying types of vertical forest structure. Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management.

❖ Determine where it is most appropriate for management of these species to occur and then develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for Canada warbler and golden-winged warbler.

French Creek & Chatauqua Lake Sub-watersheds

The French Creek and Chautauqua Lake sub-watersheds are comprised of a matrix of forest and grasslands, with several large wetland complexes interspersed in the landscape. This provides an opportunity to integrate the needs of wetland and grassland-dependent species into a holistic basin management plan. Components of this larger picture are:

❖ Develop a management plan for all wetland and grassland-dependent SGCN. Minimum management area sizes for various animal classes should be determined; targets for cooperative management with landowners and temporal and spatial targets for management actions (e.g., mowing, water control) should be set. This should be a component of the above mentioned management plan and incorporate basin specific objectives from a statewide grassland bird management plan (already being developed by DEC staff) and existing wetland planning efforts including North American Waterbird Plan, Bird Conservation Regional Plans and others. Specific tasks associated with this planning include:
  - Review OPRHP State Park Master Plans for opportunities to better manage state lands for SGCN in this basin.
  - Determine where management for early successional SGCN are most appropriate and where management for such species does not conflict with forest and wetland species that may also be of conservation interest. Develop habitat management guidelines and actions for high priority grassland bird species in the Allegheny basin (Henslow's sparrow, upland sandpiper, northern harrier and sedge wren) for incorporation in balanced management plans to better coordinate conservation actions. Identify opportunities in the plan for directing federal funds to grassland habitat where such habitat is deemed desirable in this basin.
  - Continue participation in North American waterbird planning. Focus on and refine recommendations for American bittern, least bittern and pied-billed grebe.
  - Work with USDA and other partners to develop grassland management incentives that benefit SGCN on agricultural lands in this basin.

   - Work with TNC to confirm that application of BMPs in the French Creek area has helped aquatic animals, and if so, extend these BMPs to other areas within the basin.
- Review DEC land unit management plans for opportunities to better manage state lands for SGCN in this basin, including control of invasive species.
   - Develop a monitoring and control plan that includes measures to detect invasive bivalves, prevent their introduction, and to control them before they become threats.
   - Incorporate freshwater mussel goals and objectives into regional and state water quality and fish management plans and policies.

Land Protection Recommendations

This category of actions encompasses a variety of acquisition mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition and others. The type of acquisition should be determined by the interested parties, based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations. Acquisition should be directed toward the best metapopulation sites identified for SGCN species and possibly toward areas of best species abundance.

- ❖ A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects.
  - In key locations, acquire development rights to protect water quality. The high priority species groups that will benefit from this recommendation are freshwater bivalves (mucket) and freshwater fishes, such as darters.

- ❖ A common threat to many SGCN in this basin is the loss of habitat due to human activity, such as development, dredging, wetland draining, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar, or different yet complementary habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support. Habitats fragmented by construction activities, roads, and power lines increase direct mortality of animals due to collisions. Dams impair SGCN by being physical barriers to dispersal and migration of young and adults.
  - Acquisition of forested and grassland upland tracts adjacent to wetland properties is critical to protection and restoration of amphibian, reptile and freshwater marsh nesting bird species in this basin. Ideally, these will be parcels where road building has not fragmented the 2 cover types. Identification of candidate parcels with these characteristics should occur immediately. Priority species groups that would benefit from these acquisitions are vernal pool salamanders, freshwater marsh nesting birds and lizards.

- ❖ Alder Bottom Pond/French Creek property in Region 9. This acquisition priority appears in the Open Space Plan of 2002. The site, characterized by a diverse fauna community, includes valuable freshwater wetlands.
- ❖ Allegany State Park property (Region 9), which is the largest of the parks managed by OPRHP. The acquisition of private in-holdings[9] is a priority in the Open Space Plan of 2002. The site provides habitat for many species of SGCN.
- ❖ Chautauqua lakeshore lands and vistas in Region 9 are identified in the Open Space Plan of 2002. Preserving some shoreline for undeveloped riparian areas and water quality is critical due to the extremely developed lake area. The Chautauqua Watershed Conservancy also identifies key sites for acquisition and conservation projects. The state's acquisition of Cheney Farm (on the

[9] In-holding = parcels of land within park boundaries that are privately owned.

north shore of Chautauqua Lake) is a notable success in the quest to bring significant-sized parcels of undeveloped shoreline into public ownership.

- Randolph Swamp is a significant wetland area in DEC Region 9, which includes the Conewango Creek and Little Conewango Creek drainages. There is a wide diversity of habitats that support SGCN, as noted in the Open Space Plan of 2002.

Management and Restoration Recommendations

Overall alteration of the landscape since European settlement has disrupted the natural cycle of habitat disturbance (e.g. fire, wind throw); however, some of the alterations to the landscape now provide important habitat, as in the case of hay and pasture lands and early successional habitats such as old fields. However, the declines in agriculture in the basin have resulted in the natural restoration of the native hardwood forests in the basin.

Forest Land Management

Priority management recommendations are to facilitate the natural restoration of the native forest and to reduce fragmentation of that forest by allowing or enabling patches to reconnect. Further, professional silvicultural practices should be encouraged where active forestry is in place so that the overall structure and health of the forest is maintained or improved. This will benefit all forest SGCN, regardless of priority.

- Priority management recommendation for early successional forest/shrub land birds are:
    - Conduct sustainable forestry operations that provide early successional habitat with the goal of increasing this habitat type where necessary.
    - Manage forest structure; maintain various maturity stages in forest stands consistent with natural forest mosaics to benefit forest dwelling SGCN. Maintain understory trees for lower altitude nesters. Monitor and, if necessary, control deer browse of understory through deer population management. Manage, or create, small wetlands or small (~0.25 acre) vernal ponds to benefit forest breeding raptors and amphibians.

- Priority management recommendation for forest breeding raptors is:
    - Maintain appropriate breeding habitat for forest breeding raptors around occupied nest sites with emphasis on long-eared owl. Red-shouldered hawk and Northern goshawk will also benefit.

- Priority management recommendations for woodland snakes are:
    - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation, including head starting and relocation strategies for timber rattlesnake.
    - Develop and implement an effective information and education program to gain public support for timber rattlesnake conservation.

Freshwater Wetlands & Aquatic Habitats

- Implement Best Management Practices for forest management in riparian areas in order to maintain, enhance, and restore early successional forest/shrublands. Identify opportunities in the plan for directing federal funds into such habitats.

- Priority management recommendations for freshwater marsh nesting birds are:
    - Manage predators in nesting areas to prevent egg and chick loss, where research deems it necessary and appropriate for conservation of specific populations of SGCN.

  - Manage water levels in nesting areas to prevent nest loss for freshwater marsh nesting birds, and optimize water and vegetation cover for waterfowl and spotted and other uncommon wetland turtles.
  - Restore emergent marsh to benefit freshwater marsh nesting birds.

- The priority management recommendation for lake and river reptiles is:
  - Manage uplands adjacent to aquatic habitat to provide adequate and secure nesting sites and dispersal routes for migrating animals.

- Priority management recommendations for freshwater fish are:
  - Inventory and restore habitat in the Allegheny basin for Eastern sand darter, spotted darter, blue breast darter, gravel chub black redhorse, longhead darter and river redhorse.
  - Develop a restoration program within the basin for mooneye.
  - Manage land use practices in riparian areas of the basin to foster buffer strip restoration and retention to minimize loss of stream cover.

- Priority management recommendations for hellbender are:
  - Manage land use practices in riparian areas that are known hellbender streams to decrease human induced effects.
  - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation, including captive breeding, head starting, nest protection, and relocation strategies.

- Priority management recommendation for freshwater mussels is:
  - Restore degraded habitat sites to allow for recolonization or reintroduction of listed mussels.

GRASSLANDS

- Priority management recommendation for grassland birds is:
  - Use mowing and/or prescribed fire to manage vegetative structure of established grasslands. This should be incorporated into Landowner Incentive and Farm Bill programs, and state land unit management plans.

WATER QUALITY

A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects.

- Priority management recommendations for lake/river reptiles are:
  - Manage water borne pollutants that adversely affect lake and river reptiles.

- Priority management recommendations for freshwater bivalves are:
  - Manage or restore areas of important mussel populations by controlling degradation factors including, construction activities, livestock access, point and non-point source pollution, barriers to dispersal, and flow alterations.

- Priority management recommendations for stream salamanders and fish are:
  - Restore habitat quality in degraded streams.

Invasive Species

Invasive species threaten many SGCN in the Allegheny basin. This threat may be through direct competition for nesting sites, prey and other limited resources, or by alteration of the structure and quality of habitat, as in the case of invasive plants such as purple loosestrife. Displacement of native species by invasive species disrupts ecological processes.

- The priority management recommendation for freshwater marsh nesting birds is:
  - Conduct and promote the control of purple loosestrife on public and private lands where it is known to have a negative effect on marsh nesting birds. Techniques could include biological controls.

- The priority management recommendation for lake/river reptiles is:
  - Control invasive aquatic plants where they are negatively affecting salamanders. Techniques could include biological, chemical, and mechanical means.

- The priority management recommendations for vernal pool salamanders and fish are:
  - Control invasive aquatic plants where they are negatively affecting salamanders and fish. Techniques could include biological, chemical, and mechanical means.
  - Limit introductions of non-native fish and other predatory species into habitats critical to vernal pool salamanders and native fish.

- The priority management recommendation for freshwater wetland amphibians is:
  - Control invasive species to preserve suitable wetland habitat.

Human–Wildlife Interactions

There are a variety of threats to SGCN in the basin from direct interactions with humans. These include vehicle and structure collisions, illegal and unregulated harvest, and unintentional entanglement. Species that are most susceptible to these threats are those that disperse across the landscape such as migrating birds, bats, and herpetofauna traversing to and from breeding habitats. Often fragmentation of habitats by structures, such as power lines and roads, are a significant source of mortality. Collection of wild animals for pets and food also may contribute to species declines.

- The priority management recommendations for lake/river reptiles are:
  - Reduce excessive disturbance by watercraft in habitats critical to lake and river reptiles.
  - Reduce incidental take of lake and river reptiles by fishing gear.

- The priority management recommendation for vernal pool salamanders is:
  - Reduce road kill mortality at important breeding sites and migration routes through the construction and use of amphibian crossing tunnels and other design features.

- The priority management action for hellbender is:

- Manage water pollutants and sediment loading to streams in the Allegheny basin.
- Research feasibility of removal or mitigation of some dams blocking movement of hellbenders.

❖ The priority management actions for freshwater fish are:
- Manage water pollutants and sediment loading to streams in the basin.
- Research feasibility of removal or mitigation of some dams blocking movement of fish.

Information Dissemination Recommendations

Sharing data allows stakeholder groups to make informed decisions about activities that may help or harm SGCN. Sharing information may take many forms including BMPs, fact sheets, and educational outreach programs. There is a necessity statewide to increase environmental awareness and to disseminate technical and other information, on a number of levels: with the general public, with organizations, and with local, state and federal government agencies. Many environmental education initiatives and programs currently exist. There is a need to coordinate environmental education efforts to better use the limited, available resources.

Information about most SGCN is maintained in DEC's Master Habitat Databank. It is critical that the availability of this information be made known to land managers and decision makers. The Natural Heritage Program should have the capacity to maintain current data and to disseminate such data in a timely manner so that it is readily useable. In addition, NHP should continue to develop interpreted data products, such as maps and conservation guides, for use by decision makers so they can accommodate the conservation needs of SGCN early in project design.

Agriculture and Silvicultural Recommendations

Some farm and forestry operations may lack wildlife-based objectives, thus may be detrimental to wildlife. Providing information to public and private land managers may help mitigate detrimental practices.

- ❖ Make information available to public and private land managers regarding the benefits and need for reducing fragmentation of mature forests. Also provide for early successional habitat, including even-aged forest stand management and sustainable forestry practices where it is deemed appropriate or desirable.

- ❖ Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrub land birds. Utilize existing information and education resources, such as SUNY Environmental Science and Forestry School's *Shrubs on Rights-0f-Way* guide.

- ❖ Develop an outreach program for public and private land managers to increase awareness of the benefits of managing the land with wildlife-friendly agricultural practices. Species groups that will benefit include fish, freshwater marsh nesting birds and grassland birds.

- ❖ Promote the establishment of vegetated buffers between agricultural fields and wetlands and streams to protect them from runoff and benefit fish, bivalves and freshwater marsh nesting birds.

- ❖ Provide education and outreach to forest managers of private and public lands regarding forestry practices compatible with forest breeding raptors and early successional forest/shrub land birds.

INVASIVE SPECIES

Introduction and spread of exotic species can often be minimized or prevented through increased awareness of natural resource users to the negative effects of these species on native wildlife. Awareness should be accompanied by specific actions that natural resource users could employ to prevent spread of invasive and exotic species.

- ❖ Implement recommendations of the Invasive Species Task Force.

HUMAN-WILDLIFE INTERACTIONS

- ❖ Provide information about negative effects of human disturbance on wildlife. Human behavior can be altered by education and outreach and can help reduce detrimental interactions.

- ❖ Enhance public education to curtail collection and translocation of fish, or killing of hellbenders and snakes. This includes dispelling common myths about dangers posed to people and pets by native snakes.

- ❖ Develop an outreach and education tool to highlight the possible detrimental effects of human disturbance on wetland dependant wildlife, especially SGCN. An example could be off-road vehicle effects on vernal pool and marsh nesting species.

- ❖ Develop outreach material to educate the public about the benefits of grasslands, freshwater mussel life history and at-risk Lepidoptera.

- ❖ Review and respond to project applications involving tall structures such as cellular transmission towers and wind turbines that may adversely affect tree bats.

Regulatory and Legislative Recommendations

Regulatory proposals will likely be made at the statewide level, though local governments have opportunities to modify or create laws and regulations to enhance local protection of SGCN. Local zoning and taxation policies can be used to discourage sprawl and habitat fragmentation without growth, an issue of particular importance in this basin.

- ❖ Regulatory proposals related to prevention of habitat loss include:
  - Review protection of wetlands smaller than 12.4 acres as wetlands of 'Unusual Local Importance' under Article 24 of the Environmental Conservation Law (ECL) that provide habitat for herpetofauna SGCN. High priority species that will benefit are blue-spotted salamander and Jefferson salamander.
  - Examine all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species should be reviewed either under Article 24 of the ECL or protected alternatively by local ordinance.
  - Increase regional permit oversight of development and highway projects that may affect freshwater bivalves.
  - Protect critical stream segments that provide habitat for SGCN to abate nonpoint source pollution.

- ❖ Regulatory proposals related to protection of water quality include:
  - Limit the use of pesticides on publicly owned marshes to prevent reduction of insect populations and contamination of wetlands used by SGCN, including freshwater marsh nesting birds and fish.
  - Require testing, consistent with state and EPA regulations, of all new pesticides for effects on freshwater bivalves and fish prior to approval for use in the state.
  - Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN. Establish protective buffers along streams in the basin.

- ❖ Regulatory proposals related to protection of animals from uncontrolled collection and/or harvest include:
  - Implement new legislation protecting hellbender, coal skink, longtail salamander, timber rattlesnake, and short-headed garter snake.
  - Review status of freshwater bivalves to determine if they warrant classification as "special concern".
  - Enhance law enforcement to limit collection and translocation of coal skink.

- ❖ Regulatory proposals related to the prevention of the introduction and spread of exotic species include:
  - Adopt recommendations of the state's Invasive Species Task Force.

Incentives

None at this time

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Tables and Figures

Tables

Figures

Allegheny Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Allegheny Basin.

Classification	% Cover
Deciduous Forest	46.05
Mixed Forest	20.57
Row Crops	14.03
Pasture/Hay	13.06
Water	1.83
Woody Wetlands	1.68
Low Intensity Residential	0.92
Evergreen Forest	0.69
Parks, Lawns, Golf Courses	0.56
High Intensity Commercial/Industrial	0.37
High Intensity Residential	0.15
Emergent Wetlands	0.05
Barren; Quarries, Strip Mines, Gravel Pits	0.04

Allegheny Table 2. State Parks within the Allegheny Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
ALLEGANY STATE PARK (9)	65,000	UPLAND
LONG POINT STATE PARK ON LAKE CHAUTAUQUA (9)	X	UPLAND/LAKE

Allegheny Table 3. Draft Audubon Important Bird Areas within the Allegheny Basin.

Unit Name (DEC Region)	Acres	Approved Criteria
ALLEGANY FOREST TRACT (9)	195,000	PERCENT POPULATION; FOREST; SPECIES AT RISK
CHAUTAUQUA LAKE (9)	14,000	PERCENT POPULATION; WATERFOWL; SPECIES AT RISK

Allegheny Table 4. NYSDEC land units within the Allegheny Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
28 STATE FORESTS	45,108	MULTIPLE
ALDER BOTTOM WMA (9)	800	WETLAND
ALLEGHENY RESERVOIR WMA (9)	1,100	UPLAND
CANADAWAY WMA (9)	2,080	UPLAND
CLAY POND/HARTSON SWAMP WMA (9)	230	UPLAND/WETLAND
CONEWANGO SWAMP WMA (9)	960	WETLAND
JAQUINS POND WMA (9)	31	UPLAND/WETLAND
KABOB WMA (9)	38	UPLAND
TOMS POINT WMA (9)	74	UPLAND/WETLAND
WATTS WMA (9)	1,382	WETLAND
CHENEY FARM	X	X
STOW PROPERTY	X	X

Allegheny Table 5. Critical **aquatic** habitats found in Allegheny basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	**Sub-System**	**# of Species**
Lacustrine	cold water deep	5
Lacustrine	cold water shallow	2
Lacustrine	unknown	1
Lacustrine	warm water deep	2
Lacustrine	warm water shallow	4
Palustrine	mineral soil wetland	11
Palustrine	peatlands	1
Palustrine	unknown	1
Riverine	coldwater deep	1
Riverine	coldwater stream	10
Riverine	deepwater river	3
Riverine	unknown	1
Riverine	warmwater shallow	1
Riverine	warm water stream	12

Allegheny Table 6. Critical **terrestrial** habitats found in Allegheny basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	**Sub-System**	**# of Species**
Terrestrial	barrens/woodlands	8
Terrestrial	forested	25
Terrestrial	open upland	30

Allegheny Table 7. Species of Greatest Conservation Need currently occurring in the Allegheny Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

TaxaGroup	SpeciesGroup	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Breeding waterfowl	American black duck	Unknown
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet Tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Unknown
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Decreasing
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Dickcissel	Unknown
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Osprey	Osprey	Increasing
Freshwater fish	Bigeye chub	Bigeye chub	Decreasing
Freshwater fish	Black redhorse	Black redhorse	Stable
Freshwater fish	Bluebreast darter	Bluebreast darter	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Eastern sand darter	Eastern sand darter	Unknown
Freshwater fish	Extirpated fishes	Paddlefish	Unknown
Freshwater fish	Gravel chub	Gravel chub	Unknown
Freshwater fish	Longhead darter	Longhead darter	Unknown
Freshwater fish	Mountain brook lamprey	Mountain brook lamprey	Unknown
Freshwater fish	Ohio lamprey	Ohio lamprey	Stable
Freshwater fish	River redhorse	River redhorse	Unknown
Freshwater fish	Spotted darter	Spotted darter	Unknown
Freshwater fish	Streamline chub	Streamline chub	Stable
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Decreasing
Herpetofauna	Hellbender	Hellbender	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Lizards	Coal skink	Unknown
Herpetofauna	Mudpuppy	Common mudpuppy	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Stream salamanders	Longtail salamander	Decreasing

Allegheny Table 7. (continued)

TaxaGroup	SpeciesGroup	Species	Stability
Herpetofauna	Stream salamanders	Northern red salamander	Unknown
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Short-headed gartersnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Other butterflies	Tawny crescent	Decreasing
Mammal	Furbearers	River otter	Unknown
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Mollusk	Freshwater bivalves	Black sandshell	Unknown
Mollusk	Freshwater bivalves	Clubshell	Unknown
Mollusk	Freshwater bivalves	Eastern pondmussel	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Kidneyshell	Unknown
Mollusk	Freshwater bivalves	Mucket	Stable
Mollusk	Freshwater bivalves	Paper pondshell	Unknown
Mollusk	Freshwater bivalves	Pocketbook	Unknown
Mollusk	Freshwater bivalves	Rainbow	Unknown
Mollusk	Freshwater bivalves	Rayed bean	Unknown
Mollusk	Freshwater bivalves	Round pigtoe	Unknown
Mollusk	Freshwater bivalves	Threeridge	Unknown
Mollusk	Freshwater bivalves	Wavyrayed lampmussel	Unknown
Mollusk	Freshwater gastropods	Lance aplexa	Unknown
Mollusk	Freshwater gastropods	Mossy valvata	Unknown

Allegheny Table 8. SGCN that historically occurred in Allegheny Basin, but have no recent records of occurrence in the basin.

Taxa Group	Species Group	Species
Bird	Early successional forest/shubland birds	Whip-poor-will
Bird	Forest breeding raptors	Golden eagle
Freshwater fish	Blackchin shiner	Blackchin shiner
Freshwater fish	Extirpated Fishes	Gilt darter
Freshwater fish	Iowa darter	Iowa darter
Freshwater fish	Mooneye	Mooneye
Herpetofauna	Lake/river reptiles	Queen snake
Insect	Odonates of small forest streams	Mocha emerald
Insect	Other butterflies	Regal fritillary
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mammal	Small mammals of uncertain/questionable residency	Least weasel
Mammal	Small mammals of uncertain/questionable residency	New England cottontail
Mammal	Small mammals of uncertain/questionable residency	Northern flying squirrel
Mammal	Small mammals of uncertain/questionable residency	Wateshrew
Mammal	Tree bats	Silver-haired tree bat
Marine fish	American eel	American eel
Mollusk	Freshwater bivalves	Pink heelsplitter
Mollusk	Freshwater bivalves	Round hickorynut
Mollusk	Freshwater gastropods	Campeloma spire snail
Mollusk	Freshwater gastropods	Gravel pyrg
Mollusk	Freshwater gastropods	Watercress snail

Allegheny Table 9. Allegheny current species diversity relative to the total number of SGCN statewide

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**9**	**36**	**118**	**30.5**
Bald Eagle		1		
Breeding Waterfowl		2	4	50.0
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		5	9	55.6
Early Successional Forest Breeding Birds		10	12	83.3
Forest Breeding Raptors		3	6	50.0
Freshwater Marsh Nesting Birds		3	6	50.0
Grassland Birds		10	11	90.9
Osprey		1		
FRESHWATER FISH	**12**	**13**	**40**	**32.5**
Bigeye Chub		1		
Black Redhorse		1		
Bluebreast Darter		1		
Heritage-Strain Brook Trout		1		
Eastern Sand Darter		1		
Gravel Chub		1		
Longhead Darter		1		
Mountain Brook Lamprey		1		
Ohio Lamprey		1		
River Redhorse		1		
Spotted Darter		1		
Streamline Chub		1		
Paddlefish		1		
HERPETOFAUNA	**10**	**17**	**44**	**38.6**
Freshwater Wetland Amphibian		2	5	40.0
Hellbender		1		
Lake/River Reptiles		2	5	40.0
Lizards		1	3	33.3
Mudpuppy		1		
Snapping Turtle		1		
Stream Salamanders		2	2	100.0
Uncommon Turtles of Wetlands		2	5	40.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		3	8	37.5
INSECT	**2**	**2**	**197**	**1.0**
Odonates of Rivers/Streams		1	19	5.3
Other Butterflies		1	18	5.6
MAMMAL	**2**	**3**	**21**	**14.3**
Furbearers		1	2	50.0
Tree Bats		2	3	66.7
MOLLUSK	**2**	**15**	**59**	**25.4**
Freshwater Bivalves		13	39	33.3
Freshwater gastropods		2		
TOTAL	**37**	**86**	**530**	**16.2**
% of all spp groups statewide	**28.9**			

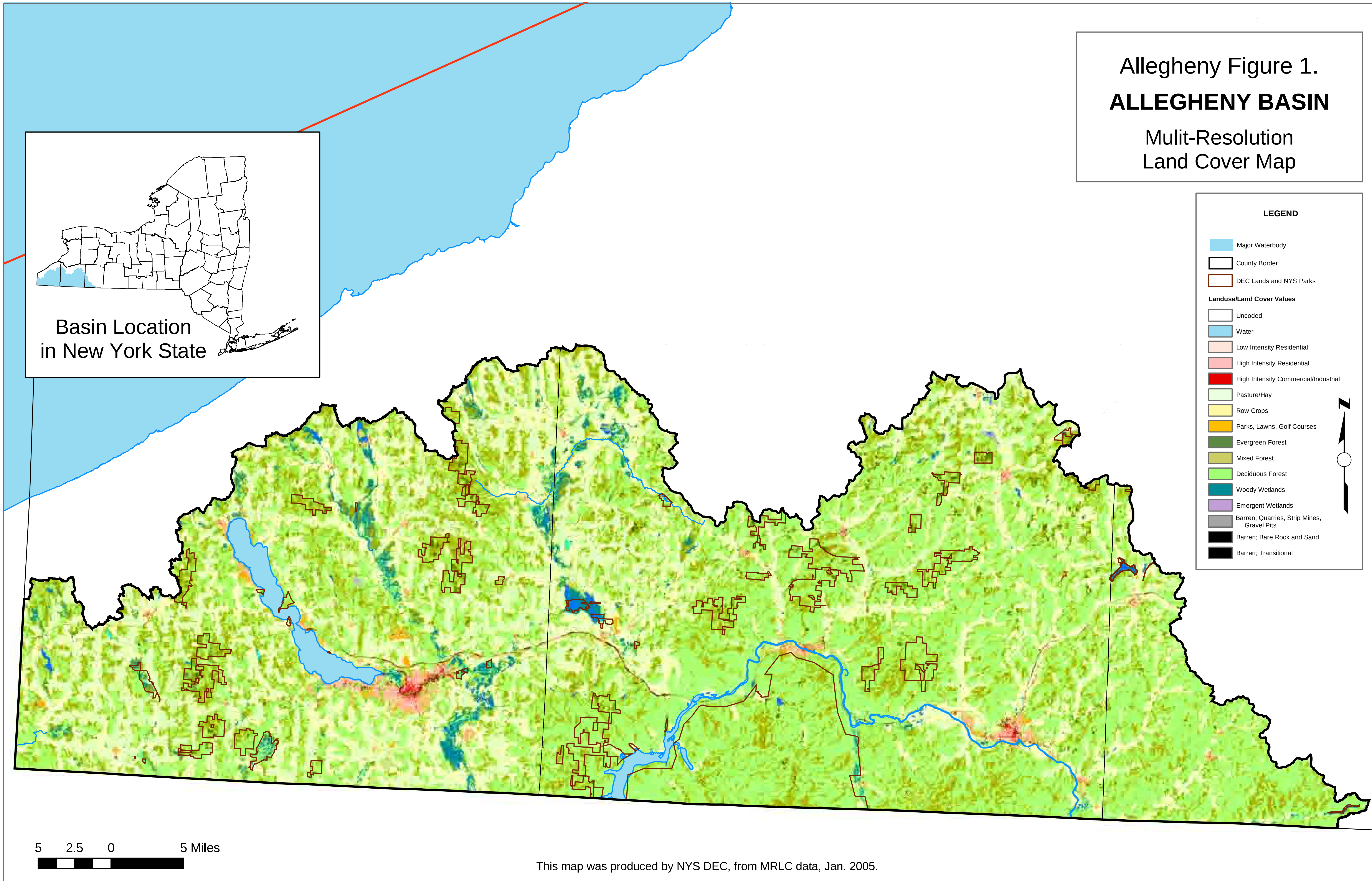
Allegheny Table 10. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats to SGCN in the Allegheny Basin. For details on threats, see Appendix: *Threats Characterization for Wildife and their Habitats*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Multiple [a]	36	97.3	14.2
Contaminants, pesticides	22	59.5	8.7
Habitat loss - conversion to cultural	22	59.5	8.7
Degradation of water quality	16	43.2	6.3
Human disturbance - illegal/unreg harvest	15	40.5	5.9
Sedimentation/erosion	15	40.5	5.9
Altered hydrology - loss of habitat quantity	14	37.8	5.5
Disturbed predator/prey cycles	12	32.4	4.7
Human disturbance - collisions	10	27.0	3.9
Habitat fragmentation	9	24.3	3.5
Disease	8	21.6	3.1
Unsustainable ag/silvicultural practices	7	18.9	2.8
Competition for life support	7	18.9	2.8
Habitat loss - natural succession - agricultural reversion; forestry	6	16.2	2.4
Competition from exotics - loosestrife, phragmites	5	13.5	2.0
Human disturbance - direct and indirect	4	10.8	1.6
Loss of streamside buffers	4	10.8	1.6
Altered hydrology - loss of habitat quality	4	10.8	1.6
Active alteration of natural processes - fire, etc.	4	10.8	1.6
Susceptibility to stochastic events - rare species	4	10.8	1.6
Reduction of patch size, shape, area	3	8.1	1.2
Loss of connectivity	3	8.1	1.2
Human disturbance - entanglement, entrainment	3	8.1	1.2
Detrimental hybridization	3	8.1	1.2
Susceptibility to stochastic events - isolated populations	3	8.1	1.2
Barriers (roads; development; curbs)	2	5.4	0.8
Habitat competition altered by overuse (deer browse, etc)	2	5.4	0.8

Allegheny Table 10. (continued)

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Aq. habitat competition altered by invasives/non-natives	2	5.4	0.8
Unknown threats	2	5.4	0.8
Pollution (acid rain; soil contamination)	1	2.7	0.4
Terr. habitat composition altered by invasives/non-natives)	1	2.7	0.4
Aq. habitat composition altered by overuse (beaver, geese)	1	2.7	0.4
Human created abrupt edges	1	2.7	0.4
Loss of host species	1	2.7	0.4
Susceptibility to stochastic events - weather, storm events	1	2.7	0.4
Climate change (range restrictions; changes in distribution)	1	2.7	0.4

[a] Multiple = recommended action addresses multiple threats rather than one specific threat


Allegheny Figure 1.
ALLEGHENY BASIN
Mulit-Resolution
Land Cover Map
LEGEND
Major Waterbody
County Border
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
N
Basin Location
in New York State
5 2.5 0 5 Miles
This map was produced by NYS DEC, from MRLC data, Jan. 2005.

Description of the Basin

The Atlantic Ocean Basin covers an area of about 914 square miles of New York's statutory ocean territory. The basin only includes the marine portions of the coastal waters; other tidal and estuarine waters of the state are included in the Lower Hudson-Long Island Bays Basin and Upper Hudson Basin sections of the CWCS. These three watersheds are inextricably linked and conservation actions conducted in each should be well coordinated. The Atlantic Ocean Basin is primarily covered by water, but includes the ocean front beaches along Long Island's south shore up to the dune line. A map of the basin boundaries is shown in Atlantic Ocean Figure 1.

The terrestrial areas that form the basin's northern boundary include headland beaches located between Montauk Point and Southampton, and barrier beaches from Southampton to Rockaway Point. The beach-ocean interface provides important habitat for birds, horseshoe crabs, and many other invertebrate species. A significant portion of the Atlantic beachfront in New York is in public ownership, a list of these properties is shown in Atlantic Ocean Table 1.

The New York portions of the western Atlantic Ocean include part of the area of the North American continental shelf called the New York Bight. This triangular area of coastal ocean is an important habitat for hundreds of marine species up and down the eastern seaboard. New York's territorial waters are located within and extend out to three nautical miles from the shoreline of Long Island. The boundary is adjacent to the state boundaries of New Jersey, Massachusetts, and Rhode Island, and borders the federal waters of the United States.

The Atlantic waters of New York range in temperature throughout the year from 37°F to 77°F and averages 57°F. This section of the ocean forms a temperate boundary between the boreal waters of New England to the north and the semi-tropical waters of the mid-Atlantic. It is influenced by the warm Gulf Stream current which flows northward along the Eastern Seaboard into the New York Bight and is deflected eastward by the landmass of Long Island. The ocean salinity within the three miles off Long Island is generally 32 parts per thousand, though it may be lower in areas near inlets or estuaries along the south shore of Long Island or during heavy rains or periods of high discharge from the land.

All marine waters of the state are subject to semi-diurnal tides that move animals and nutrients horizontally in the water column. There are also longshore currents that flow parallel to the shoreline of Long Island from east to west. Longshore currents are the main transport of sand from the headlands of Montauk to the barrier beaches to the west. Sediments in the basin and along its shoreline can move dramatically in response to storm events.

The waters in the basin are up to 20 meters deep and cover a gently sloping sand bottom with rare rocky outcrops. The New York Bight is home to more than 60 marine fish species, though there are few endemic fish species in the Bight. The majority of fish species are seasonal migrants that use the area for reproduction or growth. The large area of the relatively shallow continental shelf and the number of adjacent high-quality estuary systems contribute to the Atlantic Ocean Basin's biological diversity.

DEC has created artificial reefs in the basin to enhance fish habitat on the sandy bottom. Reef sites are found from 2 to 3.3 miles offshore of Rockaway Beach, Atlantic Beach, Long Beach, Jones Beach, Fire Island Lighthouse, Moriches Inlet, and Shinnecock Inlet. The reefs are constructed of a variety of materials including natural rock, concrete blocks, cleaned ship hulls, and armored personnel carriers. Summary information including the reefs, their coordinate locations and principle composition materials is in Atlantic Ocean Table 2. The reef material colonizes with algae, sponges, and other invertebrates quickly and attracts both forage and predatory fishes.

Fish move within the bight seasonally, generally moving inshore (shallower) and north during the summer months and offshore (deeper) and south in the winter seeking shelter from cold temperatures. Other marine species have seasonal migration routes that carry them along predictable paths into and out of New York's waters. In addition to their value as protein for human consumption, concentrations of schooling pelagic fish such as mackerel, butterfish, and squids are important to, and utilized by, an array of predatory fishes, including pelagic and demersal shark species, marine mammals, and piscivorous birds. The actual abundance and proportion of each species of waterfowl varies from year to year. The relative abundance and appearance of waterfowl in the basin is almost exclusively dependent on food source.

Anadromous fish, juvenile American eels, and migratory birds move through the basin to the apex of the New York Bight on their way inland in spring. These species move from the ocean up the Hudson River valley or into the marshes, bays, and streams of coastal New York and New Jersey. The physiographic characteristics of the New York Bight act as a funnel for migrating animals, directing them toward New York Harbor and the mouth of the Hudson River. The migratory birds make the reverse trip in the fall, while adult anadromous fish move back into the ocean soon after spawning. Catadromous juvenile American eels move upstream and may spend several years maturing in fresh water before making the reverse trip to the ocean as adults.

Sea turtles, some invertebrates, and marine mammals also follow seasonal migration routes into and out of the basin. Several species of seals are commonly seen resting on the rocky shores of Montauk and other areas on the south shore and lower New York Harbor in the winter months. Horseshoe crabs move to deep waters of the continental shelf to overwinter and return to coastal beaches and estuaries in the spring to spawn.

The Atlantic Ocean Basin is an economically important area of the state for commercial and recreational fishing, other beach recreation, and commercial shipping. Container ships move through the basin toward New York Harbor, and Port Newark and Port Elizabeth in New Jersey carrying cargo from around the world. Petroleum depots are located throughout the region; within New York Harbor, the Arthur Kill, Long Island Sound, and up the Hudson River. Tankers and barges carry crude oil, home heating oil, and gasoline from the waters of the Atlantic Ocean Basin to the inshore depots.

Shipping needs for the harbor dictated the creation of Ambrose Channel, a significant benthic feature in the basin. The channel was originally completed in

April of 1914 by dredging to a depth of 40 feet at mean low water. The 2,000 foot wide channel extended 38,000 feet from New York Harbor southeast into the apex of New York Bight (Sullivan, 1927). The seaward entrance to Ambrose Channel was marked by a lightship until a fixed light was placed at the channel entrance in the 1960s. Today, in response to increasing container ship drafts in the ports of New York and New Jersey, the US Army Corps of Engineers (ACOE) is deepening the Ambrose Channel to 53 feet at mean low water from the seaward end to the Verrazano Narrows Bridge.

Critical Habitats of the Basin and the Species That Use Them

There are a total of 86 Species of Greatest Conservation Need in the basin, representing 16% of the total SGCN statewide. The species include birds, Crustacea and Meristomata, sea turtles, marine mammals, mollusks, and marine fish. There are no SGCN that are known to have been extirpated from the basin. The full list of SGCN presently found in the basin and their status is shown in Atlantic Ocean Table 3. An analysis of diversity of SGCN in this basin relative to SGCN in the entire state is shown in Atlantic Ocean Table 5.

DEC staff members who compiled the SGCN information in the State Wildlife Grants database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State*, Second Edition. In most cases the habitats were simplified from the many vegetative associations listed in the community classifications. In the case of the lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers in the DEC, e.g. "cold water-shallow".

Each of these systems and subsystems are further refined into habitat categories in the SWG species database and can be viewed in the taxa reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. The System-Subsystem classes that are listed as critical to species in Atlantic Ocean Basin are listed in Atlantic Ocean Table 4. These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather they are a subset of habitats deemed critical to SGCN that occur in the basin. The major habitats and the SGCN that use them are discussed below.

The Marine-deep subtidal System-Subsystem is the most critical association to the largest number of SGCN in the basin. This association includes both pelagic and demersal species and several bottom types, though sand bottom is the most prevalent in the basin. These deepwater habitats are used by 66 species ranging in size from whales to marine zooplankton. There are also distinct vertical zones in this association. The surface waters of Marine-deep subtidal areas are highly productive and home to many species of marine zooplankton and the phytoplankton they feed on. Surface waters form an important migratory pathway for marine mammals, sea turtles, and pelagic fish. Wintering waterbirds form large "rafts" of individuals floating in the waters off Long Island during colder months. Greater scaup use the ocean extensively in late winter resting on open ocean waters when the bays are frozen. Northerly prevailing winds in the winter make the near ocean a calm place for waterfowl to form large rafts. Greater scaup will often come into the inlets to feed. The three species of scoters (black, white-winged, and surf) all use the near shore ocean basin as an important migration corridor as well as fall and winter feeding territory.

The Marine-deep subtidal association also has a benthic zone that is home to demersal fish like winter flounder, sharks, skates, rays, and marine crustacea. American lobsters and horseshoe crabs are found in this zone, especially in the winter months. Some fish species, like cunner and tautog use natural and man-made structure on the bottom for feeding and refuge. Many of these species eat both scavenged material and live prey found on and in the bottom sediments.

The Marine-shallow subtidal System-Subsystem association is critical habitat to 17 SGCN in the basin. The shallow subtidal zone is the area of the basin between the intertidal beach and open water up to 2 meters deep, and also has varying bottom types. This association corresponds to the statutory definition of Littoral Zone in the New York State Environmental Conservation Law. SGCN particular to this System-subsystem association include common, least, and roseate terns, small fish, and blue crabs. The terns use this zone for feeding on small fish like sand lance. Skates and rays use this zone to feed on mollusks found there. This is also the zone where mating horseshoe crabs pair up on their way to the beach in the spring. Harlequin ducks use the inlets predominately to search for mussels on rock structure.

Most of the beach area of the basin has been designated as important bird areas (IBA) by Audubon New York within 9 sites listed in Atlantic Ocean Table 6 (Audubon New York, 2004). The beach area between the dune line and the intertidal beaches on the oceanfront are breeding habitat for common tern, least tern, and plovers. There are several dry beach zones and types found in Terrestrial-coastal, Terrestrial-maritime, and Terrestrial-open upland System-subsystem associations. Collectively, these associations are critical habitat for 18 SGCN. The intertidal beach is resting and feeding habitat for transient shorebirds like red knot. They stop on Long Island during their spring migration to feed on the eggs of horseshoe crabs laid in intertidal burrows on the beach.

Overall Trends in the Basin

The basin has supported commercial shipping and fishing since the first settlements by European colonists in the 15th century. Fishing for cod and other groundfish is even thought to pre-date European settlement in New England. The major modifications to the basin have occurred through dredging in the nearshore area and conversion of the adjacent coastal areas through development, coastal manipulation and shoreline stabilization. These modifications constitute some of the most serious threats to the continuing viability of salt marshes, beaches and dunes and their dependent species. There are losses to salt marshes for unknown reasons that require further investigation. The basin has been used for dredged material disposal, including contaminated sediments from the harbors in the New York and New Jersey ports since the mid-1800s.

Historically, most of the material dredged from the port was disposed in and around an area called the New York Bight Dredged Material Disposal Site, commonly referred to as the Mud Dump Site, which was designated for dredged material disposal by the US Environmental Protection Agency (EPA). There were approximately 6 locations chosen to receive a wide range of refuse from the harbor and city, including municipal garbage, cellar dirt, floatable materials, and dredged materials. The materials disposed of in the various locations were mixed indiscriminately in the beginning and shoaling began to occur in one of the locations, leading to segregation of the materials. All of the disposal mounds were visible in hydrographic surveys taken between 1845 and 1934.

From 1914 to 1977 a single location was reserved for mud dumping from navigational dredging projects. The ACOE estimates that more than 200 million cubic yards of dredged material was disposed of in that period at the Mud Dump Site. After a lengthy regulatory process, the EPA developed a plan to remediate the potential adverse environmental effects of the materials disposed of at the Mud Dump Site. In 1997, the EPA de-designated the site, and simultaneously re-designated the site and the surrounding area as the Historic Area Remediation Site, or HARS. Dredged material that meets EPA's current "Category 1" standards will be used to cap existing sediments which exhibit a potential for adverse effects.

Other physical alterations of the basin bottom have occurred through navigational dredging and sand and gravel mining. Sediments that accumulate in the Ambrose Channel are much finer-grained muds than the naturally occurring sands of the basin. The combination of highly organic sediments and abrupt changes in depth lead to reduced dissolved oxygen in the channel bottom. The same effects are found in some sand borrow areas in the basin. These borrow areas are used to obtain sand for beach nourishment projects along the barrier beach complexes in the basin.

Fishing has been a commercial enterprise in the basin for centuries. As fishing technology progressed, catch rates began to exceed the reproductive capacity of many commercially harvested species. Negative environmental effects to the benthic nursery areas for juvenile fish have occurred as a result of advancements in fishing gear. Other effects include coastal habitat loss and degradation, contaminants, and impingement and entrainment by power generating stations. These effects are discussed in further detail in the Lower Hudson-Long Island

Bays section of the CWCS. As over-exploited fisheries become unprofitable or closed by regulation, new fisheries are developed.

According to National Oceanographic and Atmospheric Administration (NOAA) research vessel surveys, the abundance index for northeast demersal fishes declined by nearly 70% between 1963 and 1974 (Anderson et al., 1999). Demersal species in the surveys primarily include flounders, fish in the cod family, dogfish, goosefish, and skates. Pelagic fishes like bluefish, Atlantic mackerel, Atlantic herring, and butterfish have also been assessed by NOAA's Northeast Fisheries Science Center. The most recent Bluefish assessment (Gibson and Lazar, 2002) indicates the stock is overfished (low biomass), but overfishing is not occurring (current fishing mortality above the reference level). The 2005 commercial quota is down due to lack of knowledge of the status of the resource. The remaining pelagic fisheries are considered underutilized based on their stock assessments in 1996. Fishery-independent statistics for pelagic SGCN like menhaden and bay anchovy are not available, and fishery landings have declined to levels seen in the 1960s and 70s. Spawning stock biomass has started to decline due to recent poor recruitment and may continue to decline until recruitment improves and the recruits enter the spawning stock.

Water quality in the nearshore zone, particularly in the areas immediately adjacent to New York Harbor has declined since European settlement. Since that time coastal waters near the city have served as a waste disposal system for sewage and garbage. Other contributing factors to water quality decline include the dumping of dredged material, coal ash, construction and demolition debris, industrial wastes including acids, and nonpoint source pollutants as a result of human habitation.

Changes in environmental protection laws, fisheries management laws, and cleanup efforts of government and non-governmental organizations over the past 30 years have led to improvements in water quality and fisheries. Passage of the Sustainable Fisheries Act of 1996 and amendments to regional fishery management plans have reduced exploitation rates, increasing the abundance of some fish stocks. However, there are some species, like marine mammals and sea turtles that have shown little or no documented improvement in their status in spite of 30 years of protection under the federal Endangered Species Act (ESA). NOAA revised their Recovery Plan for Northern Atlantic Right Whales which is designed to promote the recovery of northern Atlantic right whales to a level sufficient to warrant their removal from listing under the ESA. The most significant need for northern Atlantic right whale is to reduce or eliminate deaths and injuries from anthropogenic activities, particularly shipping and commercial fishing operations. Secondary priorities of this species' recovery include characterization, monitoring and protection of important habitat, and identification and monitoring of the status, trends, distribution and health of the species. NOAA has also created take reduction plans for Atlantic large whales and harbor porpoises.

Threats

There are a variety of threats to species and their habitats in this basin. These threats are often diffuse and interrelated. The complete summary of threats indicated for SGCN in this basin is in Atlantic Ocean Table 7. Other prominent threats mentioned in species and habitat management plans for the area are also discussed.

Overharvest of Fisheries

Overharvest of fisheries is the most frequently cited single threat to SGCN in the basin. The overharvest of forage fish populations can have a drastic effect on the birds that depend on that forage base. Although other SGCN such as sea turtles and marine mammal species in the basin are not subject to commercial harvest, they can be affected by fishing gear. Many of the fishery management plans for harvested species in the basin indicate that their stocks are over-exploited. Because most of the harvested species are migratory or found in large ranges outside the statutory limits of New York State, coordination with other states, federal agencies and authorities, and neighboring governments is being done to address this threat. In some cases, there are international fisheries just outside of the US Exclusive Economic Zone that are not subject to US fishery management restrictions. There is much more information about the implications and recommendations for over-fishing in the fishery management plans of the Atlantic States Marine Fisheries Commission (ASMFC). A list of SGCN covered by ASMFC plans is in Atlantic Ocean Table 8. Some of these species also have federal fishery management plans and regulations (i.e., dogfish, Atlantic herring, coastal sharks, winter flounder, and lobster).

Habitat Loss and Degradation

Habitat loss due to human development is another significant threat to SGCN in the basin, affecting 17 species groups. Development on beaches, trawling scars on the ocean floor, and placement of pipelines and structures in and on the water result in habitat loss in this basin. The placement of shoreline structures like bulkheads, groins, and jetties can seriously alter the coastal habitat by modifying biological resources and habitat structure, causing cumulative ecological effects and changing physical and ecological processes such as the distribution of sand on beaches. Wave action and reflection off bulkheads causes sand scour immediately seaward of the structure. Over time, the intertidal portion of the remaining beach may disappear entirely. When the shoreline is hardened, habitats do not cease to exist but shift from one type to another which may have dramatic effects on species composition. Groins and jetties interrupt longshore currents and trap sand. Undeveloped beach immediately down-current from the structures becomes more prone to erosive forces. Placement of structures in the dunes and on the upper beach cause immediate loss of habitat for nesting and transient birds. Shoreline engineering, such as jetties, bulkheads and repeated beach nourishment are short-term strategies that weaken the barrier islands. These elements as well as construction in the beach and dune areas affects the ability of the system to respond naturally to human-induced threats as well as storm events and sea level rise, and therefore threaten the viability of all species who utilize the area throughout their lifecycle.

Mining for sand, gravel, and shellstock, as well as exploration and production drilling of the outer continental shelf, affect the biota and their habitats. Sand and gravel mining can result in loss of infaunal benthic organisms; mining modifications of the substrate in the plume area can sometimes be measured in miles. Deep borrow pits within areas of minimal flushing can have decreased dissolved oxygen and may become seasonally or permanently anaerobic. Use of "borrow areas" for beach nourishment can have a significant effect on benthic invertebrates and their habitats. The Atlantic surf clam is not on the list of SGCN, but is a commercially important harvested species in the waters of the Atlantic Ocean, and it is directly harmed by sediment dredging in borrow areas. Deposition of drilling mud during exploratory and production drilling affects the surrounding habitats. Accidents that result in spilled oil products can originate from well blowouts, pipeline breaks, and shipping accidents; these can have a devastating effect on the environment. Potential future threats to the basin related to off-shore development activities include power generation projects, pipelines and cables, and off-shore aquaculture when these structures are improperly sited.

Contaminants

Chemical contamination in the basin is the legacy of industrial development in the adjacent coastal cities. The contamination has been delivered through disposal of contaminated sediments dredged from estuarine and riverine environments, or from natural sediment transport out of the nearby harbors. Movement of these contaminants can be dramatically increased by storm activity in the basin. Although disposal of dredged material in the ocean no longer takes place, the resuspension of contaminants from these sediments through various types of offshore development activities can affect SGCN.

Oil spills are a risk in this basin due to the high volume of petroleum tankers in the area. There is the risk of spills from petroleum tankers and barges due to leaks and accidents, but there is also the risk of leakage of fuel and hydraulic systems from all shipping traffic. Petroleum products are also used as antifreeze in the lining of underwater power transmission cables. Those cables are at risk of leakage due to age, or punctures due to fishing activity and anchor dragging. The effect of oil on wildlife can be significant. There is acute toxicity to fish and marine invertebrate adults, juveniles, larvae, and eggs from the compounds in petroleum. There is also danger to sea birds and ducks from the petroleum coating their feathers both due to the removal of the insulating properties, as well as the toxicity of the ingested oil when the bird tries to clean itself, or consumes contaminated prey.

Sewage discharge and nonpoint source pollution results in organic loading of riverine, estuarine, and coastal waters. Symptoms of this loading in the nearshore waters of the basin are the increasing prevalence of excessive algae blooms, shifts in algal species composition, high sediment biological oxygen demand (BOD) at affected sites, and anoxic events. Reduced water quality is the second most common threat to SGCN in this basin.

Dredged material disposal, as discussed above, results in alteration of the bathymetry, grain size, and contaminant load in the sediments of a small portion of the basin within the HARS. Most of the contaminants found in these sediments can be mobilized through the food web into higher level consumers like predatory fish, whales, and pisciverous birds. DDT compounds impair the reproduction of birds by thinning the shells of their eggs. Contaminants like mercury and PCBs are thought to impair the reproduction of some marine mammals. PCBs are known to accumulate in the fatty tissues of many fish species, but the specific long-term effects on reproduction and survival are unknown. Disposal of dredged material from harbors inshore also moves organic sediments out into the naturally more nutrient poor parts of the basin.

Entanglement, Entrainment, and Collisions

Floatable debris such as plastics can kill marine animals that ingest them by causing intestinal blockages. Floatable debris also entangles both marine species and birds, and in minor cases cause limited mobility, deformities, or, in the worst cases, drowning.

Fishing gear can unintentionally affect many of the species in the basin. Gill nets and trawls are not selective in the species that they catch, other than size. The mortality of non-target species from fishing gear, bycatch, can be significant. The effects of bycatch mortality on sea turtles in the Gulf of Mexico shrimp fishery resulted in the mandated installation of turtle excluder devices on all shrimp nets. In the northeastern United States, bycatch reduction plans have limited the use and size of certain gear like long lines. Whales can also become entangled in fishing gear of various types and drown. Large whale species, such as right whales, tend to encounter fixed fishing gear but subsequently break free. However, as a result they may carry away pieces of that gear on their bodies, frequently wrapped around their tail flukes or across their mouths. NMFS keeps records of reports of marine mammals that have been found tangled in fishing gear, and use the information contained in those reports to monitor the efficacy of gear restrictions. Fishing gear like trawl nets can also alter the physical habitat of the basin by scarring the benthos.

Shipping in general can be a threat to SGCN. The potential threats associated with ship traffic include introduction of invasive species in ballast water, whale strikes, and petroleum discharges from vessels among others. Container ship traffic is a major cause of human-induced right whale mortalities in the western North Atlantic. It appears that the western North Atlantic population of these whales migrates through the busiest shipping lanes in the region, including ships entering New York Harbor (Swartz et al, 1999).

Priority Issues in the Basin

In this basin, there are several existing or emerging issues that were not covered by other discussion in this basin chapter. The following section attempts to describe these issues and their relevance to SGCN in this basin.

Coordination with other States:

Coordination with other states and NMFS regarding interstate and federal fishing activities, marine mammals, and other endangered species conservation is necessary. Because most of the harvested species within this basin are migratory or found in large ranges outside the statutory limits of New York State coordination with other States and interstate entities regarding interstate and federal fishing activities is essential. To further this goal attempts should be made to use existing interstate cooperative mechanisms for habitat protection, such as NMFS and Atlantic States Marine Fisheries Habitat Committee, National Estuary Research Reserves and federal/state estuary programs to address SWG habitat recommendations on a regional basis. In addition SWG funds should be regionally pooled for regional scale studies and conservation activities.

Coordination to Address International Harvest

Coordination with above mentioned entities will be necessary to address international harvest and/or protection of SGCN.

Offshore Resource Development

Offshore mineral extraction

The effects of offshore mineral extraction must be reviewed to determine potential effects on SGCN and their habitats and actions taken to address these effects.

Wind power and hydropower development

The effects of these activities on SGCN must be carefully reviewed in order to minimize any adverse effect on these species and their habitats.

Pipelines and Cables

The cumulative effects of pipelines, cables and other transmission lines must be reviewed for potential effects on SGCN and their habitats in the basin.

Off-shore aquaculture development

The development of off-shore aquaculture both within New York's statutory limit and in federal waters has the potential to negatively affect SGCN and other species in the basin, as well as, water quality and their habitat. Potential effects of off-shore aquaculture including escapement, disease, genetic mixing of stocks, nutrient loading, etc. must be considered to minimize to the greatest extent possible, adverse effects on SGCN and other important species in the basin.

Sand/gravel mining activities

These activities can directly affect SGCN and their habitats and actions must be taken to protect and minimize potential effect on SGCN and their habitats.

Beach Development and Beach Nourishment

Wind, waves, tides, currents, and storms all shape and maintain coastal habitats. While these forces can be destructive, over time these dynamic processes work to rejuvenate the beaches and dunes, tidal wetlands, barrier islands and bays. Development, coastal manipulation and shoreline stabilization constitute some of the most serious threats to the continuing viability of salt marshes, beaches and dunes and their dependent species. In the past there has been a great deal of effort towards maintaining dynamic shorelines exactly in place. This past coastal management has been expensive and unsuccessful in many cases, allowing incompatible development in this dynamic environment. Shoreline engineering, such as jetties, bulkheads, and repeated beach nourishment are short-term strategies that weaken the barrier islands. This has broad reaching effects on loss of suitable habitat for many SGCN, including loss of tidal wetlands, which, in turn, affects water quality of the bays and wildlife habitat.

Vision, Goals and Objectives for the Basin

Vision

The Atlantic Ocean Basin will have natural processes restored to the maximum extent practical to support healthy and sustainable populations of all SGCN presently found there.

Existing conservation partnerships among federal, state, and local government partners, not-for-profit organizations, and other citizens groups will be strengthened. New and innovative partnerships will be formed.

Conservation partners in the basin will work together to collect, share, and analyze information on SGCN and their habitats in the basin. Information will be used to constructively manage species and habitats for the greatest benefit to biodiversity preservation while balancing human needs for use of the resources.

Members of the public will understand the value of healthy habitats and the species that they support.

Goals and Objectives

- ❖ Ensure that no at-risk species becomes extirpated from the basin by better understanding the current distribution, abundance, and habitat needs of these species. Share this information with local governments in a way that helps inform their decision making related to local land use.

- ❖ Increase the capacity for effective management of migratory marine species at all times of the year, including response to spills, strandings, and collisions. The management will be supported by adequate data collection on all SGCN in the basin.

- ❖ Reduce the adverse effects of human activities in the basin and adjacent lands on SGCN through improved pollution prevention strategies and more effective regulation of development within the coastal area through more focused attention on projects that could cause the highest level of effects. Increase the capacity for effective enforcement of management strategies and plans.

- ❖ Preserve and restore key representative habitats that support the basin's biodiversity.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations for Critical Habitats

- ❖ Monitor the use of artificial reefs and natural structures by SGCN in the basin. Compare fish sanctuary areas with unrestricted areas to quantify, if possible, benefits of sanctuaries to structure-oriented SGCN.
- ❖ Collect data on beach habitat use by SGCN in the basin to determine priority areas for land protection and beach management. Include temporal information on beach use to enable development of beach disturbance restriction windows for recreational use, construction, and beach nourishment.
- ❖ Determine effectiveness of and possible improvements to current coastal regulations and policies. DEC is doing this for the Tidal Wetlands Regulations.
- ❖ Map all major habitat types to establish baseline and use as basis for trends analysis.
- ❖ Build and manage an accessible coastal/marine spatial habitat database which includes open space data that towns and counties can access to update information. Encourage standardization of all Town, County and State GIS databases.
- ❖ Property owners such as OPRHP, DEC, etc. should assess beach driving activities, location, and effects on SGCN.

Data Collection Recommendations for SGCN

Several high priority SGCN in this basin require collection of additional species-specific data in order to effectively implement management actions for them. The specific recommendations are outlined below.

HORSESHOE CRAB

- ❖ Continue fishery-independent monitoring of all life stages of horseshoe crab off the south shore of Long Island.

TRANSIENT SHOREBIRDS/HORSESHOE CRABS

- ❖ Investigate interactions of migratory bird species and horseshoe crab eggs along NY's Atlantic coastline.

- ❖ Document and map important shorebird forage areas on Atlantic Beaches using reports from birders. Include dates of bird concentrations at the site.

- ❖ Document dominant food items (including horseshoe crab eggs) during migration stopovers on Atlantic beaches.

ATLANTIC STURGEON

- ❖ Conduct sea sampling to learn bycatch in number and size of Atlantic sturgeon by fishery over space and time in commercial fisheries of the Atlantic Ocean.

- ❖ Continue monitoring the abundance, distribution and habitat use of juvenile Atlantic Sturgeon in the Atlantic Ocean.

PELAGIC SHARKS

- ❖ Initiate a volunteer shark data collection program which would collect additional catch and biological information on pelagic sharks from New York's recreational anglers with Cooperative Shark Tagging Program, Apex Predators Program under NOAA Fisheries.

- ❖ Increase traditional tagging programs and implement radio tagging to better document the movement of pelagic sharks through the basin.

- ❖ Increase the collection of landings data from shark dealers.

- ❖ Participate in coastal and pelagic shark stock assessments.

- ❖ Initiate coastal shark surveys, in coordination with universities, to identify essential fish habitat for coastal sharks.

WINTERING WATERFOWL

- ❖ Determine contaminant levels (e.g., mercury, other metals, PCBs, other organochlorines) in samples of the above waterfowl/water birds wintering in the Atlantic Ocean Basin to assess potential effects on reproduction or survival. Obtain samples as opportunities arise.

BEACH AND ISLAND GROUND-NESTING BIRDS

- ❖ Support and encourage habitat research projects that would help define preferred habitat in order to guide restoration efforts and focus habitat protection efforts.

- ❖ Support basin-appropriate research that addresses data collection priorities established in species Recovery Plans (piping plover and roseate tern), the Tern Management Handbook (Kress and Hall, 2002) and similar planning documents currently being prepared through interstate and interagency working groups.

- ❖ Continue annual surveys to collect nesting data, including but not limited to, number of nesting pairs, productivity, and number of active breeding sites.

HARBOR PORPOISE

- ❖ Use radio tagging and satellite telemetry to monitor movements of harbor porpoise in the basin.

- Monitor seasonal abundance with aerial surveys.

- Conduct contaminant analysis on stranded animals to determine effects of local habitat on the species.

Right whale

- Continue the ongoing northern right whale survey conducted by the Riverhead Foundation for Marine Research.

- Characterize fixed fishing gear configurations, such as the number of vertical lines a fisherman uses, to gain a better understanding of the magnitude and risk of entanglements in the basin.

Transient (non-breeding) shorebirds

- Initiate annual shorebird monitoring program, using established protocols at 5-10 locations in New York State.

- Conduct field studies to document ecology of transient shorebirds, including important food items, habitat use and time/activity budgets.

Planning Recommendations

- ❖ Regularly update oil and chemical spill response plans for the basin in cooperation with the US Coast Guard, state, and local governments. Review the ability of government and not-for-profit wildlife rehabilitation facilities to respond to wildlife damaged by petroleum and chemical spills in the basin.

- ❖ Complete fishery management plans for all SGCN lacking current plans. Coordinate planning with ASMFC, federal government, estuary programs, other states, NGOs, and the fishing community. Incorporate the recommendations for Large Marine Ecosystem-based fishery management developed by the Northeast Fisheries Science Center in 2004. Consider planning strategies to obtain information on forage species abundance and availability to support predators.

- ❖ Develop a long-term beach and island ground-nesting bird management plan with population targets and management recommendations to achieve them.

- ❖ Define priority areas of wintering waterfowl, marine mammal, and sea turtle use and develop management strategies to minimize human disturbance and offshore development through the permitting process.

- ❖ Develop a conservation plan for transient (non-breeding) shorebirds that regularly occur in New York which identifies objectives and actions to sustain shorebird resources within and outside New York State.

- ❖ Provide training for town government staff to implement Coastal Erosion Hazard Area (CEHA) and to understand the NYS Tidal Wetland law.

Land Protection Recommendations

- Acquire fee title, development rights, or other easements on beach property to protect beach and island ground-nesting birds, transient waterfowl, and horseshoe crabs.

- Protect (through fee title acquisition and easements) shore lands and require upland buffers associated with beach, bluff and dune habitat within state regulation to accommodate natural processes and sea level rise. This will allow for marshes and dunes to retreat inland.

Management and Restoration Recommendations

- Establish and/or continue to implement seasonal use restrictions on public beaches documented as important habitat for transient shorebird species, especially red knot; beach and island ground-nesting birds especially roseate tern, common tern, and least tern; black skimmer and piping plover; and horseshoe crabs. Restricted activities may include pedestrian access in nesting areas, use of vehicles on beaches, construction projects, and beach nourishment activities.

- Enforce grain size conditions on beach nourishment permits to avoid changes to beach habitats used by SGCN, especially beach and island ground nesting birds and horseshoe crabs.

- Remove and/or reduce the presence of feral domestic species and wild predators on beach and island ground-nesting birds.

- Maintain a moratorium on Atlantic sturgeon possession and implement changes to fisheries with the greatest sturgeon bycatch to minimize them.

- Implement the management recommendations of the Interstate Fishery Management Plan for horseshoe crabs.

- Manage vegetational succession in beach areas used for nesting by beach and island ground-nesting birds. Use dredge spoil placement, beach nourishment and overwash to restore or expand nesting habitat, especially for roseate terns.

- Use seasonal fenced areas for plovers and terns as seasonal habitat protection for other beach strand species.

- Close nesting beaches to off-road vehicles during periods of unfledged plover and tern chick use.

- Fence early successional habitat created by breaches and overwash.

- Develop a specific habitat protection and restoration action plan for publicly owned beach, bluff, and dune complexes.

- Increase enforcement capacity and training for all existing and proposed management strategies and plans for requirements that are legally enforceable. This could include working with NMFS through Joint Enforcement Agreements for the enforcement of federal regulations by local law enforcement officials.

- Implement the NMFS rules and regulations for skates and rays as appropriate for New York waters.

- Implement management regulations for pelagic and demersal sharks consistent with the recommendation of NMFS and work with ASMFC to develop an Interstate FMP for coastal sharks.

- Develop technical guidelines (e.g., seasonal windows, mitigation) on ocean construction activities (pipelines, cables, dredge borrow areas) to minimize effects to SGCN and other important wildlife species.

- Seek management and restoration opportunities that aim to restore natural shorelines in the basin.

Information Dissemination Recommendations

- Share results of wintering waterfowl contaminant levels with agencies and interested parties involved in contaminant tracking efforts in NY Harbor and dredged material management to guide their efforts.

- Continue to work with state, federal, and municipal beach managers to identify beaches important to SGCN in the basin and make management recommendations to protect them at appropriate seasonal and spatial scales using data collected under the State Wildlife Grants Program.

- Share transient shorebird information collected under SWG with international conservation organizations.

- Educate and inform landowners adjacent to beach and island ground-nesting bird nesting areas about the importance of predator control in these areas, including feral domestic and domestic animals.

- Conduct outreach to fishermen to inform fishermen of the Atlantic Large Whale Reduction Plan and the Harbor Porpoise Take Reduction Plan.

- Conduct outreach to law enforcement personnel to inform them of the Atlantic Large Whale Reduction Plan and the Harbor Porpoise Take Reduction Plan and their requirements for fishing gear so that this information can be incorporated into routine inspections of vessels and gear.

- Develop outreach materials for mariners regarding the identification of whales, dangers to whales associated with ship strikes and marine debris, and where to report information.

Regulatory and Legislative Recommendations

- Evaluate needs and benefits to promote voluntary use of bait bags in the eel and conch fisheries to reduce the number of horseshoe crabs needed for bait.

- Improve and increase the effectiveness and consistency of current coastal regulations.

Incentives

- Develop private lands incentives to remove existing obsolete beach structures and discourage new beach hardening structures including groins, jetties, and bulkheads.

- Develop buy-out program for storm damaged beachfront properties within flood-hazard areas and/or disincentives to redevelopment.

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Tables and Figures

Tables

Figures

Atlantic Ocean Table 1. Protected shore lands in the Atlantic Ocean Basin.

Park Name	Jurisdiction
Amsterdam Beach	State Park
Atlantic Avenue Town Park	Hempstead Town Park
Atlantique Park	Islip Town Park
Bluff Road Dunesland Park	East Hampton Town Park
Breezy Point	National Recreation Area
Camp Hero	State Park
Cedar Beach Park	Babylon Town Park
Davis Town Park	Brookhaven Town Park
East Atlantic Beach	Hempstead Town Park
Fire Island	National Seashore
Gilgo Beach State Park	State Park
Gilgo Beach Town Park	Babylon Town Park
Great Gun Town Beach	Brookhaven Town Park
Hither Hills	State Park
John F Kennedy Memorial Wildlife Sanctuary	Oyster Bay Town Park
Jones Beach	State Park
Lido Beach Town Park	Hempstead Town Park
Long Beach Park	City of Long Beach Park
Main Town Beach	East Hampton Town Park
Malibu Town Park	Hempstead Town Park
Montauk Point	State Park
Montauk Point	State Park
Napeague	State Park
Nassau Beach County Park	Nassau County Park
Point Lookout Town Park	Hempstead Town Park
Ponquogue Town Beach	Southampton Town Park
Rheinstein Estate Park	East Hampton Town Park
Robert Moses Park	State Park
Rockaway Park	City of New York Park
Sagg Main Town Beach	Southampton Town Park
Shadmoor	State Park
Silver Point County Park	Nassau County Park
Smith Point County Park	Suffolk County Park
Tiana Town Beach	Southampton Town Park
Tobay Beach Park	Oyster Bay Town Park
W Scott Cameron Town Beach	Southampton Town Park

Atlantic Ocean Table 2. Artificial reefs in the Atlantic Ocean Basin, their depth, and principle components.

Name	Depth in Feet	Materials
Rockaway	32 - 40	tires, steel buoys, rock, concrete
Atlantic Beach	55 - 64	tires, auto bodies, trucks, barges, other boats, armored vehiles, various concrete, natural rock
Fishing Line	50 - 53	concrete, barges, boats
Hempstead Town	50 - 72	boats, barges, armored vehicles, concrete rubble, a drydock
Fire Island	62 - 73	tires, barges, boats, armored vehicles, experimental coal ash blocks, natural rock, various concrete rubble
Moriches	70 - 75	tires, various boats, armored vehicles, concrete
Shinnecock	79 - 84	tires, barges, boats, steel and concrete tower, armored vehicles, steel and concrete bridge rubble

Atlantic Ocean Table 3. Species of Greatest Conservation Need currently occurring in the Atlantic Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Beach and Island ground-nesting birds	American oystercatcher	Stable
Bird	Beach and Island ground-nesting birds	Black skimmer	Stable
Bird	Beach and Island ground-nesting birds	Common tern	Decreasing
Bird	Beach and Island ground-nesting birds	Least tern	Decreasing
Bird	Beach and Island ground-nesting birds	Piping plover	Increasing
Bird	Beach and Island ground-nesting birds	Roseate tern	Decreasing
Bird	Common loon	Common loon	Unknown
Bird	Osprey	Osprey	Stable
Bird	Transient shorebirds	Dunlin	Unknown
Bird	Transient shorebirds	Purple sandpiper	Unknown
Bird	Transient shorebirds	Red knot	Decreasing
Bird	Transient shorebirds	Ruddy turnstone	Unknown
Bird	Transient shorebirds	Sanderling	Unknown
Bird	Transient shorebirds	Semipalmated sandpiper	Unknown
Bird	Transient shorebirds	Short-billed dowitcher	Unknown
Bird	Wintering waterbirds	Black scoter	Unknown
Bird	Wintering waterbirds	Common eider	Increasing
Bird	Wintering waterbirds	Cory's shearwater	Unknown
Bird	Wintering waterbirds	Greater scaup	Decreasing
Bird	Wintering waterbirds	Greater shearwater	Unknown
Bird	Wintering waterbirds	Harlequin duck	Stable
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Long-tailed duck	Unknown
Bird	Wintering waterbirds	Razorbill	Unknown
Bird	Wintering waterbirds	Red-necked phalarope	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Bird	Wintering waterbirds	Surf scoter	Unknown
Bird	Wintering waterbirds	White-winged scoter	Unknown
Crustacea/Meristomata	American lobster	American lobster	Unknown
Crustacea/Meristomata	Blue crab	Blue crab	Unknown
Crustacea/Meristomata	Horseshoe crab	Horseshoe crab	Unknown
Crustacea/Meristomata	Zooplankton	Marine zooplankton	Unknown
Herpetofauna	Sea turtles	Green turtle	Decreasing
Herpetofauna	Sea turtles	Kemp's or Atlantic ridley	Decreasing
Herpetofauna	Sea turtles	Leatherback	Decreasing
Herpetofauna	Sea turtles	Loggerhead	Decreasing
Mammal	Marine mammals	Blue whale	Unknown
Mammal	Marine mammals	Fin whale	Unknown
Mammal	Marine mammals	Harbor porpoise	Unknown
Mammal	Marine mammals	Humpback whale	Unknown
Mammal	Marine mammals	Northern right whale	Unknown
Mammal	Marine mammals	Sei whale	Unknown
Mammal	Marine mammals	Sperm whale	Unknown
Marine fish	Alewife - marine district population	Alewife	Unknown
Marine fish	American eel	American eel	Unknown
Marine fish	American shad	American shad	Unknown
Marine fish	Atlantic sturgeon	Atlantic sturgeon	Unknown
Marine fish	Blueback herring	Blueback herring	Decreasing
Marine fish	Demersal sharks	Dusky shark	Decreasing
Marine fish	Demersal sharks	Sand tiger shark	Unknown
Marine fish	Demersal sharks	Sandbar shark	Decreasing
Marine fish	Demersal sharks	Tiger shark	Unknown
Marine fish	Estuarine associates of SAV	Fourspine stickleback	Unknown
Marine fish	Estuarine associates of SAV	Lined seahorse	Unknown
Marine fish	Estuarine associates of SAV	N. American ninespine stickleback	Unknown
Marine fish	Estuarine forage species	Atlantic silverside	Unknown
Marine fish	Estuarine forage species	Mummichog	Unknown
Marine fish	Estuarine forage species	Spotfin killifish	Unknown
Marine fish	Estuarine forage species	Striped killifish	Unknown
Marine fish	Estuarine migratory pelagic	Bay anchovy	Unknown
Marine fish	Estuarine migratory pelagic	Menhaden	Unknown
Marine fish	Labrids	Cunner	Unknown
Marine fish	Labrids	Tautog	Unknown
Marine fish	Northern puffer	Northern puffer	Unknown
Marine fish	Oyster toadfish	Oyster toadfish	Unknown

Atlantic Ocean Table 3. (continued)

Taxa Group	Species Group	Species	Stability
Marine fish	Pelagic sharks	Basking shark	Unknown
Marine fish	Pelagic sharks	Bigeye thresher shark	Decreasing
Marine fish	Pelagic sharks	Blue shark	Decreasing
Marine fish	Pelagic sharks	Bonnethead shark	Decreasing
Marine fish	Pelagic sharks	Longfin mako shark	Decreasing
Marine fish	Pelagic sharks	Porbeagle shark	Decreasing
Marine fish	Pelagic sharks	Scalloped hammerhead shark	Decreasing
Marine fish	Pelagic sharks	Shortfin mako shark	Decreasing
Marine fish	Pelagic sharks	Smooth hammerhead shark	Unknown
Marine fish	Pelagic sharks	Thresher shark	Decreasing
Marine fish	Pelagic sharks	White shark	Unknown
Marine fish	Rainbow smelt	Rainbow smelt	Decreasing
Marine fish	Skates and Rays	Atlantic torpedo	Unknown
Marine fish	Skates and Rays	Barndoor skate	Unknown
Marine fish	Skates and Rays	Clearnose skate	Unknown
Marine fish	Skates and Rays	Cownose ray	Unknown
Marine fish	Skates and Rays	Little skate	Decreasing
Marine fish	Skates and Rays	Manta	Unknown
Marine fish	Skates and Rays	Rosette skate	Unknown
Marine fish	Skates and Rays	Roughtail stingray	Unknown
Marine fish	Skates and Rays	Smooth skate	Unknown
Marine fish	Skates and Rays	Thorny skate	Unknown
Marine fish	Skates and Rays	Winter skate	Unknown
Marine fish	Tomcod	Atlantic tomcod	Unknown
Marine fish	Winter flounder	Winter flounder	Decreasing

Atlantic Ocean Table 4. Habitats listed as critical to SGCN found in the Atlantic Ocean Basin, described by habitat system and subsystem as adapted frm Edinger *et al* (2000). The number of SGCN that use each system-subsystem association is also indicated.

System	Subsystem	# of Species
Marine	deep subtidal	66
Marine	shallow subtidal	17
Terrestrial	coastal	12
Marine	intertidal	12
Terrestrial	maritime	6
Terrestrial	open upland	5
Marine	unknown	4
Marine	cultural	4

Atlantic Ocean Table 5. Atlantic Ocean Basin species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**5**	**28**	**118**	**23.7**
Beach and Island Ground-Nesting Birds		6	7	85.7
Common Loon		1	1	100.0
Osprey		1	1	100.0
Transient waterfowl		7	14	50.0
Wintering Waterbirds		13	19	68.4
CRUSTACEA	**4**	**4**	**7**	**57.1**
American lobster		1	1	100.0
Blue crab		1	1	100.0
Horseshoe crab		1	1	100.0
Zooplankton		1	1	100.0
HERPETOFAUNA	**1**	**4**	**44**	**9.1**
Sea Turtles		4	5	80.0
MAMMAL	**1**	**7**	**21**	**33.3**
Marine Mammals		7	7	100.0
MARINE FISH	**17**	**47**	**51**	**92.2**
Alewife - marine district population		1	1	100.0
American eel		1	1	100.0
American shad		1	1	100.0
Atlantic sturgeon		1	1	100.0
Blueback herring		1	1	100.0
Demersal sharks		4	4	100.0
Estuarine associates of SAV		3	5	60.0
Estuarine forage species		4	5	80.0
Estuarine migratory pelagic		2	2	100.0
Labrids		2	2	100.0
Northern puffer		1	1	100.0
Oyster toadfish		1	1	100.0
Pelagic sharks		11	11	100.0
Rainbow smelt		1	1	100.0
Skates and Rays		11	11	100.0
Tomcod		1	1	100.0
Winter flounder		1	1	100.0
MOLLUSK	**1**	**1**	**59**	**1.7**
Blue mussel		1	1	100.0
TOTAL	**29**	**91**	**537**	**16.9**
% of all spp groups statewide	**22.7**			

Atlantic Ocean Table 6. Important Bird Areas in the Atlantic Ocean Basin and their total acreage. The IBA boundaries may extend beyond the boundary of the basin.

IBA Site Name	Total Acres
Captree Island Vicinity	14510.78
Fire Island (east of lighthouse)	5418.00
Great South Bay	57554.88
Jamaica Bay Complex	21152.33
Moriches Bay	13296.24
Montauk Point	7864.06
Napeague Harbor and Beach	4366.57
Shinnecock Bay	12672.55
West Hempstead Bay/Jones Beach	33249.42

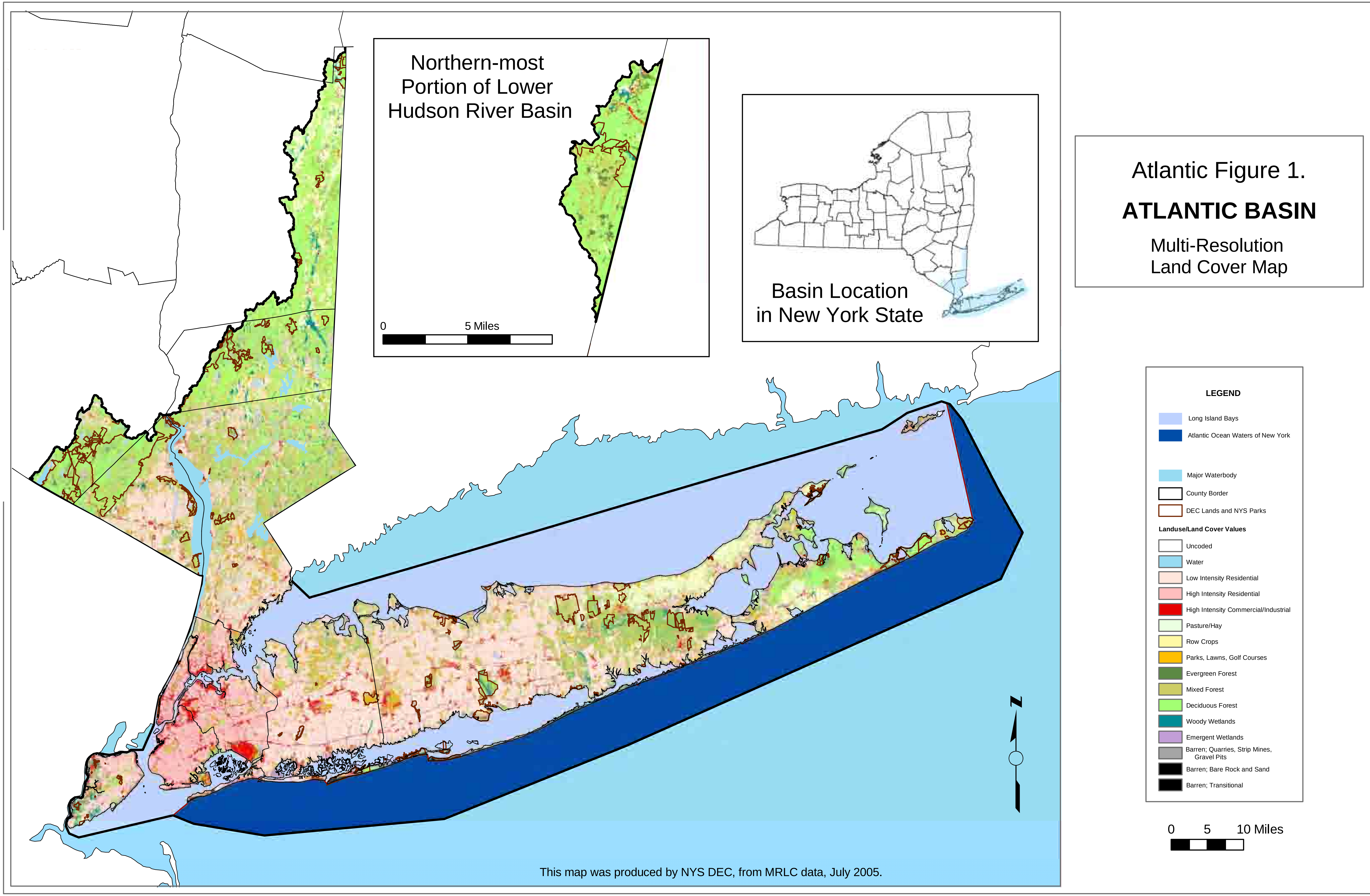
Atlantic Ocean Table 7. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the Atlantic Ocean - NY Bight Basin. For details on threats, see Appendix: Threats Characterization for Wildlife and Their Habitats.

Threat Description	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Human Disturbance - illegal/unregulated harvest	20	69.0	16.9
Habitat Loss - cultural (e.g., development)	17	58.6	14.4
Contaminants	12	41.4	10.2
Degradation of Water Quality	12	41.4	10.2
Disrupted Predator-Prey Cycles	8	27.6	6.8
Climate Change (change in water level, temperature)	8	27.6	6.8
Human Disturbance - entanglement, entrainment, impingement	7	24.1	5.9
Human Disturbance - collisions	5	17.2	4.2
Susceptibility to Stochastic Events (weather, storms)	5	17.2	4.2
Human Disturbance - general	4	13.8	3.4
Disease	4	13.8	3.4
Barriers to Movement in Aquatic Habitats (e.g., dams, weirs, culverts)	4	13.8	3.4
Interspecific Competition for Resources	4	13.8	3.4
Susceptibility to Stochastic Events (isolated pop'ns)	2	6.9	1.7
Aquatic Habitat Altered by Natural Processes (e.g., beaver)	2	6.9	1.7
Competition from Invasive Exotics	1	3.4	0.8
Active Alteration/Suppression of Natural Processes (e.g., fire)	1	3.4	0.8
Climate Change (change in species range, distb'n, migration)	1	3.4	0.8
Sedimentation/Erosion (impacts on aquatic habitats)	1	3.4	0.8

Atlantic Ocean Table 8. SGCN in the Atlantic Ocean Basin for which the Atlantic States Marine Fisheries Commission has management jurisdiction. Year of completion of the Fishery Management Plan (FMP) and most recent update is indicated.

Species	FMP Completion Date	Most Recent Update
American Eel	1999	N/A
American Lobster	1997	2005
Atlantic Herring	1993	2001
Atlantic Menhaden	1981	2004
Atlantic Sturgeon	1990	2001
Horseshoe Crab	1998	2004
Shad and River Herring	1985	2002
Spiny Dogfish and Coastal Sharks	1987	N/A
Tautog	1996	2002
Winter Flounder	1992	1998

Source: www.asmfc.org, list of Fishery Management Reports. Downloaded 5/9/05.



Atlantic Figure 1.

ATLANTIC BASIN

Multi-Resolution Land Cover Map

Description of the Basin

The Delaware Basin is in the southeastern portion of New York State (NYS), bordering New Jersey and Pennsylvania. The basin covers 2,363 square miles primarily across Sullivan, Ulster, and Delaware counties. Small portions of Chenango, Greene, Schoharie, Broome, and Orange counties also fall within the boundary of the Delaware Basin. There are portions of two mountain ranges in the basin. The southern Catskill mountain range cuts through the eastern portion of the basin in Ulster, Sullivan, and Delaware counties. The Shawangunk Mountains skirt the southeastern border of the basin in Orange, Ulster and Sullivan counties.

According to the US Environmental Protection Agency (EPA) multi resolution land classification (MRLC) maps, the basin is 86% covered by forest. Of this forest cover, 45% is deciduous forest, followed closely by mixed deciduous and evergreen forests that cover 36%. Evergreen forest is relatively scarce in this basin, covering 5% of the land area. Residential and commercial development covers just over 1% of the basin's land area. Just over 9% of the basin is covered by agricultural land uses. The complete list of land classifications in the basin is given in Delaware Table 1. This high ratio of forests to human land uses contributes to the overall excellent water quality in the basin. There are 1,900 miles of rivers and streams in the basin and 400 lakes and ponds. The eastern central portion of the basin is within the boundary of the Catskill Park and contains extensive publicly-owned and DEC-administered Forest Preserve Lands. About one-third of the park is within the basin. A summary of DEC-administered lands in the basin is given in Delaware Table 2.

Created in 1904, the entire Catskill Park today includes about 700,000 acres of public and private land within boundaries delineated on maps by a line usually called the blue line. Intermingled with the Catskill Forest Preserve lands in the Catskill Park are towns, villages and hamlets, highways and byways, businesses and residences. About 60 % of the lands in the Catskill Park are privately owned, and home to approximately 50,000 year-round residents.

The Catskill Forest Preserve was created on May 15, 1885 when Governor David B. Hill signed a law requiring that,

> *"The lands of the state, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed."*

The Catskill Forest Preserve comprises approximately 287,000 acres of public land, 117,730 of which fall within the Delaware Basin in New York State's Greene, Sullivan, Delaware and Ulster Counties. The watershed includes approximately 19,760 acres of state forest lands; these include Arctic, Hickok Brook, Plattekill, Relay, and Tommanex State Forests. State wildlife management areas in the watershed approximate 16,610 acres and include Mongaup, Bearspring Mountain, and Wolf Hollow wildlife management areas. State unique areas in the watershed comprise approximately 7,470 acres and includes the Neversink Unique Area. State-held conservation easements in the watershed approximate 4,660 acres and other DEC-administered lands in the watershed approximate 650 acres. Thousands of acres of forests with meadows, lakes, rivers, springs, waterfalls, and cliffs are home to a wealth of wildlife. There are hundreds of miles of trails, scenic vistas, large tracts of wilderness, and intensively used recreational areas such as campgrounds and the Belleayre Mountain Ski Center.

There are two traditional state parks in the Delaware Basin. The 1,390-acre Lake Superior State Park in the Town of Bethel in Sullivan County is primarily forested, with some wetlands and the open water of Lake Superior. Areas within the park are classified as hay/pasture and row crops by EPA's MRLC maps. Oquaga Creek State Park, on the border of Delaware and Broome counties, is about 1,504 acres of primarily forest with some grassy areas and open water. This park abuts DEC forest lands in the northwestern corner of the basin. There is also a 2-acre John Burroughs Memorial Site in Roxbury, NY.

The entire main stem of the Delaware River, from the estuary in Delaware Bay to the confluence of the east and west branches of the river in Hancock, N.Y., is unrestricted by dams. The Delaware is the only major northeastern US river where this is the case. A segment of the upper Delaware within the basin from Hancock, N.Y. to Cherry Island near Sparrow Bush, N.Y. was designated part of the National Wild and Scenic River System in 1978. In order to qualify for this designation, the river must be "free-flowing, and relatively undeveloped, possess outstanding remarkable scenic, recreational, geological, fish and wildlife, historical, and cultural resources, or other similar values." The history of fly fishing has made some of the stream renowned in the sport for brown and rainbow trout catches. This segment of the upper Delaware River includes riffles and Class I and Class II rapids, pools, and eddies. In addition, there are federal guidelines for development and alteration of the lands and waters within the designated segment.

The lack of dams on the main stem of the Delaware River has allowed continued use of this river system by diadromous fish species. Spawning American shad ascend the river to Hancock and the lower East Branch each spring, and juveniles migrate out in the fall. The spawning run supports a popular recreational fishery. American eels are widely distributed throughout the basin. The immature stages ("yellow eels") spend varying numbers of years in streams and ponds, and eventually metamorphose into pre-spawning adults in the late summer and fall. These "silver eels" leave the river and migrate to the Sargasso Sea to spawn and die. There is a modest and historical weir fishery on the Delaware for silver eels. Other diadromous species that enter the New York portion of the basin are sea lamprey, gizzard shad, and striped bass.

The population of the basin according to the 2000 US Census was 177,811 people, at an average population density of 75 people per square mile. The average population density in the Delaware Basin is 1,000 times less than the average population density in Manhattan. The total population is also nearly 1,000 times less than the total population of the Lower Hudson-Long Island Bays Basin. In spite of the relatively small population in this basin, Orange County's population is currently the fastest growing in the state according to the US Census Bureau.

The basin is home to several surface water supply reservoirs, three of which supply water to New York City. Creation of these reservoirs has been through dams constructed along Delaware River tributaries. These reservoirs are part of an extensive surface water supply system for millions of New Yorkers and divert about one third of the river's total volume. The reservoirs and their watersheds within the Delaware Basin are managed and protected by the New York City Department of Environmental Protection (NYCDEP). The aquatic resources in these reservoirs have been managed for high quality trout fisheries.

The NYCDEP has owned approximately 26,550 acres of reservoir buffer land for decades; the reservoirs themselves total 11,350 acres. In May of 1997, EPA issued a filtration avoidance determination for New York City's water supply because it met the objective criteria of that agency for protection of drinking water. In January of 1997, the New York City Watershed Memorandum of Agreement (MOA) was signed by New York City, New York State, EPA, the towns, villages, and counties within the reservoir watersheds, and some environmental and public interest groups. This MOA created a framework for multiple institutions to protect the water supply of the city. The management plan created by NYCDEP uses a combination of land acquisition, voluntary measures, infrastructure upgrades, and best management practices to protect and improve the water quality in the reservoirs. NYCDEP has provided millions of dollars of funding for these activities. NYCDEP has acquired fee title to 11,730 acres since signing the MOA. These are scattered throughout the watershed. In addition, NYCDEP has acquired conservation easements on 2,625 acres. The Watershed Agricultural Council has acquired easements on 5,850 acres. Non-profit land trusts hold 815 acres of preserves and 9,360 acres of conservation easements.

In addition to the large NYC water supply dams, there are many smaller impoundments distributed throughout the basin. These change the original stream habitat into lentic habitats with mixed consequences for basin flora and fauna. On the negative scale, the low-head dams may block migration routes, disrupt sediment and nutrient transport, and warm downstream stream segments. Two larger hydroelectric dams (Lake Wallenpaupack in PA and the Mongaup system in New York) have these effects and may also indirectly influence releases from the NYC reservoirs.

Critical Habitats of the Basin and the Species That Use Them

The Delaware Basin is home to 81 of the 537 Species of Greatest Conservation Need (SGCN) or about 15% of the SGCN statewide. Of those, 25 are in decline, 5 are stable, 8 are increasing, and 42 are of unknown status. The complete listing of SGCN presently found in the basin and their status is in Delaware Table 3. There are 13 species thought to be extirpated from the basin shown in Delaware Table 4. Delaware Table 5 shows the relative species diversity in the basin compared to the complete list of SGCN in the state. There are two species of odonate whose only populations in New York are found in the Delaware Basin. These are the green-faced clubtail and Septima's clubtail. Populations of native brook trout in the basin with unique genetic signatures are thought to have evolved in the Delaware Basin over thousands of years (Keller, 1979).

The 1,900 miles of streams and rivers and 400 lakes and ponds in the basin provide extensive aquatic habitat for SGCN. There are 17 species that depend on coldwater streams in the basin as critical habitat. The overall water quality in the basin is excellent but prone to degradation by human development, invasive species, and atmospheric deposition.

DEC staff members who compiled the SGCN information in the CWCS Planning Database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State*, *Second Edition*. In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers at DEC, e.g., "cold water–shallow."

Each of these systems and subsystems is further refined into a habitat category in the CWCS Planning Database and can be viewed in the taxa reports in Appendix A. The habitat categories are excluded here for the sake of simplicity but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. The system-subsystem classes that are listed as critical to species in the Delaware Watershed are listed in Delaware Table 6. These critical habitats are not a comprehensive listing of all habitat associations found in the basin, but are a subset of the habitats deemed critical to SGCN that occur in the basin.

The basin is dominated by forested habitat yet, surprisingly, terrestrial open habitats are used by 38 SGCN, the most in this basin. Terrestrial open habitats make up less than 10% of the basin landscape. Terrestrial open habitats include areas classified as row crops and pasture land in the MRLC data, which occur at lower elevations in the basin, often in river and stream valleys. Higher elevations are generally forested.

Terrestrial forested habitats are used by 36 SGCN in the basin. Forests in the basin are characterized by northern hardwood species (beech, birch, maple) with some smaller patch communities of hemlock and pine. Deciduous and mixed forest stands are dominant in the basin and provide critical habitat for the cerulean warbler and timber rattlesnake, both northeast species of concern (Therres, 1999).

Overall Trends in the Basin

The Delaware Basin was almost completely deforested during the 19th century. The loss of forests resulted in flash flooding and heavy siltation of the Delaware River and its tributaries. Stream temperatures increased dramatically during the summer from lack of shade and reduced groundwater input to the streams. The once extensive hemlock forests of the Catskills were heavily harvested for their bark. Tannery and acid manufacturing waste contributed to degradation of water quality in the basin. All of these factors coupled with intense angling pressure and introduction of non-indigenous brown and rainbow trout in the 1880s drastically changed the native fish communities in the Delaware and its tributaries.

Siltation continues today, though not of the magnitude that spurred the creation of the Catskill Forest Preserve. Reforestation occurred with conversion of agricultural land to forests but some of these areas are becoming deforested again due to changing land uses resulting in forest fragmentation. Orange County in particular, is becoming developed at a high rate and has the fastest growing population of any county in the state. Balancing human with ecological needs continues to be a challenge.

Some of these effects have been reversed by the creation of Catskill Park and the Forest Preserve. The construction of a reservoir system in the 1950s and 1960s altered flows of major Delaware River tributaries. The need for adequate drinking water supply for the City of New York and essential habitat for fish and aquatic invertebrates led to significant degradation of the basin’s stream habitats during the last half of the 20th century. Passage of the New York State Reservoir Release Legislation (NYS Environmental Law Article 15, Title 8) in 1976 provided the basis for more suitable flow regimes below New York City reservoirs. An October 1980 proceeding by NYCDEP against DEC in the County of Albany Supreme Court under Article 78 of the CPLR resulted in a Stipulation of Discontinuance which changed the NYS Reservoir Release Legislation. Negotiations between DEC, NYCDEP, and the other Delaware Basin states continue to seek improved thermal and habitat conditions in approximately 70 miles of tailwater below the three reservoirs.

Threats

Habitat Loss and Degradation

All of the species in the Delaware Basin are vulnerable to the effects of multiple threats. The most common single threat listed for species that occur in the Delaware Basin in the CWCS database is loss of habitat by human development. The complete list of threats to SGCN is found in Delaware Table 7. Development pressure and recent large-scale development proposals for the Catskills are the most proximate habitat loss threats at this time. New development stresses existing natural resources decreasing flood protection and habitat provided by these resources and increasing siltation which affects aquatic habitat. In addition, sprawl-type development occurring in adjacent counties is influencing development patterns within the basin.

Dams used to create reservoirs on the tributaries to the Delaware River interrupt the naturally dynamic flow of these streams and block migration routes of anadromous and resident species. Other barriers to species dispersal and movement include culverts, road crossings, gravel deltas and temperature, turbidity, and chemical gradients. Many stream species and riparian communities are adapted to the flood cycles of free-flowing streams. Flood waters often carry fine sediments necessary for stream odonates and other burrowing aquatic animals. Alteration of the flooding cycles may change the community structure in dammed stream reaches. Dams cause sediments to accumulate in reservoirs, altering streambed composition in lower reaches. Terrestrial barriers to species movement also exist and include roads and fences.

Not only is volume of flow an issue for many aquatic species in tributaries affected by the reservoirs, but the temperature of the water released from reservoirs plays an important role in the health of these animals. Water released from reservoirs is drawn from deeper, colder strata. Thus, the aquatic communities that become established below the dams are primarily composed of obligate coldwater species. Impounded waters in reservoirs become warmer than the free-flowing areas of streams below reservoir dams. Releases over the dam from the warmer surface waters in the reservoir can have negative effects on fish and other aquatic species, and releases of insufficient quantity do not maintain suitably cold temperatures in stream reaches further removed from the dams.

Toxics

Toxic contaminants are the second most commonly cited threat to SGCN in this basin. Four water bodies in this basin appear on DEC Division of Water's Clean Water Act Section 303(d) list of waters with fish consumption advisories due to toxic contaminants in fish. Neversink Reservoir, Pepacton Reservoir, and Cannonsville Reservoir all have elevated levels of mercury due to atmospheric deposition. Upper Trout Creek and its tributaries are contaminated by PCBs in creek sediments that likely leached from improper upland disposal.

Other contaminants of concern in this basin include pharmaceuticals and endocrine disrupting compounds, pesticides and MBTE. Pharmaceticals and endocrine disruptors can be discharged from sewage treatment plants and through on-site septic systems. Pesticides are carried in storm water and MBTE pollutes groundwater from underground petroleum tank leaks and gasoline spills.

Atmospheric Deposition

Atmospheric deposition has degraded the East Branch of the Neversink River, its tributaries, and Wolf Reservoir. Water quality degradation, including atmospheric deposition, is the third most cited single threat to SGCN in the Delaware Basin. Atmospheric deposition in New York State originates primarily from power plant and other industrial emissions of sulfur dioxide, nitrogen oxide, and ammonia in the Midwest. These emissions are carried in clouds by prevailing winds to the east and deposited as precipitation. This causes calcium leaching from soils affecting regeneration of certain tree species and limits uptake of calcium by arthropods, eventually affecting avian diets. Mercury contamination in birds through atmospheric deposition is a potential effect just beginning to be understood. In addition to direct aquatic effects, atmospheric deposition can kill trees, causing loss of terrestrial habitat and secondary effects on aquatic habitats by destruction of riparian vegetation. Loss of riparian vegetation leads to increased temperatures, runoff, and siltation.

Another atmospheric threat to the Delaware Basin is carbon dioxide and other greenhouse gases. There are various projections of how much global warming will occur by what date, but most scientists believe that the earth's temperature will rise significantly in a matter of decades. If this process is manifest in the Delaware basin, any number of temperature-intolerant species may be negatively affected. Projected indirect consequences of global warming, such as floods, droughts and high winds, may further disrupt species and processes that have evolved in the basin over millennia.

Invasive Species

Introduction of non-native species has been and will continue to be a threat to this basin, but both native and non-native species are able to take advantage of ecological imbalances. Forest pests and pathogens include chestnut blight (historic), beech bark disease and wooly adelgid (current) and sudden oak death (potential). Tree diseases have a cascading affect through food webs, habitats, and ecosystems. Other potential biological threats include chronic wasting disease, largemouth bass virus, and swim bladder nematodes. Native species such as tent caterpillars and deer have exploited imbalances in the system with deer browsing leading to the decline of understory vegetation and the animals that depend upon the habitat it provides. Gypsy moth larvae feed voraciously on the leaves of almost any tree, often completely defoliating them in areas of severe infestation. Without leaves, the trees are unable to produce food, weaken, and then die. Some natural controls for gypsy moth, including the *Entomophaga maimaiga* fungus, have been effective in dramatically reducing their populations in the Delaware Basin. There are some native gypsy moth predators in New York including the white footed mouse.

Several species of invasive plants are also found in the basin. Tree of heaven, Oriental bittersweet, autumn olive, common reed, purple loosestrife, and Japanese knotweed are a few of the invaders of note. These plants often out-compete native plants and provide poor habitat and food for wildlife. Oriental bittersweet can overgrow and choke out trees; purple loosestrife can completely dominate emergent marshes once it becomes established.

Priority Issues in Basin

The major natural resource issue in this basin is conservation and management of resources. The Delaware Basin is home to large stands of high-quality forest habitat and some of the cleanest water in the state. There is an opportunity to use this basin as a baseline for SGCN populations that occur in other areas of the state as well. Since the reforestation of the Catskills and the rest of the Delaware Basin, habitat fragmentation has been limited compared to other parts of the state. There is an opportunity to balance new development with the needs of forest dependant species. Not only should the needs of wildlife shape future development in the basin, but the protection of the New York City reservoir system will have a profound influence as well. Resolution of these competing needs will have to undertaken with care in the coming decades.

In the areas of the Catskill Forest Preserve, there is little to no opportunity for active forest management for tree health or wildlife enhancement. The policy in the forest preserve is to extinguish all wildfires as soon as they are detected. Build up of fuel and other symptoms of forest aging must be carefully monitored. Areas of forest habitat outside the preserve should be managed in context with the adjoining wild areas to maximize the habitat value of managed vs. unmanaged habitats in relation to each other, avoiding abrupt changes in cover type or creation of isolated habitat "islands." State Forest lands not in the preserve and private lands can be managed with prescribed burning and other acceptable silvicultural techniques.

Maintenance of adequate water volume and appropriate temperatures in Delaware Basin streams is essential to maintaining the Delaware River and its tributaries as outstanding fish and wildlife habitat. Protection of the quality of the water in these streams is an increasing concern in areas of the basin experiencing explosive growth.

Vision, Goals and Objectives for the Basin

Vision

The Delaware Basin will have healthy and sustainable populations of all SGCN that presently occur here. Opportunities for reintroduction of extirpated species will be acted upon by all conservation partners in the basin.

Existing conservation partnerships among federal, state, and local government partners, tribal nations, not-for-profit organizations, and other citizens groups will be strengthened. New and innovative partnerships will be formed.

Conservation partners in the basin will work together to collect, share, and analyze information on SGCN and their habitats in the basin. Information will be used to constructively manage species and habitats for the greatest benefit to biodiversity preservation while balancing human needs for use of the resources.

Members of the public will understand the value of healthy habitats and the species that they support. Both consumptive and non-consumptive recreational users of resources in the basin will support scientifically sound management of wildlife and habitats of the basin.

Goals and Objectives

- ❖ Ensure that no at-risk species become extirpated from the basin by better understanding the current distribution and abundance of SGCN in the basin. Share this information with local governments and other partners in a way that helps inform land use decision making.

- ❖ Develop a stepped down watershed strategy for this basin that expands on the recommendations made here. Key products should include a research agenda that supports management and policy for the basin.

- ❖ All of the members of the Delaware River Basin Commission will continue to improve flow management in the Delaware River to enhance natural resource values of the river while protecting drinking water supplies.

- ❖ Improve the water quality in the few degraded waters in the basin to achieve a goal of no impaired waters on the Clean Water Act §303(d) list for New York. This should include pursuit of atmospheric deposition abatement in other states.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations for Critical Habitats

- Research upland forested habitat use by vernal pool dwelling animals in this basin, especially blue-spotted salamander, Jefferson salamander.

- Expand mapping and inventory of natural communities in the Basin, especially those on publicly held lands.

- Survey stream habitats for :
  - freshwater bivalves, especially brook floater and Eastern pondmussel
  - lake and river reptiles, especially Eastern ribbonsnake and wood turtle
  - Freshwater and anadromous fish; especially comely shiner, swallowtail shiner, ironcolor shiner, American eel, and American shad

  Determine present distribution and abundance of these species. Water quality and habitat characteristics should be correlated with the faunal distribution data to determine optimal habitat characteristics for all these species.

- Map and sample vernal pools in the basin for use by vernal pool salamanders, especially blue-spotted and Jefferson salamanders.

- Evaluate forest stands in the Delaware Basin for use by tree bats.

- Compare forest habitat use by SGCN in Catskill Forest Preserve areas and forests in active management to determine desirability and efficacy of forestry management actions on forest-dependant SGCN in this basin, especially forest breeding raptors and woodland and grassland snakes.

- Continue to survey and document timber rattlesnake dens in the basin. Incorporate the den location data into the Natural Heritage Program element occurrence database to ensure effective regulatory protection of these animals.

- Identify lakes, ponds and streams in the basin suffering from acidic conditions and examine their suitability for reclamation by liming.

- Continue to map and monitor upland and riparian forest health in the basin.

Data Collection Recommendations for SGCN

- ❖ Determine preferred stream habitats and occurrence location for green-faced clubtail and Septima's clubtail in the basin. The Delaware Basin is the only known area in New York where these two odonate species occur.

- ❖ Investigate dispersal and migration of SGCN and use this information in land use management decisions.

- ❖ In freshwater marshbird populations, especially pied-billed grebe, least bittern, American bittern, and king rail, periodically monitor levels of contaminants in birds and eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. Identify population dynamics and factors influencing success in these species.

- ❖ Identify barriers to movement of SGCN (i.e. culverts, roads, dams).

- ❖ Research/understand effects of climate change and atmospheric deposition on SGCN.

- ❖ Expand habitat and population monitoring for golden-winged warblers in the Delaware Basin to build on hybridization research in Sterling Forest.

- ❖ Research forest canopy manipulations as a management tool for interior songbirds requiring early successional forest in the Delaware Basin. Creation of openings and ground growth and thickets should be explored.

- ❖ Determine population status of priority herpetofauna species in the basin, especially:
  - All species of lake and river reptiles found in the basin
  - Eastern hognose snake
  - timber rattlesnake

- ❖ Monitor the population of ironcolor shiner in the Basher Kill, the largest and single remaining known location of this species in New York.

- ❖ Monitor populations of American eel and American shad.

- ❖ Understand the relationship of atmospheric deposition and global climate change to priority species.

- ❖ Determine the genetic status of the Heritage Strain Brook Trout in the Catskills. Genetic analysis, using modern methodology, needs to be completed not only for fish found in waters that have previously been described as having heritage strain fish but also for other waters that have wild brook trout without a clear history of non-heritage hatchery blood lines.

Planning Recommendations

- Update water quality, land management and restoration plans for the basin, including NYC reservoir management plans, Delaware River Basin Plan, etc., to include SGCN needs.

- Update forest management plans to address needs of SGCN in the basin, especially early successional forest/shrubland birds.

- Complete comprehensive conservation plans for priority areas and SGCN species and habitats. Ensure plans include measurable objectives and a framework for assessing progress towards goals.

- Transfer SGCN-related data to municipal planning situations.

- Evaluate the importance of remaining Delaware Basin hay and pasture lands to grassland species relative to other portions of the state.

- Incorporate heritage strain brook trout issues into existing management plans including the Neversink River Unique Area Management Plan.

- Investigate the feasibility of improvements of stream bottom in areas of the basin where odonates of rivers/streams are historically known to breed. Softening of some stream reaches will likely benefit freshwater bivalves, too.

- Create and/or provide funding to localities incorporating SGCN concerns into land use plans.

- Fund localities working towards decreasing acid deposition and/or greenhouse gas reduction.

- Develop a management plan for the Delaware Basin population of American eel. This plan should be a part of and support an overall management plan for inland populations of American eel.

Land Protection Recommendations

- Protect expanding bald eagle nesting areas in the upper Delaware River by pursuing conservation easements on suitable nesting sites.

- Protect vernal pool salamanders by pursuing conservation easements or acquisition of wooded uplands surrounding breeding sites.

- Secure dens and other critical habitats for woodland/grassland snakes, especially timber rattlesnake and eastern hognose snake through easement or other acquisition techniques.

- Protect freshwater bivalve species by acquiring easements along stream reaches that support those species, especially Eastern pondmussel and brook floater. Other priority areas should include sections of the Neversink River that support high mussel diversity.

- Support acquisition of the Neversink Highlands parcels recommended in the 2002 NY State Open Space Plan. These parcels will benefit several SGCN and help preserve biodiversity in the area.

- Support acquisition of Shawangunk Mountain parcels within the Delaware Basin that are recommended in the 2002 NY State Open Space Plan. These parcels will benefit several SGCN and help preserve biodiversity in the area.

- Preserve/protect, and acquire wherever possible, unfragmented forest areas in the basin.

- Encourage use of SGCN information into land acquisitions.

- Support acquisition of land consistent with the NYC Watershed MOU and NYS Open Space Plan. Consider acquiring lands with emergent marsh habitat and potential wetland restoration sites adjacent to state-owned land.

Management and Restoration Recommendations

- Investigate population enhancement of timber rattlesnakes in the basin through captive breeding and release into suitable habitats, and relocation of adults.
- Introduce captive-bred freshwater bivalves into stream reaches where populations are isolated by dams, or streambed restoration has occurred.
- Maintain heritage strain brook trout in headwater lakes and ponds in the watershed. Update the heritage brook trout management plan by Keller (1979).
- Maintain existing water and vegetation conditions in the Basher Kill Wetlands owned by DEC to support ironcolor shiner populations at current levels.
- Restore emergent marsh where possible.
- Encourage forest understory regeneration in the forested habitats of the basin. This action will benefit early successional forest/shrubland birds and deciduous/mixed forest breeding birds. A particular technique to explore is the use of exclusion fencing in areas of deer overbrowse.
- Increase hunting participation in the basin to reduce deer herds to levels that allow forest understory regeneration.
- Work with the Delaware River Basin Commission and NYCDEP to improve thermal conditions downstream of reservoir dams in the basin to benefit aquatic biodiversity.
- Define and map nesting, roosting, and perching habitat for forest breeding raptors in the basin, especially long-eared owl. Manage these forest stands in a manner protective of the nesting habitat.
- Map and manage riparian forest and grasslands adjacent to lakes and rivers to secure nesting sites and dispersal routes for lake/river reptiles.
- Update lake and pond fish stocking policies to protect extant populations of vernal pool salamanders.
- Create a habitat incentive program to encourage private land owners to make land use decisions which protect and preserve SGCN habitat.
- In areas where water levels are managed, manage water levels to preserve and protect SGCN.

Information Dissemination Recommendations

- Provide guidance to local governments and state agencies and authorities regarding SGCN prone to road collisions and sensitive to habitat fragmentation in the basin.

- Work with private forest owners in the basin to provide guidance on habitat needs of deciduous and mixed forest dependent SGCN in the basin.

- Work with utilities to effectively manage the utility rights-of-way for early successional forest/shrubland birds, and other shrub community dependant SGCN.

- Educate resource users about prevention of introduction of invasive species into the basin.

Regulatory and Legislative Recommendations

- Support regulatory proposals related to prevention of habitat loss that enhance protection of critical stream segments that provide habitat for SGCN.

- Support regulatory proposals related to protection of water quality in critical stream segments that provide habitat for SGCN with additional remedies and enforcement to abate NPS pollutants, erosion, sedimentation, and hydrological alterations.

- Pursue expanded protection for wetlands that are smaller than 12.4 acres and that are important to SGCN in the basin through the "unique local importance" provisions of Article 24 of the Environmental Conservation Law.

- Explore effective regulatory and legislative remedies to prevent the introduction and spread of invasive species.

- Support legislative and regulatory remedies to decrease acid deposition and greenhouse gas emissions in the Basin.

Incentives

- Pursue incentives and potential funding mechanisms for Delaware Basin localities working toward reduced acid deposition and greenhouse gas emissions.

- Explore creation of tax and other incentives for incorporation of riparian setbacks in land use plans at the local level. The setbacks should be based on the needs of SGCN like lake and river reptiles and others.

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Tables and Figures

Tables

Figures

Delaware Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Delaware Basin.

Classification	% Cover
Deciduous Forest	45.01
Mixed Forest	36.32
Evergreen Forest	5.07
Pasture/Hay	5.01
Row Crops	4.44
Water	1.88
Low Intensity Residential	0.73
Woody Wetlands	0.67
Parks, Lawns, Golf Courses	0.26
High Intensity Commercial/Industrial	0.13
High Intensity Residential	0.13
Barren; Quarries, Strip Mines, Gravel Pits	0.03
Emergent Wetlands	0.02
Uncoded	0.01

Delaware Table 2. NYSDEC land units within the Delaware Basin

Unit Name (DEC Region)	Acres	Primary Natural Habitats
ARCTIC CHINA STATE FOREST	2959	forest
BALSAM LAKE MOUNTAIN WILD FOREST	26849	forest
BARBOUR BROOK STATE FOREST	786	forest
BASHAKILL WMA	2946	upland, riparian habitat, wetlands
BEALS POND STATE FOREST	617	forest
BEAR SPRING MOUNTAIN WMA	14491	upland
BEARPEN MOUNTAIN STATE FOREST	814	forest
BEAVERKILL CAMPGROUND	268	forest preserve
BELLEAYRE SKI AREA	641	forest preserve
BIG INDIAN WILDERNESS	26830	forest
CAT HOLLOW STATE FOREST	758	forest
CHERRY RIDGE WILD FOREST	19015	forest
COLUMBIA LAKE STATE FOREST	687	forest
CRYSTAL LAKE WILD FOREST	502	forest preserve
DRY BROOK RIDGE WILD FOREST	9515	forest preserve
HALCOTT MOUNTAIN WILD FOREST	1760	forest preserve
HICKOK BROOK MUA	1046	forest
HUCKLEBERRY RIDGE STATE FOREST	507	forest
KERRYVILLE STATE FOREST	677	forest
LITTLE POND CAMPGROUND	457	forest preserve
MARSH POND STATE FOREST	891	forest
MELONDY HILL STATE FOREST	3459	forest
MICHIGAN HILL STATE FOREST	605	forest
MIDDLE MOUNTAIN WILD FOREST	10668	forest preserve
MONGAUP POND CAMPGROUND	682	forest preserve
MONGAUP VALLEY WMA	6408	upland, wetland
MURPHY HILL STATE FOREST	597	forest
NEVERSINK RIVER UNIQUE AREA	6483	riparian and in-stream habitat
PAGE POND STATE FOREST	820	forest
PLATTEKILL STATE FOREST	1747	forest
RELAY FOREST STATE FOREST	1278	forest
ROOSA GAP STATE FOREST	513	forest
SLIDE MOUNTAIN WILDERNESS	11769	forest preserve, streams
STEAM MILL STATE FOREST	5162	forest
SUNDOWN WILD FOREST	2274	forest preserve
TOMANNEX STATE FOREST	104	forest
WHITTACKER SWAMP STATE FOREST	810	forest
WILLOWEMOC WILD FOREST	15674	forest preserve
WOLF BROOK MUA	569	forest
WOLF HOLLOW WMA	68	?
WURTSBORO RIDGE OPEN SPACE	1140	forest

Delaware Table 3. Species of Greatest Conservation Need currently occurring in the Delaware Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Unknown
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	High altitude conifer forest birds	Bicknell's Thrush	Unknown
Bird	Peregrine falcon	Peregrine falcon	Increasing
Crustacea/Meristomata	Blue crab	Blue crab	Increasing
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Comely shiner	Comely shiner	Unknown
Freshwater fish	Ironcolor shiner	Ironcolor shiner	Stable
Freshwater fish	Swallowtail shiner	Swallowtail shiner	Unknown
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Stream salamanders	Longtail salamander	Unknown
Herpetofauna	Stream salamanders	Northern red salamander	Unknown
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Vernal pool salamanders	Marbled salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Eastern hognose snake	Unknown
Herpetofauna	Woodland/grassland snakes	Northern copperhead	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Arrow clubtail	Unknown
Insect	Odonates of rivers/streams	Brook snaketail	Unknown
Insect	Odonates of rivers/streams	Extra-striped snaketail	Unknown
Insect	Odonates of rivers/streams	Green-faced clubtail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Odonates of rivers/streams	Septima's clubtail	Unknown
Insect	Odonates of rivers/streams	Spine-crowned clubtail	Unknown

Delaware Table 3. (continued)

Taxa Group	Species Group	Species	Stability
Insect	Other butterflies	Frosted elfin	Decreasing
Insect	Other butterflies	Henry's elfin	Unknown
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Regal fritillary	Unknown
Insect	Other butterflies	Tawny crescent	Decreasing
Insect	Riparian tiger beetles	A tiger beetle	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Eurylophella bicoloroides*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Heptagenia culacantha*	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	American eel	American eel	Unknown
Marine fish	American shad	American shad	Unknown
Mollusk	Freshwater bivalves	Alewife floater	Unknown
Mollusk	Freshwater bivalves	Brook floater	Unknown
Mollusk	Freshwater bivalves	Dwarf wedgemussel	Stable
Mollusk	Freshwater bivalves	Eastern pearlshell	Unknown
Mollusk	Freshwater bivalves	Eastern pondmussel	Unknown

Delaware Table 4. SGCN that historically occurred in Delaware Basin, but are now believed to be extirpated from the basin.

Taxa Group	Species Group	Species
Bird	Barn owl	Barn owl
Bird	Breeding waterfowl	American black duck
Bird	Breeding waterfowl	Blue-winged teal
Bird	Grassland birds	Sedge wren
Crustacea/Meristomata	Freshwater crustacea	Piedmont groundwater amphipod
Insect	Karner blue butterfly	Karner blue
Insect	Other butterflies	Southern grizzled skipper
Insect	Other moths	Melsheimer's sack bearer
Insect	Riparian tiger beetles	Cobblestone tiger beetle
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mammal	Tree bats	Silver-haired bat
Marine fish	Atlantic sturgeon	Atlantic sturgeon

Delaware Table 5. Delaware Basin species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**9**	**35**	**118**	**29.7**
Bald Eagle		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		5	9	55.6
Early Successional Forest Breeding Birds		11	12	91.7
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		2	6	33.3
Grassland Birds		7	11	63.6
Peregrine Falcon		1		
FRESHWATER FISH	**4**	**4**	**40**	**10.0**
Heritage-Strain Brook Trout		1		
Comely Shiner		1		
Ironcolor Shiner		1		
Swallowtail Shiner		1		
HERPETOFAUNA	**7**	**15**	**44**	**34.1**
Freshwater Wetland Amphibian		1	5	20.0
Lake/River Reptiles		2	5	40.0
Snapping Turtle		1		
Stream Salamanders		2	2	100.0
Uncommon Turtles of Wetlands		1	5	20.0
Vernal Pool Salamanders		3	4	75.0
Woodland/Grassland Snakes		5	8	62.5
INSECT	**4**	**17**	**197**	**8.6**
Odonates of Rivers/Streams		8	19	42.1
Other Butterflies		6	18	33.3
Riparian Tiger Beetles		1	2	50.0
Stoneflies/Mayflies - Lotic		2	20	10.0
MAMMAL	**2**	**3**	**21**	**14.3**
Furbearers		1	2	50.0
Tree Bats		2	3	66.7
MARINE FISH	**2**	**2**	**51**	**3.9**
American Eel		1		
American Shad		1		
MOLLUSK	**1**	**5**	**59**	**8.5**
Freshwater Bivalves		5	39	12.8
TOTAL	**28**	**80**	**537**	**14.9**
% of all spp groups statewide	**21.9**			

Delaware Table 6. Critical habitats found in Delaware basin classified at the system and subsystem level, adapted from Edinger et al. (2002). The number of SGCN that use each system/subsystem association as a critical habitat is indicated.

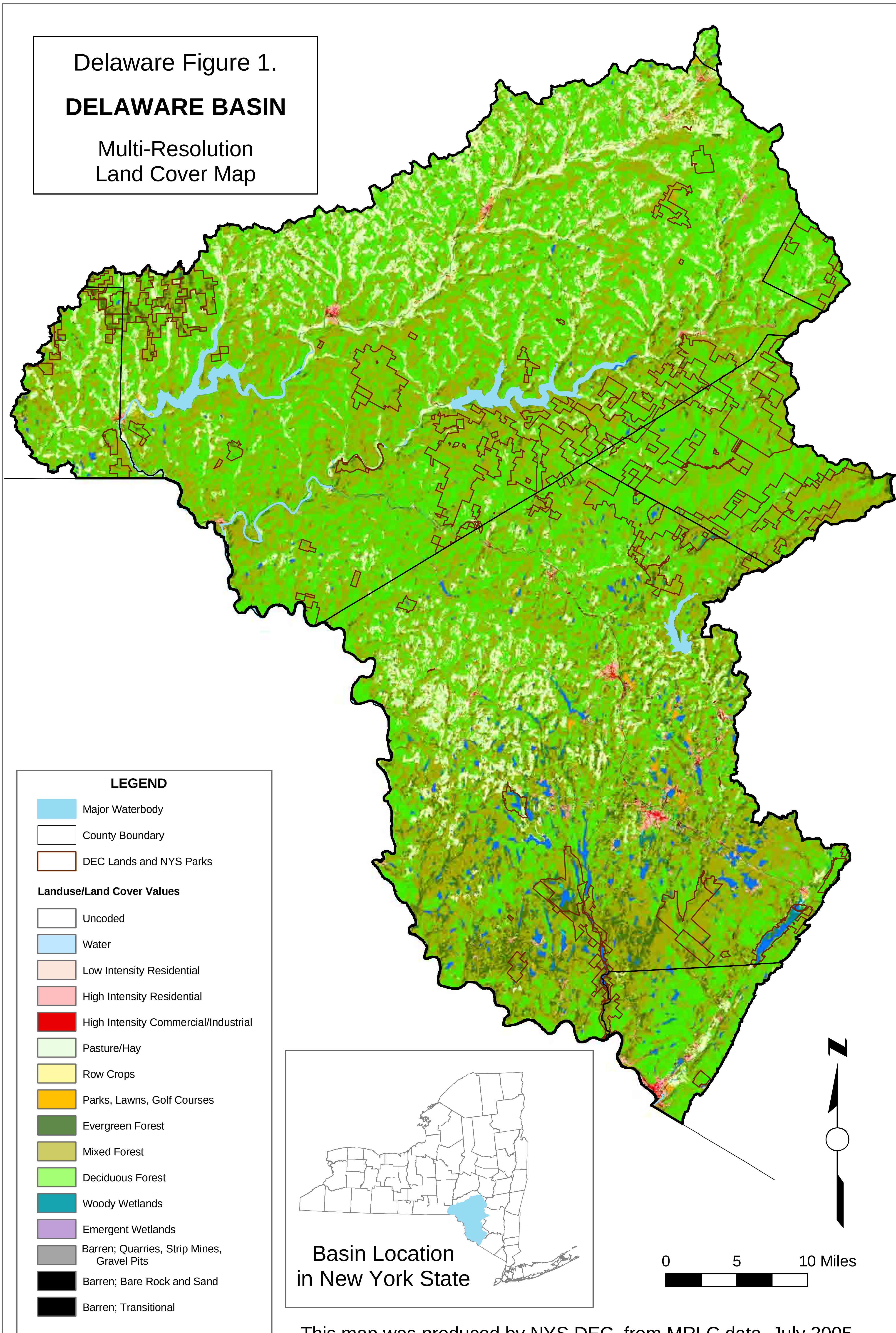
Habitat System	Subsystem	# of Species
Terrestrial	open upland	38
Terrestrial	forested	36
Riverine	coldwater stream	17
Palustrine	mineral soil wetland	15
Terrestrial	barrens/woodlands	14
Riverine	warmwater stream	8
Riverine	deepwater river	7
Lacustrine	warm water shallow	5
Palustrine	peatlands	4
Lacustrine	cold water deep	3
Terrestrial	alpine/mountain	3
Lacustrine	cold water shallow	2
Lacustrine	warm water deep	2
Riverine	cultural	1
Riverine	unknown	1
Subterranean	natural	1

Delaware Table 7. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the Delaware Basin. For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats*.

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Multiple	29	100.0	13.8
Loss of habitat to human development	20	69.0	9.5
Toxics	12	41.4	5.7
Water quality degradation	12	41.4	5.7
Illegal or unregulated harvest	12	41.4	5.7
Vehicle/structure collisions	11	37.9	5.2
Altered hydrology - dams	9	31.0	4.3
Disturbed predator/prey cycles	9	31.0	4.3
Habitat fragmentation	8	27.6	3.8
Disease	7	24.1	3.3
Insensitive agriculture/forestry	6	20.7	2.9
Interspecific competition for resources	6	20.7	2.9
Habitat succession	6	20.7	2.9
General human disturbance	5	17.2	2.4
Habitat alteration by exotic species (aquatic)	7	24.1	3.3
Alteration of natural processes (fire, flooding)	5	17.2	2.4
Loss of streamside buffers	4	13.8	1.9
Altered hydrology - water withdrawal	4	13.8	1.9
Sedimentation	4	13.8	1.9
Reductionof patch size	3	10.3	1.4
Loss of connectivity between metapopulations	3	10.3	1.4
Entanglement, entrainment	3	10.3	1.4
Detrimental hybridization	3	10.3	1.4
Isolated populations	3	10.3	1.4
Roads and other terrestrial barriers	2	6.9	1.0
Habitat alteration by exotic species (terrestrial)	2	6.9	1.0
Deer browse	2	6.9	1.0
Susceptibilty to stochastic events (weather)	2	6.9	1.0
Susceptibilty to stochastic events (rare spp.)	2	6.9	1.0
Climate change (terrestrial)	2	6.9	1.0
Unknown	2	6.9	1.0
Acid rain (terrestrial)	1	3.4	0.5
Aquatic habitat overuse by beaver, geese, etc.	1	3.4	0.5
Negative edge effects	1	3.4	0.5
Loss of host species	1	3.4	0.5
Erosion	1	3.4	0.5

Delaware Table 8. Existing natural resources management plans and agreements within the Delaware Basin

Plan/Agreement Name	Involved Parties	Information
Delaware River Basin Commission Comprehensive Plan, July 2001	State of New York, City of New York, State of Pennsylvania, State of Delaware, US Army Corps of Engineers, National Park Service, US Fish & Wildlife Service	Regulates timing and volume of water flows in the Delaware River, improvement projects in the river system, set water quality standards
A Fishery Management Plan for the Upper Delaware Tailwaters, March 1992	NYSDEC	Fish stocking and management policies for the East Branch, West Branch, and mainstem Delaware River
New York City Watershed Memorandum of Agreement	New York State, New York City, USEPA, local gov'ts in the reservoir watersheds, citizen groups	water quality protection strategies for the NYC water supply reservoirs
DEC Lands Unit Management Plans: ARCTIC STATE FORESTS BALSAM LAKE MOUNTAIN BEAR SPRING UMP BIG INDIAN CHERRY RIDGE DELAWARE STATE FORESTS DRY BROOK RIDGE EAST BRANCH STATE FORESTS HALCOTT MOUNTAIN MIDDLE MOUNTAIN NEVERSINK RIVER UNIQUE AREA SHAWANGUNK RIDGE MANAGEMENT UNIT SLIDE MOUNTAIN SOUTHERN TIER SULLIVAN MANAGEMENT UNIT SUNDOWN TREATY LINE WILLOWEMOC	NYSDEC	Land use policies and resource management goals for the DEC-owned properties in the basin, including non-consumptive recreation, hunting, fishing, and forest harvest. Plans are on file at DEC.


Delaware Figure 1.
DELAWARE BASIN
Multi-Resolution
Land Cover Map
LEGEND
Major Waterbody
County Boundary
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
Basin Location
in New York State
N
0
5
10 Miles
This map was produced by NYS DEC, from MRLC data, July 2005.

Description of the Basin

The Lake Champlain Basin covers 8,234 square miles in New York, Vermont, and Quebec, about 3,015 square miles (37%) of which lie within New York State (NYS). The New York portion of the Basin is composed of land areas that drain into Lake Champlain and that are located within Essex, Clinton, Franklin, Warren, and Washington counties. There are about 5,400 miles of mapped rivers and streams in the New York portion of the Basin (USGS Watershed Index). Some of the major water bodies include Chazy Lake and the Great Chazy River (Clinton County) in the northern part of the Basin, the Ausable River (Essex County), Saranac River (Clinton, Essex, Franklin counties), Lake Placid (Essex County), and the Saranac Lake Complex (Upper, Middle, and Lower; Franklin County) in the north-central part of the Basin, and Lake George (Warren County) in the southern part of the Basin. The largest and most significant water body, of course, is Lake Champlain. The Lake is 435 mi^2 in total surface area, 120 miles long, flowing north from Whitehall, New York (Washington County) to the Richelieu River in Quebec, and has 587 miles of total shoreline (Lake Champlain Basin Program, 2002). The Lake consists of five distinct segments, two of which are in New York State: the main lake and the south lake. The main lake consists of the vast majority of the Lake (primarily Clinton and Essex counties) and contains its widest and deepest points. The narrower, river-like south lake extends from lower Essex County southward, with the NYS portion largely restricted to South Bay in Washington County.

Lake Champlain, the sixth largest natural lake in the United States (only the five Great Lakes are larger), was formed about 12,000 years ago as the last glacial period came to an end and the retreating glaciers left behind a large body of freshwater which included the Great Lakes, Lake Champlain, and much of the St. Lawrence River Valley (Lake Champlain Research Consortium, 2004). The Lake has supported the human inhabitants of the Basin since that time; from the Native Americans who hunted, fished, and farmed there, to the European settlers who came after Samuel de Champlain explored the Lake in 1609, and finally modern-day New Yorkers who derive economic, recreational, and cultural benefits in the form of drinking water, agriculture, fishing, hunting, trapping, boating, and wildlife viewing. Lake Champlain provides critical fish and wildlife habitat such as nursery and spawning grounds for a diverse array of fish species, it functions as an important migratory corridor for passerine birds, raptors, and waterfowl, and it contains marshes teeming with biodiversity.

The second largest lake in the Basin is Lake George (Warren and Essex counties). Lake George lies within Lake George Park, a 300 mi^2 area of public and private land lying wholly within the Adirondack Park. Lake George Park is comprised of about 100 square miles of State-owned land, primarily “forever wild” forest preserve, 155 square miles of privately-owned land, and 45 square miles of water surface, of which about 44 square miles is the surface of Lake George. There are about 115 streams flowing into Lake George. The health of the lake and that of the people, fish, and wildlife that depend upon it, is largely a reflection of the quality of these tributary streams. The Lake and its tributaries provide drinking water, recreation, and aesthetic and cultural benefits to people, and provide invaluable habitat to several fish and wildlife species including land-locked Atlantic salmon, native mussels, and odonates.

From a terrestrial perspective, the Lake Champlain Basin is comprised of three ecoregions (as defined by The Nature Conservancy). The majority of the watershed is classified as Northern Appalachian Boreal Forest, and is made up primarily of the Adirondack Mountains. The St. Lawrence/Champlain Valley ecoregion defines the area from northern Clinton County, along Lake Champlain, southward through the northern tip of Washington County. The Lower New England/Northern Piedmont ecoregion comprises the smallest part of the Basin: the northern extent of the Hudson River Valley and the Taconic Highlands in Washington County. About 3/4 of the Lake Champlain Basin falls within the Adirondack Park boundary (southeastern Franklin County, the southwestern two-thirds of Clinton County, all of Essex County, northeastern Warren County, and northwestern Washington County). The remaining 1/4 of the region outside the boundary includes the relatively open habitats of eastern Clinton County and central Washington County, and the relatively forested northern extent of the Taconic Highlands of northeastern Washington County.

With about 230,000 people and a mean population density of 75 people per square mile, the Lake Champlain Basin is among the least populated in the State (US Census Bureau, 2002). There are two main population centers in the Basin: Plattsburgh (population 19,156; Clinton County) and Glens Falls (population 14,194; Warren County; US Census Bureau, 2002). The majority of the human population in this Basin is condensed within the Champlain Valley (eastern Clinton County through northern Washington County), with additional significant concentrations of residents within the Village of Lake Placid (Essex County) and Village of Saranac Lake (Essex and Franklin counties), and as a result, many of the threats to wildlife and their habitats also occur there. However, despite these stresses, the Lake Champlain Basin remains a relatively healthy area, ecologically speaking, with a diverse array of habitats. Habitat types range from the extensive hardwood and boreal forest and wetland systems of the Adirondacks to the agricultural, marsh, and low elevation forested habitats of the Champlain Valley.

The predominant habitat type within the watershed is forest (about 75%), including deciduous, coniferous, and mixed forest habitats (Lake Champlain Figure 1, Lake Champlain Table 1). Anthropogenic uses dominate about 14% of the Basin (Lake Champlain Figure 1, Lake Champlain Table 1). This includes agriculture (row crops 8%, pasture, and hay land 4%), residential and commercial/industrial development (2%), lawns and golf courses (0.2%), and barren areas (quarries, strip mines, gravel pits 0.1%). About 8% of the remaining land cover is classified as open water (primarily the Lake itself), and 2% is classified as emergent wetlands and wooded wetlands (Lake Champlain Figure 1, Lake Champlain Table 1). These habitats accommodate 106 Species of Greatest Conservation Need (SGCN; Lake Champlain Table 2). This is about 20% of the 537 species designated as SGCN in New York State (Lake Champlain Table 3), and includes 53 bird species, 18 insect species, 17 amphibian and reptile species, 7 freshwater fish species, 6 mammal species, 4 mollusk species, and 1 species of marine fish. There are 21 species that historically occurred in the Basin, but are now believed to be extirpated (Lake Champlain Table 4).

Critical Habitats of the Basin and the Species That Use Them

Species of Greatest Conservation Need (SGCN) within the Lake Champlain Basin occupy a landscape mosaic of interconnected terrestrial and aquatic habitats. The mineral-rich bedrock and soils of this region support communities high in plant and animal diversity. Emergent marshes, bogs and fens, clayplain forests, boreal forests and wetlands, floodplain forests, maple-ash swamps, hardwood-cedar swamps, pine-oak-heath sandplain forests, and large lake systems are some of the critical habitats found in this Basin.

Forested Habitats

Forested habitats dominate the Lake Champlain Basin, and range from lowland deciduous, coniferous, and mixed forests to the boreal forests of the higher elevations of the Adirondacks. For the purposes of this document, the forested habitats will be broken up into three general regions: the Adirondack Mountains, the Champlain Valley, and the Taconic Highlands.

The six-million acre matrix of public and private lands of the Adirondack Park is comprised of some of the largest, intact stretches of forest (including some first growth) in the State including alpine/boreal forest communities. Predominant vegetation types in this region are beech-maple forest, hemlock-northern hardwood forest, and spruce-fir forests. These habitats support wide-ranging mammals such as marten and fisher, early successional birds such as Canada warbler, raptors such as long-eared owl, northern harrier, and peregrine falcon, and forest interior birds such as wood warblers and various thrushes. Abandoned mines and natural caves provide bat habitat and support listed species such as the Indiana bat. Alpine tundra ecosystems exist on several of the Basin's highest mountain peaks such as Mt. Marcy (the State's highest peak) and Whiteface Mountain. These areas are characterized by shrubs, herbs, mosses and lichens. The plant communities of the alpine zone have survived in these isolated and exposed habitats since the end of the last glacial period.

A critical habitat type of the Adirondacks is the lowland boreal system. This is an area of moderately low diversity in which the plants and animals are adapted to short summers and deep snow and in which songbirds, insects, and evergreens are common (Jenkins, in review). The Adirondacks are technically south of the true Boreal Zone, but still have extensive tracts of habitat characteristic of the southern edge of the true boreal and where northern animals and plants are subject to boreal processes (Jenkins, in review). Common forest vegetation types of the lowland boreal include conifer swamps and low bog forests. The largest corridors of boreal habitat are found in the northwest Adirondacks, but the eastern part of the Adirondacks located within the Lake Champlain Basin also contains many patches of isolated boreal vegetation (Jenkins, in review). Some of these patches are large, but most are a couple of hundred acres or less (Jenkins, in review). Despite this, they are a significant habitat feature and contain significant populations of northern plants such as black spruce, white spruce, dwarf cranberry, bog aster, and various sedges, and northern animals such as spruce grouse, Bicknell's thrush, and bay-breasted warbler (Jenkins, in review).

The transitional lowland forests of the Champlain Valley lie between the boreal forests and the broadleaf deciduous zone. The Champlain Valley also represents the northern extent of the range of many tree species such as shagbark hickory, red and white oak, and hop hornbeam. The forested habitats found here are relatively intact compared to other forested habitats in New York State and the Great Lakes region, but due largely to anthropogenic causes are more fragmented than the extensive forests of the Adirondacks. These forests are characterized by conifers such as hemlock and pine, and deciduous species such as birch, beech, maple, and to a lesser extent, oak. The area is a mosaic of deciduous stands in locations with good soils (lower elevations in the base of the Valley). These habitats support species such as timber rattlesnakes, common five-lined skink, a variety of raptors including peregrine falcons, and migratory and breeding birds such Canada warbler and American woodcock. Forests in the Champlain Valley dominated by conifers tend to be located in less favorable habitats with poorer soils. These coniferous habitats include transitional areas between the mountains of the Adirondacks and the Champlain Valley, and unique areas like the Clintonville Pine Barrens and the Gadway Sandstone Pavement Barrens Preserve (Adirondack Nature Conservancy parcels in Clinton County). These tracts are pitch pine-heath and jack pine barrens established on lands scoured by the retreating glacier 12,000 years ago and support rare insects such as the pine pinion moth and the Acadian swordgrass moth. Clintonville barren is dominated by pitch pine. This site has deep sandy soils and sand dunes created when melt water emptied into glacial Vermont. Gadway is dominated by jack pine. This site is on sandstone pavement (very shallow soil). The pavement was created when a tremendous flood of glacial melt water scoured the surface material and exposed bedrock. The largest stands of jack pine in northeastern New York are owned by the W. H. Miner Agricultural Research Institute. This barren is known as the Altona Flat Rock. It is also a sandstone pavement barren. Fire has been the predominant ecological factor regenerating and structuring the barrens at Clintonville, Gadway and Altona Flat Rock.

The Taconic Mountains in the southeastern part of the Basin encompass large areas of contiguous, high quality, northern hardwood forest, and it serves as a recharge area for numerous rich fens in the lower Hudson Valley. The far northern extent of this region in northeastern Washington County contains a diverse mix of wetland and upland communities including spruce-fir swamp, hemlock-northern hardwood forest, and spruce flats. The large, contiguous nature of this area provides habitat for forest-interior bird species and large mammals (e.g., fisher, river otter). Important habitats in the Taconics include hemlock-northern hardwood forest and Appalachian oak-hickory forest. This area supports a diverse population of resident and migratory bird species as wintering and breeding habitat, and as a migratory corridor for passerine birds and raptors. Rare reptile species found here include timber rattlesnake.

Wetland and Other Aquatic Habitats

Much of the wetland and other aquatic habitat in the Basin is embedded in a forested matrix and is distributed throughout the Basin. The following descriptions attempt to provide a general feel for the wetlands and other aquatic habitats in the watershed.

More than 300,000 acres of wetlands can be found in the Lake Champlain Basin (NYS and Vermont portions). Estimates from New York National Wetland

Inventory (NWI) maps indicate that there may be over 200,000 acres in the New York portion of the Basin. Wetland types found here include bogs (characterized by sphagnum mosses), wooded swamp/bottomland forest (mature trees including cedar, red maple, silver maple, and black ash), shrub swamp (woody shrubs such as speckled alder and various species of willow and dogwoods), emergent marsh (frequently or continually flooded wetlands with plants such as cattails and rushes), wet meadows (seasonal wetlands with grasses and sedges), and vernal pools (seasonal/temporary ponds or wetlands often associated with wooded habitats). In the Lake Champlain Basin a number of wetland types and plant communities are uncommon. Bogs, fens, alpine peatlands, cedar swamps, and black gum swamps are all examples of rare wetland plant communities. Lake Champlain Basin wetlands are located on the Atlantic flyway, a migratory corridor for waterfowl and other birds. They provide critical resting and feeding sites during fall and spring migration. Certain fish species in Lake Champlain, such as the northern pike, require wetlands as spawning grounds and as nursery areas for their young. Amphibian and reptiles such as western chorus frog, blue-spotted salamanders, and Jefferson salamanders rely on these habitats year round. Excellent examples of wetland habitat can be seen at the Lake Champlain Marshes Bird Conservation Area (BCA). This BCA includes six Wildlife Management Areas (Kings Bay, Montys Bay, Wickham Marsh, Ausable Marsh, Putts Creek, East Bay) from near the Canadian border to the southern tip of the Lake, and includes large emergent marshes, forested swamps, and shrub swamps (as well as adjacent upland habitats).

Over 1/3 of New York State's wetlands are found in the Adirondacks, and wetland types include spruce-fir swamp, shallow emergent marsh, sedge meadow, and boreal wetlands. This region also has unique habitats such as the ice meadows found along the Hudson River and vernal pools dotted across the landscape. These habitats support wetland birds such as American bittern, least bittern, and pied-billed grebe. Marsh and vernal pool habitats also support herpetofauna such as blue-spotted and Jefferson salamanders. The ponds and lakes in the Adirondacks provide habitat for rare fish species such as round whitefish, reptiles such as the wood turtle, foraging sites for raptors such as osprey, and are the stronghold for nesting common loons in the State. As discussed above, wetlands of the lowland boreal system found in the Adirondacks are a significant habitat feature and contain significant populations of wetland-dependent northern plants and animals. Common vegetation types of the lowland boreal include conifer swamps, low bog forests, open sphagnum bogs, tall-shrub swamps, and shrub-sedge meadows.

The southeastern portion of the Basin is characterized by the ridges and valleys of the northern Taconic Highlands. This area contains high quality habitat for wetland-dependent species. Important habitats include red maple-hardwood swamp, floodplain forest, and vernal pools. All are of regional importance to breeding and migratory birds, resident herps, and rare plant communities. Where wetland complexes are still relatively intact, species that require large, contiguous areas of undisturbed wetland habitats such as wood turtle can be found. Other rare wildlife found here includes sedge wren, American bittern, Jefferson salamander, and blue-spotted salamander.

Of the roughly 5,000 miles of rivers and streams and 235 significant lakes, ponds and reservoirs in the Basin, Lake Champlain is the dominant feature of the watershed, covering about 5% of the entire Basin and accounting for 61% of the total lake acres. The Lake provides habitat for 81 species of fish including lake sturgeon, eastern sand darter, mooneye, and lake whitefish. The Adirondack region contains an estimated 2,800 ponds and lakes (both within and outside the Basin), miles of pristine headwater streams, and several large river systems. Other significant aquatic lake habitats within the Basin include Lake George, Lake Placid, and Saranac Lake (Upper, Middle and Lower). Large river systems include the Great Chazy River, Saranac River, and Ausable River (both East and West branches). These aquatic habitats provide spawning habitat for fish, breeding, feeding, and migratory stopover sites for birds, and support a diverse array of amphibians, reptiles, and invertebrates.

Grassland Habitats

Conservationists often think of areas in the St. Lawrence Valley and the Lake Plains when considering management actions for grassland-dependent wildlife in New York State; however, the Lake Champlain Basin contains natural and human-created (i.e., pasture, hay land) grassland habitats that support grassland species of conservation concern. Work done by DEC and New York Natural Heritage Program for the Grassland Reserve Program (USDA Farm Bill) indicate that there are significant grassland habitats and associated plant and animal communities (e.g., butterflies, birds) in central Washington, eastern Essex, and northern and eastern Clinton counties. Two examples are the Fort Edward Grassland Important Bird Area (Audubon and other private landowners) in central Washington County and grasslands associated with the Kings Bay Wildlife Management Area in northeastern Clinton County. The Fort Edward grassland is important for grassland birds including northern harrier, upland sandpiper, and short-eared owl. The Kings Bay Wildlife Management Area historically contained nesting black terns, northern harriers, and other grassland nesters. Furthermore, areas with significant amounts of agriculture in the Champlain Valley (northeastern Clinton County) and the northern extent of the Hudson Valley (central Washington County) can provide habitat for grassland-dependent species, although agricultural practices incompatible with wildlife may reduce the value of these habitats.

Publicly Held or Designated Lands - Opportunities to Develop Conservation Partnerships

Many of the critical habitats in the basin have unique ecological (wildlife and plant communities, geological formations) or cultural (recreational, historical value) characteristics, and thus have been designated with some protective status by State agencies such as the Office of Parks, Recreation and Historic Preservation (OPRHP) and DEC. These areas include state parks, state forests (and unique areas), forest preserve (also wilderness area, wild forest, and primitive areas), wildlife management areas (WMA), and bird conservation areas (BCA), and total about 750,000 acres distributed throughout the Lake Champlain Basin. The majority of protected land is in large forest tracts (primarily wilderness areas, wild forests, and primitive areas) located in the Adirondack Park and in nearby state forests. Other critical tracts such as the Four Brothers Islands complex in Lake Champlain, an important colonial bird nesting area, is owned and managed by The Nature Conservancy. The Conservancy owns a number of important habitats within the Champlain Basin.

Lists of public land holdings areas have been provided here (Lake Champlain Table 5-8) to provide a spatial context (i.e., location and size) for these large pieces of habitat, and to recognize their importance in the implementation of the conservation recommendations that follow. The species and habitats found on these parcels provide an excellent opportunity for research, survey, and inventory efforts. Additionally, these areas, due to their protected status, can act as "ecobeakers", intact blocks of relatively healthy habitat where conservation partners can observe properly functioning ecological processes and gain insight into how to address conservation dilemmas in landscapes that have been heavily altered by human activity. Finally, these properties give public and private natural resource managers the chance to partner with the agency that administers the land to help deliver habitat and population management actions designed to benefit SGCN.

There are four state designated critical environmental areas (CEA) in the Basin, all of which are in Warren County (Lake Champlain Table 9). CEAs are traditionally designated by DEC to protect drinking water supplies (surface waters or ground water aquifers), but other government agencies may designate CEAs for reasons such as preservation of wetland habitat (Rush Pond), protection of a unique aquatic or geologic feature (Round Pond), and protection of natural resources (Lake George). As with the state parks, state forests, WMAs, and BCAs mentioned above, CEAs may be important areas to focus management actions. These actions can take the form of population and habitat surveys, land protection initiatives (e.g., conservation easements), or habitat management/restoration efforts, and offer an excellent opportunity to for local governments and land use groups to get involved.

These lists are not meant to be a comprehensive catalogue of all publicly held or designated lands in the Lake Champlain Basin. There are many parcels owned by local governments that provide benefits to SGCN (e.g., town parks, green belts), and there are many privately held parcels that have been designated as protected through perpetual conservation easements, fee acquisitions, and other methods (e.g., Audubon's Important Bird Areas). These private lands are usually acquired because of their unique biological character and/or highly imperiled status, and should not be overlooked during more targeted conservation planning efforts. Local land trusts such as the Adirondack Land Trust and the Lake Champlain Land Trust, and private groups such as The Nature Conservancy that own and/or administer these lands are important partners in the conservation of fish and wildlife species of concern.

Species of Greatest Conservation Need and their Critical Habitats

DEC staff members who compiled the SGCN information in the CWCS Planning Database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and sub-system level was extracted from the database (Lake Champlain Tables 10 and 11). The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger, et al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the Lacustrine and Riverine systems, the subsystems were modified to reflect the classifications most often used by DEC fisheries managers (e.g., cold water-shallow). These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather it is a subset of the habitats deemed critical to SGCN that occur in the basin.

Each of these systems and subsystems are further refined into a habitat category in the SWG species database and can be viewed in the taxa reports in Appendix A. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can also be found in the Appendix B.

Overall Trends in the Basin

Biodiversity Trends

The Lake Champlain Basin (NYS and Vermont) supports about 318 species of birds, 81 species of fish, 56 species of mammals, 21 species of amphibians, and 20 species of reptiles, a number of which are at the northern edge of their range (Lake Champlain Basin Program, 1999). This diversity is due, in part, to the diversity of habitat types seen here, from the alpine habitats of the Adirondack High Peaks to the aquatic habitats of Lake Champlain. New York Natural Heritage Program element occurrence records indicate that the Lake Champlain Basin is of critical importance to wildlife diversity in New York State. Almost half of all birds of greatest conservation need are found within this Basin (Lake Champlain Table 3). Almost 40% of herpetofauna and 30% of mammals of greatest conservation need call the Basin home as well (Lake Champlain Table 3). Additionally, NYNHP data indicate that the Champlain Valley and extensive forests and wetlands of the Adirondacks are of vital importance to rare insects and mollusks. The region's extensive rivers, tributaries, and marshes support rare fish like sturgeon and rare insects such as odonates and stoneflies.

While this biodiversity is impressive, trends in land use that are incompatible with wildlife have taken their toll on populations. Populations of some rare, threatened, and endangered plant and animal species and rare natural communities in the Lake Champlain Basin are declining as a result of habitat degradation, invasions on non-native species, collection, and other factors. Over 50% (41) of the 81 fish species that reside in the Basin have been classified as SGCN, and over 40% (17) of the 41 herpetofauna have been so classified. Of the 318 bird species, 17% (53) have been designated as SGCN in NYS, and of the 56 mammals, 11% (6) have been listed as SGCN in NYS.

Of the 106 SGCN in this Basin, 37% are declining (Table 2). Of those species in decline, the majority (74%) is birds; however, there is insufficient data to suggest that a disproportionate number of bird species are declining relative to other taxa. This statistic may just be a function of the rigorous monitoring that has occurred for birds. Thirteen percent of the reptiles and amphibians, 8% of insects, and 5% of freshwater fish designated as SGCN are declining. Many of these declining species specialize in a few select habitats or foraging guilds, and in so doing, inhibit their ability to adapt to declining habitat quantity and quality.

More troublesome still is the 45% of SGCN whose status we do not know (Lake Champlain Table 2). The majority of these are insects (27%), followed closely by birds and herpetofauna (25% for both). Wildlife managers do not know the status of 8% of the mammals, 8% of the mollusks, and 6% of the fish listed as SGCN. Anecdotal evidence and preliminary data suggest that these species may be rare and/or declining, but without sufficient data on their distribution and abundance it is exceedingly difficult to try to combat threats to their populations and habitats.

Changing Human Population, Land Use, and Habitat Quality

As described above in the description of the Basin and its critical habitats, this region contains an extraordinary diversity of ecosystems that are still in comparatively good health. Despite the relatively small human population compared to other watersheds in the State, human population growth and the development (e.g., residential, industrial, roads) that accompanies it are still a problem for the Lake Champlain Basin. From 1990-2000, the fastest growing counties in the Basin were Franklin County (10%), Warren County (7%), and Essex County (5%; US Census Bureau, 2002). These areas of high human population growth coincide with locations of some of the most sensitive habitats and the rare species that depend upon them (e.g., boreal forests and wetlands of the Adirondacks). Between 2000 and 2015, it is estimated that the greatest increases in human populations will be in the northern part of the Basin; specifically, in Franklin (13% by 2015) and Clinton (9% by 2015) counties (New York Statistical Information System, Cornell Institute for Social and Economic Research, 2002). The growth in these counties is expected to be two or more times that of the growth in the remaining three counties. In some areas the development centers on building of second homes and a significant seasonal increase in population. Fortunately, human population density is still relatively low in these counties and there are still vast stretches of land that are untrammeled. While population growth may bring economic prosperity to the region, it is important that the development that will surely accompany this growth be sustainable and compatible with wildlife and the critical habitats they rely upon.

Historically, land use in the Basin resembles the rest of New York State. It was forested prior to European colonization followed by intense silviculture (throughout the State, but particularly in the Adirondacks) and agriculture (particularly in the fertile lands of the Champlain Valley), and has now returned to forested land (Stanton and Bills, 1996). Records indicate that in 1910, on average, over 50% of the Lake Champlain Basin was classified as farmland (i.e., row crops, pasture, hay land; Stanton and Bills, 1996). By the 1990s this trend had completely reversed itself, and today over 75% of the watershed is classified as forest (Stanton and Bills, 1996; MRLC data, 2005). The nature of the remaining agricultural land has changed as well. Cropland diversity has decreased and smaller farms have been consolidated into larger units. The number of farms dropped dramatically between 1910 and 1992, but the average farm size almost doubled (Stanton and Bills, 1996). Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the Basin.

The Lake Champlain Basin includes some of the highest quality wetlands in the Northeast, including lakeside wetland complexes and many rare or declining natural wetland communities (Howland et al., 2003). Similar to the rest of NYS, wetland habitats declined dramatically in the Basin from 1900 until the 1970s. During this time it was common practice to drain marshes for agriculture and other land use practices. The Freshwater Wetlands Act protected these habitats, and wetland losses have been slowed dramatically since 1975. With the exception of the Adirondack Park, only wetlands larger than 12.4 acres, or certain wetlands of unusual local significance, are regulated. In the Adirondack Park, all wetlands larger than one acre, or wetlands of any size when adjacent to a water body are protected. From the 1980s through the 1990s the Adirondacks experienced a small net gain in wetlands. Today wetlands are incrementally destroyed, and wetland complexes fragmented, by smaller, more numerous projects, many of which are less than one acre and scattered throughout the Lake Champlain Basin (Lake Champlain Basin Program, 1998). Also, the quality of existing wetlands is threatened by siltation, runoff from agriculture and development, and introduction of invasive species. Efforts are on-going to broaden New York State protections to protect isolated wetlands smaller than 12.4 acres.

With its relatively modest human population and large tracts of forest wilderness, water quality in the Lake Champlain Basin is generally good to excellent (DEC Division of Water, 2002). DEC has engaged in extensive surveys of macroinvertebrate communities in rivers and streams in the State in an effort to assess thirty year trends in water quality. Within the Lake Champlain Basin, about 68% of the streams and rivers sampled were classified as non-impacted (very good water quality). About 30% were classified as slightly impacted (good water quality). The slightly impacted sites were generally associated with creeks and streams in close proximity to population centers such as Glens Falls, Plattsburgh, and the Village of Lake George. The remaining 2% of sample sites were classified as moderately impacted (poor water quality). Again, this was associated with a creek in the relatively urban/suburban setting of Glens Falls and is likely due to runoff.

The quality of the water in the second largest water body in the Basin, Lake George, is categorized as good (Lake George Planning for the Future Committee, 2001), however, negative changes in water quality have been reported. The southern portion of the lake is more developed and exhibits lower transparencies, lower dissolved oxygen concentrations, higher phosphorous and chlorophyll-A concentrations, and increased growth of invasive aquatic plants and animals. Non-point source pollution is the greatest threat to water quality in Lake George, emanating from a host of sources including septic systems, unabated storm water runoff, and stream bank erosions caused by poor land use practices in upland sections of the watershed (Lake George Planning for the Future Committee, 2001). Unfortunately, despite the relatively good health of lake systems throughout the Basin, this is a widespread trend. Public and private natural resource managers must take a proactive approach to protect high quality aquatic systems, and to slow or halt the decline of aquatic habitats that have already been degraded by contaminants, sedimentation, and invasive species.

Despite the relatively good health of aquatic systems in this Basin, in general, human effects on stream and riparian habitat have been intense and wide-ranging (Howland et al., 2003). Humans have altered the flow of streams and rivers for flood control, bridges and roads, power generation (dams), agriculture, and development. This alteration has resulted in the loss of floodplains and riparian buffers; increased river channel instability; altered hydrology (decreased water storage, conveyance); decreased water quality (including increased sedimentation); and loss and fragmentation of fish and wildlife habitat (Howland et al., 2003).

The most significant water quality problems in the Lake Champlain Basin affect Lake Champlain itself: fish consumption advisories due to PCB and mercury contamination, excessive nutrient loadings, invasive/exotic plant and animal species, and atmospheric deposition. These issues will be addressed in more detail in the "Threats" section that follows.

Threats

DEC staff members who compiled the SGCN information in the CWCS Planning Database were asked to indicate threats to SGCN and their habitats. During the analysis for the Basin, a listing of threats for each species occurring in the Lake Champlain Basin was extracted from the database. The threats and summary figures compiled here (Lake Champlain Table 12) are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and others. The information provided does not quantify the magnitude of a particular threat. It is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat was assigned, and the frequency with which a particular threat was mentioned in the database. For example, “Climate Change” was identified as a threat for 10% of the SGCN species groups in the Basin; however, it is likely that climate change affects (or will affect in the future) all species and their habitats. Furthermore, the purpose of this information is not to compare the severity of one threat against another.

Rather than go through each of the 38 threats listed in Table 12, some of the more prominent threats to species of greatest conservation need in the Lake Champlain Basin have been combined into a few broad categories and summarized here. The most significant threats were determined by reviewing information from the CWCS database, scientific literature, and conservation plans for the Basin.

Habitat Loss and Fragmentation

Anthropogenic changes like development (residential and commercial, roads, power lines), dredging, and wetland draining, and natural changes such as succession reduce not only habitat quantity, but the quality of habitat as well by disrupting the function of remaining habitat patches. Examples of the loss of habitat function include loss of connectivity to patches of similar habitat (or different yet complementary habitats), loss of metapopulation dynamics in small, isolated patches (“sink” habitats), increased negative edge effects (increased susceptibility to predation), and reduction in the types of species the patch can support (“area sensitive” species).

Almost 14% of the Lake Champlain Basin is comprised of habitats that have been significantly altered by humans [residential and commercial development, agriculture (row crops, hay lands), parks and golf courses, and barren habitats (quarries, strip mines, gravel pits)]. Many of these habitats are maintained by suppressing ecological processes such as vegetative succession and fire; however, the reverse is also true. Late and early successional forest habitats may suffer because of a reluctance of the public to engage in the active management of these habitats. The result is large, homogenous forest tracts with lower structural, vegetative, and species diversity than would be encountered in forests with both natural disturbances (e.g., fire, wind throws) and active management (variable cutting regimes). While a potential goal for this Basin may be to incorporate more structural and vegetative species diversity into forests and other habitats, it is important to maintain the contiguity of large blocks of habitat where they exist, and to increase the size and connectedness of habitat patches where feasible.

Degraded Water Quality, Atmospheric Deposition, and Altered Hydrology

Many of the SGCN in this Basin rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites). Conservation partners have identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality includes siltation, nutrient runoff, temperature increases, toxics (e.g., pesticides, heavy metals), lowered dissolved oxygen, and altered hydrology (dams, water withdrawal, ground water extraction). Additionally, contaminants enter aquatic and terrestrial systems through atmospheric deposition and have both habitat and population-level effects.

Some of the significant water quality issues in this basin include PCBs in Lake Champlain. PCB contamination negatively affects reproduction and survival of mammals such as river otter and raptors such as bald eagles. One significant source of PCBs is lake sediment in Cumberland Bay; ongoing remediation activities in the Bay are expected to reduce this source (DEC Division of Water, 2002). Other continuing sources of PCBs to the lake have yet to be identified. Recently completed remediation efforts (e.g., Cumberland Bay) should reduce this source.

Mercury contamination is thought to be a result of atmospheric deposition. Mercury is released from anthropogenic sources (coal burning plants, etc.) and is carried via wind currents from sources in the Midwest and deposited onto terrestrial and aquatic habitats through rain, snow, or dust. If mercury is converted to methylmercury, it can be consumed by organisms, move up the food chain, and increase in concentration as it does so (Evers, 2005). Traditionally, high levels of mercury were correlated with decreased productivity and survivorship of common loons (Schoch and Evers, 2002), but recent findings suggest that mercury contamination is a much larger threat to human and ecological health. A recent report by Evers (2005) compiling data from 21 peer-reviewed journal articles shows elevated mercury levels in almost every taxa including fish (e.g., brook trout, yellow perch), crayfish, salamanders, waterbirds (e.g., common loon), forest songbirds (e.g., Bicknell's thrush), and furbearers (mink and otter). The report goes on to state that not only does mercury pose a threat to fish and the humans consuming them, but also to wildlife living in habitats as diverse as mountain tops and small headwater streams. Particularly high mercury levels were observed in the Adirondack Mountains. Mercury can have adverse effects on individual animals living in this region, as well as population-level effects through changes in behavior, reproduction, and body chemistry (Evers, 2005). Mercury concentrations are such that consumption advisories have been expanded within the Lake Champlain Basin, as well as elsewhere in New York.

Elevated phosphorous levels in the basin contribute to excessive algal and vegetative growth, thus exacerbating the spread of aquatic nuisance plants and diminishing the value of aquatic habitats for fish and wildlife. Phosphorous loading is often the result of point and non-point source pollution. The Lake Champlain Basin Program has begun a program to reduce point and non-point sources (Lake Champlain Basin Plan - Opportunities for Action, 1993, 1996, 2003) in Lake Champlain and hopes to reduce excess phosphorous loads by 25% every five years for a 20-year period. Establishment of total maximum daily loads (TMDL) for streams, and planned improvements to point sources such as sewage treatment facilities, hold hope of further reductions.

Another significant threat in the Lake Champlain Basin that has negative consequences for wildlife is the declining pH of Adirondack water bodies due to acid rain. Utility plant pollution laden with nitric and sulfuric acid from industrial sites in the Midwestern United States (Ohio, Illinois, Indiana, Pennsylvania) is carried northeast via wind currents, and deposited in the form of precipitation onto the Adirondack Mountain range. The thin, acidic soils and the nutrient-poor water bodies in these areas make them particularly susceptible to acidification. Despite the reductions in emissions that have resulted from the Clean Air Act, the Adirondacks are now more sensitive to acid deposition due to the accumulation of acids and the loss of buffering capacity in the soil (Schoch, 2002). The effects of acid rain can be seen in the damaged spruce-fir forests of the high peaks of the Adirondacks, reduced fish numbers and reproductive success in ponds with a pH of <5, and decreased foraging and reproductive success of nesting common loons (Environmental Protection Agency, 2004; Schoch, 2002).

Altering the flow of riparian habitats with dams and bridges, and for flood control, agriculture, and development (roads, residential, commercial) can directly and indirectly affect fish and wildlife. Movement of populations of aquatic species such as fish and freshwater bivalves are inhibited, and habitat for all species dependent on lotic systems is lost outright or degraded through decreased conveyance and increased sedimentation. Stream and road bank erosion of naturally sandy soils are a primary source of sand/sediment. DEC's Division of Water found that, in some areas of the Basin, winter road sanding practices are also thought to be a significant source of sediment loads. Once in the stream, the sand and sediment fills in gravel spawning beds, decreasing salmonid spawning success, limiting macroinvertebrate production, and increasing winter mortality of fish and invertebrates. Excessive sand and sediment loads also contribute to the formation of significant sedimentation deltas at the mouths of many tributary segments. Such deltas can restrict fish migration into the tributaries and present opportunities for the establishment of non-native aquatic vegetation. Effects related to sediment deltas are particularly well-documented in Lake George.

Aquatic and semi-aquatic invasive plants such as purple loosestrife, Eurasian water milfoil, water chestnut, Japanese knotweed, yellow iris, and invasive animals such as zebra mussels and sea lampreys are also an increasing threat to Lake Champlain and other waters of the Basin. This is discussed in more detail in the following section.

Invasive Species

Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout the basin. In wetlands and other aquatic habitats, species like purple loosestrife, Eurasian water milfoil, water chestnut, Japanese knotweed, and common reed with little value to wildlife, displace native plant species and disrupt ecological processes. Eurasian water milfoil was first discovered in the Basin in 1962 and now occupies an extensive range throughout Lake Champlain and at least 40 other water bodies in the basin (Howland et al., 2003). This species forms dense mats of vegetation that degrades the structure and function of aquatic habitats. Similarly, dense mats of water chestnut have infested southern

Lake Champlain. While mechanical control of water chestnut has met with some success, water milfoil has been more difficult to control. Japanese knotweed is now forming dense riparian stands of vegetation along the Boquet River, the Ausable River and certain tributaries that flow into Lake George. Knotweed is quickly replacing native vegetation along these waterways with little or no benefit to fish or wildlife resources. Mechanical and/or chemical control of Japanese knotweed has proven to be extremely difficult.

Upland plants such as garlic mustard, bush honeysuckle and others continue to replace native plants. A recently discovered invasive plant in the Champlain Valley, black swallow-wort (a.k.a. "the dog strangling vine"), has the potential to cause major disruptions to upland plant communities. Investigations into chemical and biological control mechanisms for this nuisance plant species are ongoing.

Invasive aquatic animals degrade habitat quality and/or directly affect fish and other aquatic species. Zebra mussel densities have increased dramatically since their discovery in Lake Champlain in 1993 (Howland et al., 2003). Zebra mussels have affected water supplies, crowded out native mussels species, and reduced the biomass of other benthic animals in many areas. Sea lampreys, a parasitic invasive fish that feeds on the body fluids of other fish, have a significant effect on other native fish populations. The Lake Champlain Fish and Wildlife Management Cooperative (DEC, Vermont Fish and Wildlife, USFWS) is currently implementing a sea lamprey management program to combat this threat. White perch became established in Lake Champlain during the 1980s and have substantially affected the fish community of the lake. Finally, alewives have recently been discovered in Lake Champlain. This species poses a threat to larger cold water fish species, but the extent of the threat has yet to be determined. Headwater lakes and ponds in the Lake Champlain watershed historically had simple fish communities consisting of relatively few fish species. Non-native fishes have been widely introduced in those lakes and ponds, causing drastic declines in round whitefish and brook trout. Numerous invasive non-native aquatic organisms are found in adjacent watersheds and have access to Lake Champlain through the Erie and Champlain Canals. Potential measures to restrict or prevent introductions of such invasive species via the canal should be evaluated and, if viable, implemented. The Lake Champlain Aquatic Nuisance Management Plan approved in 1999 by NYS and Vermont was designed to address many of the threats posed by non-native species.

In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. For example, exotic insects like viburnum leaf beetle lack any natural predators and threaten to alter the composition of young forest stands. Beech bark disease, a fungal disease of the genus Cryptococcus, is having devastating effects on American beech trees within the Adirondack Park. American beech is the primary source of tree mast for use by wildlife within the Park. Total loss of mast in localized areas may in turn have significant effects on wildlife populations that utilize this food source. There are several forest pathogens and insect pests that may affect forested habitats. Some of these pests have yet to reach the Lake Champlain Basin from southern NYS (e.g., hemlock wooly adelgid, Japanese long-horned beetle), but northward movement of the distribution of these species has been observed.

Native species present in locations or numbers not historically found can de detrimental to some SGCN. These invasive native species can out compete the species of concern for forage or nest sites, can pose a predation threat (e.g., perch preying upon round whitefish), or can reduce habitat quality by altering vegetative composition and structure. A case in point is double-crested cormorants on Lake Champlain. The cormorants found here is a part of the interior Great Lakes population. During the 1960s cormorant populations in the Great Lakes were devastated by the effects of chemical contaminants (primarily pesticides) on reproduction. Pollution control, in addition to the protective status granted by the Migratory Bird Treaty Act, has allowed populations of cormorants to soar to historic highs. Nesting colonies were first observed on islands within Lake Champlain in the 1980s and the population has grown to over 7,000 nesting pairs (USFWS, 2000). The expanding population of double-crested cormorants observed in this Basin may pose a threat to SGCN such as island-nesting waterbirds (e.g., black-crowned night herons, cattle egrets, and great egrets) and the habitats they depend upon. Investigations into this threat were initiated in the late 1990s by DEC, Vermont Fish and Wildlife, USFWS, and USDA APHIS Wildlife Services to quantify the scope, dynamics, and magnitude of the effects of double-crested cormorants on fish and wildlife of Lake Champlain.

Incompatible Silvicultural and Agricultural Practices

Agricultural and silvicultural products are both important to the economy of the Lake Champlain Basin. Unfortunately, traditional agricultural and silvicultural practices may lack ecologically-based objectives, thus may be detrimental to wildlife.

Trends in modern farm operations (increased field size, loss of edge habitats, erosion due to conventional tillage, intensive grazing, poorly timed mowing/haying of fields) can have negative consequences for wildlife and their habitats in regions where agriculture (e.g., row crops, pasture/hay land) makes up a significant portion of the landscape as seen in northern and eastern Clinton County and central Washington County. Additionally, runoff from agricultural operations can increase contaminant, nutrient, and sediment loads in adjacent aquatic habitats negatively affecting the SGCN that reside there. In the forested landscapes that predominate the Lake Champlain Basin, forestry operations that do not comply with best management practices and that are poorly planned and executed can damage habitat function and reduce habitat quality for SGCN that reside there. It is important to develop and implement farm and forestry practices that are both ecologically and economically sustainable.

Human-Wildlife Interactions

There are a variety of threats to SGCN in the Basin from direct interactions with humans and the structures we erect. These include vehicle and structure collisions and illegal and unregulated harvest. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines and roads, are a significant source of mortality.

Anecdotal evidence and preliminary data gathering efforts have suggested that wildlife collisions with human-created structures (e.g., large wind turbines, communication towers, and power lines) can have significant population-level effects. The U.S. Fish and Wildlife Service (USFWS) is currently investigating the effects of these types of structures on wildlife populations (specifically, migratory birds), but as human populations within the Basin continue to increase, these structures will become a more significant hazard to SGCN.

Many of the amphibian and reptile species of conservation concern have no protected status. Killing, collection/translocation, and the illegal sale of herpetofauna in the pet trade pose a significant threat to rare and declining reptile and amphibian species. Furthermore, public misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals.

Climate Change

The threat with the greatest potential to affect fish and wildlife on a scale much larger than just this Basin is climate change. Large quantities of carbon released into the atmosphere by human activities have increased the amount of carbon dioxide in the air and trapped the Sun's heat. This has resulted in an increase in the global temperature at a rate faster than anything that has been observed for at least 10,000 years (Millennium Ecosystem Assessment Board, 2005). Habitats in the Adirondacks such as the lowland boreal may be particularly susceptible to climate change. Warming trends may affect the distribution patterns of plants and animals that inhabit boreal habitats and may extirpate some plants and animals that cannot adapt or move to more suitable areas. However, researchers studying this issue in the Adirondacks have not been able to reach consensus on the methods used to study climate change at a local scale, thus making predictions about future effects difficult (Jenkins, in review; Stager and Martin, 2002).

Priority Issues in the Basin

The stressors described above vary in their significance across different regions within the basin. For the purposes of summarizing threats, the prominent hazards for three different regions within the basin are listed here:

Adirondacks

- Atmospheric deposition
- Habitat loss and fragmentation
- Incompatible forestry practices
- Invasive species
- Human disturbance (illegal animal collection, recreation)
- Climate change

Champlain Valley

- Habitat loss and fragmentation
- Degraded water quality and altered hydrology
- Incompatible agricultural and forestry practices
- Invasive species
- Human disturbance (illegal animal collection, recreation)
- Climate change

Taconic Highlands

- Habitat loss and fragmentation
- Degraded water quality and altered hydrology
- Invasive species
- Human disturbance (illegal animal collection)
- Climate change

Vision, Goals and Objectives for the Basin

Vision

The Lake Champlain Basin will be part of a healthy and sustainable ecosystem.

Traditional and non-traditional public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on Species of Greatest Conservation Need within the basin in a format that can easily be shared among natural resource managers and disseminated to the public to raise awareness of the issues facing species of concern and their habitats.

These conservation partners will also work in a coordinated manner to manage populations and habitats over a large spatial and temporal scale. This will be done through comprehensive planning, land protection, adaptive management, and rigorous evaluation.

The result of these efforts will be healthier and more secure animal populations, habitats, and communities. Loss of Species of Greatest Conservation Need to extinction will be slowed or halted. Species that currently are common will remain common and populations of threatened/endangered/special concern species will improve to the point where they can eventually be de-listed.

Goals and Objectives

- Establish a conservation framework within the Lake Champlain Basin through which public and private stakeholders interested in wildlife conservation can work cooperatively towards the management, enhancement, and protection of the basin's biodiversity, focusing on at-risk species.

- Ensure that no at-risk (threatened/endangered) species becomes extirpated from the basin. Furthermore, ensure that common species remain common.

- Manage animals, fish, mussels, invertebrates, their habitats, and land use practices to produce sustainable benefits for species of conservation concern.

- Maintain knowledge of species and their habitats in sufficient detail to recognize long-term population shifts.

- Fill "data gaps" for those species where population status, distribution, and habitat needs are unknown.

- Identify, manage, protect, maintain, and restore habitat/natural communities over as broad a spatial scale as possible. Work to keep large forest and wetland complexes unfragmented, and to restore fragmented wetlands and forests where feasible to increase patch size and connectivity. Quality grassland habitats should be maintained where they occur and increased in size only if it does not fragment adjacent habitats. Similarly, within this basin, the restoration and management of early successional forest habitats must be evaluated relative to the effects on other communities of significance.

- Reduce the effects of dams, culverts and other human-made obstructions to the movement of fish and wildlife dependent upon aquatic habitats.

- Work with land managers to incorporate wildlife-based objectives into traditional land management activities such as forestry and agriculture that still allow these activities to be economically sustainable.

- For species that migrate beyond state borders, conservation actions must be evaluated for consistency with regional, national, and international management plans for those species. Furthermore, actions for all SGCN should be consistent with management goals and objectives of the Lake Champlain Fish and Wildlife Management Cooperative (includes DEC, VT Fish and Wildlife, US Fish and Wildlife Service, and Quebec Wildlife and Parks).

- Develop a “stepped down”, more targeted plan for the Basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented “on the ground”.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data collection recommendations for SGCN

Data collection (research, surveys, and inventories) is a crucial first step for the majority of SGCN in the Lake Champlain Basin. Many of the conservation actions in the following categories (e.g., Planning, Land Acquisition, etc.) should not or cannot be done until critical data gaps are addressed for particular species and their habitats, unless immediate action is needed to secure populations or habitats in severe decline. Once we know more about a species' abundance, distribution, life history, and habitat needs we can begin to decide where, when, and how conservation actions can be implemented.

There are a number of priority species and groups that need population, habitat, and life history research to address critical data gaps. This information will help more clearly identify threats and establish baseline information for these species. This type of data collection will address multiple threats to many species. They are listed below alphabetically by taxonomic group and species group.

BIRDS

General recommendations

- ❖ Monitor freshwater marsh nesting birds, peregrine falcon, common loon for contaminants in their eggs, in juveniles, and adults. Contaminants of particular concern are heavy metals including mercury, pesticides, and PCBs.
- ❖ Investigations initiated in the late 1990's by DEC, Vermont Fish and Wildlife, USFWS, and USDA APHIS Wildlife Services to quantify the scope, dynamics, and magnitude of the effects of double-crested cormorants on fish and wildlife of Lake Champlain should continue.
- ❖ Federal, state, and local agencies should work to monitor the status of island-nesting colonial waterbirds and native fish species relative to the abundance and distribution of double-crested cormorants, and determine if there is any correlation to observed changes.

Boreal forest birds

- ❖ Develop a long-term monitoring program to determine population and habitat trends of boreal forest birds, and to determine threats to these species. The highest priority species in the group are the New York State endangered spruce grouse, and the declining olive-sided flycatcher and bay-breasted warbler. The status of the following species is unknown: Cape May warbler, rusty blackbird, Tennessee warbler, and three-toed woodpecker.

- Incorporate the results of the State Wildlife Grant study on boreal forest birds into future monitoring efforts and data analyses.

Breeding waterfowl

- Conduct more intensive surveys for common goldeneye in the Adirondacks and Champlain Valley (particularly Clinton County and northern Essex County) to estimate overall abundance, document habitat use, and design a long-term monitoring program (e.g., every 5 years).

Common loon

- Support research that addresses threats to the long term viability and survival of loons in the basin, including atmospheric pollution (mercury) and shoreline development.

- Continue to support research of migration routes, nesting and wintering sites, and general ecology and life history of the Adirondack common loon population.

Common Nighthawk

- Develop survey methodology to determine population trends for this species. Breeding Bird Atlas (BBA; 2000-04) records indicate that this species was observed in several blocks throughout the Basin, from Franklin through Washington counties.

Deciduous/mixed forest breeding birds

- Initiate research to investigate factors affecting habitat use and productivity of red-headed woodpecker.

- Determine the population status of cerulean warbler and Louisiana waterthrush in this Basin.

Early successional forest/shrubland birds

- Complete an inventory and analysis for high priority focus species that identifies core habitats (highest abundance) and geographic areas (where appropriate). For this Basin this includes golden-winged warbler, Canada warbler, and whip-poor-will.

- Develop a long term monitoring program for golden-winged warblers. In particular, monitor status and trends of golden-winged warblers along the "front" of blue-winged warbler invasion northward.

- Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on golden-winged warbler population status and habitat needs into future monitoring efforts and data analyses.

Forest breeding raptors

- Determine the population status of long-eared owls in this Basin. Surveys should initially focus on sites in Essex County in the northern part of the Basin (Breeding Bird Atlas, 2000-04).

- Determine the presence of golden eagle within this Basin, and if observed, document habitat use (i.e., migration, breeding, wintering, etc.).

Freshwater marsh nesting birds

- Initiate baseline population surveys to determine abundance and distribution of high priority species, and periodically re-survey to detect trends. Refine monitoring techniques to better detect population trends and determine the cause of observed changes. Focus species include American bittern, pied-billed grebe, and black tern. Initially, surveys efforts should focus on marsh habitats in Clinton County (BBA 2000-04), then expanded throughout the Basin.

- Prepare a catalog, where possible, of migratory and breeding sites, identifying and mapping sites at a coarse scale to select sites worthy of monitoring. Evaluate these habitats by a variety of techniques at multiple scales to better understand the micro- and macro habitat features important to nest site selection.

- Conduct studies of habitat use, prey availability, and diet at migratory staging and molting areas and wintering grounds to assess possible threats and limiting factors for high priority species.

- Further evaluate the effectiveness of artificial nest platforms for increasing nest success or densities of black tern, emphasizing placement of platforms where nest substrates appear to be limiting or where terns may be encouraged to nest in areas of low disturbance.

- Investigate aspects of behavioral ecology, such as mate selection, mate fidelity, spacing behavior, coloniality, dispersal, and post fledging parental care.

- Incorporate the results of the 2004 State Wildlife Grant study on marsh birds into future monitoring efforts and data analyses.

Grassland birds

- Complete an inventory of potential grassland habitat for species present, distribution, and relative abundance of priority species within this Basin. These include northern harrier, sedge wren, short-eared owl, and upland sandpiper. Survey efforts should focus on grassland habitats in the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County.

- Develop and implement supplemental monitoring programs for grassland bird species that are not adequately sampled by the Breeding Bird Survey to determine precise population trends and evaluate effectiveness of conservation efforts. Use long term trend data to determine effectiveness of grassland conservation efforts.

- Incorporate the data generated by tasks above into the New York State Grassland Bird Management Plan currently being developed under the 2003 State Wildlife Grant.

High altitude conifer forest birds

- ❖ Continue the Mountain Birdwatch monitoring protocol on all Adirondack peaks where Bicknell's thrush is known to occur. Implement other long-term monitoring if needed to determine population trend.

- ❖ Evaluate the long term viability of Bicknell's thrush as a part of New York State's breeding avifauna.

Osprey

- ❖ Annually or periodically monitor the population (or certain regions of the population) to determine the number of territorial pairs and reproductive outcome. Record notable new aspects of the species' ecology, especially pertaining to any local declines. This task should focus on the Adirondacks.

- ❖ Ensure that information on all new osprey nests are submitted to the Natural Heritage Program.

Peregrine falcon

- ❖ Annually monitor and determine the number of territorial peregrine falcons and their reproductive outcome at nest sites in the Champlain Valley and the Adirondacks.

- ❖ Conduct radio-telemetry studies as well as field observations to determine essential peregrine falcon habitat. Through population monitoring and banding, determine site-fidelity, turnover, migration and wintering movements, home-ranges, mortality, longevity, etc. of peregrine falcons.

- ❖ Conduct research on the interaction of rock and ice climbers with falcon nest site selection, nest site abandonment, and nesting success.

Freshwater Fish

Lake Sturgeon

- Before re-introductions efforts can occur (in habitats where it is appropriate and necessary), fisheries managers should conduct a genetic evaluation of lake sturgeon stocks. Some preliminary comparisons of lake sturgeon genetics in the St. Lawrence River have been completed (McQuown et al., 1999). Additional studies are needed to determine if there are differences between lake sturgeon genetic stocks in the St. Lawrence River and stocks in Lakes Erie and Champlain.
- Work by Vermont Fish and Wildlife staff has identified a small population of sturgeon in Lake Champlain and has documented limited natural reproduction by that population. Any efforts to restore lake sturgeon in Lake Champlain will be coordinated with Vermont.

Mooneye

- Monitor the status of this species in waters where it is found in the Lake Champlain Basin and identify critical habitats.

Sauger

- Determine the abundance and distribution of this species in the Lake Champlain watershed (including the Poultney River).

- Monitor newly discovered and existing sauger populations to determine population trends.
- Research habitat requirements for sauger in this Basin.

Round Whitefish

- Survey remote Adirondack waters to detect presence of or absence of round whitefish.

Herpetofauna

The herptile species in this basin all have similar research needs. The highest priority species for these data collection recommendations are:

- Western chorus frog
- Eastern ribbon snake
- Common five-lined skink
- Spotted turtle
- Blue-spotted salamander
- Jefferson salamander
- Timber rattlesnake

❖ Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat for all high priority herp species.

❖ Document life history parameters specific to New York populations of these species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

❖ Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on high priority amphibian species into future monitoring efforts and data analyses.

❖ Conduct a periodic re-survey of known sites of occurrence for wood turtle and Eastern ribbonsnake in order to detect population trends. New York State Herpetile Atlas (DEC, 2005a) records for wood turtles indicate that this species is distributed throughout the Basin, with the concentrations in Essex County. The Eastern ribbonsnake was observed scattered throughout the basin with the majority of observations in Clinton County.

❖ Spiny softshells have been found in the Vermont and Quebec portion of Lake Champlain, but have not yet been observed in NYS waters; however, they are a highly mobile species (research has indicated that animals tagged in Vermont swam 10-miles straight line distance in one season) and may be found in the western portion of the Lake. It is important to develop population survey protocols and implement protocols at known and potentially suitable sites to determine the extent of occupied habitat in the Basin.

❖ Conduct periodic surveys of known sites of occurrence for western chorus frog in order to detect population trends. The New York State Herpetile Atlas

(DEC, 2005a) effort observed this species in three survey blocks within this Basin (Clinton and Essex counties).

- ❖ Conduct periodic re-survey of known sites of common five-lined skink in order to detect population trends. New York State Herpetile Atlas (DEC, 2005a) records for this species indicate that it is found in northeastern Warren County and northern Washington County along Lake George, and between Lake George and Lake Champlain (South Bay).

- ❖ Conduct periodic re-survey of known sites of occurrence for blue-spotted and Jefferson salamanders in order to detect population trends. Herpetile Atlas data (DEC, 2005a) show records for these species primarily in Clinton and Essex counties.

- ❖ Conduct periodic re-survey of known sites of occurrence for timber rattlesnake in order to detect population trends. New York State Herpetile Atlas (DEC, 2005a) data report the occurrence of timber rattlesnake in several blocks in the Lake Champlain Valley from southern Clinton County through northern Washington County.

Insects

Other Butterflies

- ❖ Within this Basin, determine the population status and distribution of high priority butterfly species including mottled duskywing, Persius duskywing, and tawny crescent.
- ❖ Determine the best management regimes for species in each locality.
- ❖ Establish the duration of all life stages, the precise habitat needs of all life stages, and how this information should be coordinated with management actions.
- ❖ Identify important food plants and determine the relationship between food availability and species numbers.

Other moths

- ❖ Within this Basin, determine the population status and distribution of high priority moth species including the State endangered pine pinion moth. This noctuid moth is found in rare pitch pine-heath barrens like those formed 12,000 years ago by the receding glacier at the Clintonville Pine Barrens (900 acres, Adirondack Nature Conservancy, Adirondack Land Trust) in the northeastern portion of the Adirondack Park.
- ❖ Develop standardized measures of habitat parameters, investigate metapopulation dynamics, and develop standard definition of what is needed for "viable" populations of high priority moth species.

Odonates

- ❖ Complete the statewide inventory of odonates and their habitats as outlined in the 2003 State Wildlife Grant. “Hot spots” of odonate diversity within this Basin should be identified and targeted for management action based on species richness, acuteness of threats, and overall value to odonates and other SGCN.

Riparian tiger beetles

- Determine the population status and distribution of Cicindela ancocisconensis within the Lake Champlain Basin. This species is currently known from fewer than 10 streams/rivers statewide.
- Inventory suitable cobble bar habitats throughout the Basin, with focus on the Ausable River.
- Determine vegetation density, cobble size, and sand/cobble interspersion of occupied habitats.
- Compile baseline data on existing threats to these species including existing gravel mine permits, exiting areas of high ATV use, existing hydrological flow alterations.
- Incorporate results from the 2004 State Wildlife Grant study on tiger beetle distribution and abundance into data analysis, monitoring, and management efforts for this species.

Stoneflies/Mayflies of lotic waters

- Survey sites within the historical ranges of *Heptagenia culacantha* and *Rhithrogena uhari*.
- Determine the critical habitat for these species.
- The information generated in tasks (1) and (2) should be coordinated with DEC Division of Water and their on-going effort to document 30-year trends in water quality of rivers and streams of New York State based on macroinvertebrate data.

Mammals

Indiana bat

- Survey winter populations and continue to survey new potential hibernacula in the basin as they are discovered.
- Survey for Indiana bats using vocalization detectors and mist netting at sites that are geographically similar but that have differences in the density of development over large areas.
- Live trap and mark Indiana bats during the fall swarm, fall entry, and spring emergence at one hibernacula to determine the arrival and departure periods of the species by age and sex.
- Complete three years of roost temperature monitoring at all Indiana bat sites in the basin using continually monitoring temperature probes.

Small-footed bat

- Radio-tag, release, and track reproductive female small-footed bats as they exit the hibernacula and track them to their summer range.
- Radio tag and release small-footed bats as they enter the largest hibernacula for the winter. Relocate them within the mine to determine their roost selection.
- Continue to survey hibernating small-footed bats in conjunction with Indiana bat hibernacula surveys.
- Research threats to habitats and populations.

Tree bats

- Conduct surveys of migrants to determine the timing, distribution, species composition and elevation of migrating bats. This is likely to include

combinations of acoustical monitoring, radar, and visual monitoring. High priority species include Eastern red bat and hoary bat.
- Conduct summer surveys of tree bats that will include capturing individuals and acoustical monitoring.
- Research threats to critical habitats and populations.

Mollusks

Freshwater bivalves

- Research the best survey methods both for detection of rare species and evaluation of population status and trends. Conduct surveys to determine the distribution and abundance of mussel species-at-risk in the Lake Champlain Basin. High-priority species in this Basin include black sandshell.
- Conduct research to determine habitat parameters necessary for good populations of each species of species-at-risk listed mussels.
- Research all parameters of mussel habitat requirements including temperature, substrate, fish, flow, food, etc.
- Determine fish hosts for species where this is not known for populations living in the Lake Champlain Basin.
- Determine or confirm breeding phenology and habitat conditions necessary for successful breeding for listed mussels (e.g. mussel density, pop. level of fish host, temp, flow).
- Work with the Lake Champlain Ecosystem Team (USFWS, Vermont Fish & Wildlife, Vermont DEC, DEC, USGS-BRD, Vermont TNC, Adirondack TNC, Lake Champlain Basin Program, University of Vermont) on their Native Mussel initiative. This effort involves quantitative surveys of specific river reaches to determine population trends of rare mussel species such as black sandshell, fluted shell, pocketbook, fragile papershell, pink heelsplitter, and giant floater (please note that not all of these species have been observed in the NYS portion of the Lake Champlain watershed).

Data collection recommendations for habitats

HABITAT LOSS AND FRAGMENTATION

Before other conservation actions can be taken to combat the harmful effects of habitat loss and fragmentation, data need to be collected on specific habitat requirements of SGCN (e.g., landscape scale characteristics like patch size and juxtaposition, microhabitat characteristics like stem density and ground cover), population processes (e.g., minimum viable population, metapopulation dynamics, source/sink dynamics), and how, when, and where habitat management and/or restoration should occur. Specific recommendations include:

FORESTED HABITATS

- ❖ Research the possible causes for declines of Canada warbler and the effectiveness of forest management regimes in opening up the canopy and promoting ground growth and thickets beneficial to this species. BBA (2000-04) data indicate that, within this Basin, this species is found in the Adirondack Park from Clinton County through Warren County. These may be areas to focus a research effort.

- ❖ Determine if active management (creation of habitat, such as regenerating fir waves) can be an effective management tool for Bicknell's thrush. This relatively rare, forest interior species is often associated with the high peaks of the Adirondack Park. BBA (2000-04) data show concentrations of this species in western Essex County. Key habitats include hemlock ravines and high elevation spruce-fir stands within a mosaic of northern hardwood forest types. These may be areas to focus a research effort.

- ❖ Assess the threats to Bicknell's Thrush resulting from human disturbance (e.g., wind power projects, and cell phone towers). An amendment to the Whiteface Mountain UMP that included the development of new ski trails, required the completion of a Vermont Institute of Natural Science study of potential impacts to thrush habitat with measures for mitigation prior to any development.

- ❖ Early successional forest/shrubland birds - determine effects of viburnum leaf beetle on early successional forest/shrub habitats and species utilizing them. The location will depend upon the intensity and scope of the infestation, life history traits and management objectives for the SGCN to benefit from the action, and logistics (funding, cooperating partners, feasibility of using a particular method in a specific locale). High priority species include golden-winged warbler, Canada warbler, and whip-poor-will.

- ❖ Deciduous/mixed forest breeding birds - determine the effects of various cutting regimes (partial harvest, clear cut, etc.), and size and shape of the area harvested on "forest interior" birds including wood thrush.

- ❖ Early successional forest/shrubland birds - evaluate which cutting regimes (partial harvest, clear cut, etc.) provide the maximum benefit for the greatest number of early successional bird species. This work should take into account all of the SGCN in this group (American woodcock, black-billed cuckoo, blue-winged warbler, brown thrasher, Canada warbler, golden-winged warbler, prairie warbler, ruffed grouse, whip-poor-will, willow flycatcher).

- Forest breeding raptors - experiment with different timber management techniques in order to find out which are compatible with forest breeding raptors and which methods provide the maximum benefits for forest breeding raptors. This includes trying different cutting regimes (partial harvest, clear cut, etc.), different buffer distances between harvest sites and occupied nests, and fire management, where appropriate. This should be done in both deciduous and coniferous forests and should take into account all of the SGCN in this group (Cooper's hawk, long-eared owl, Northern goshawk, red-shouldered hawk, sharp-shinned hawk).

AQUATIC HABITATS

- Conduct controlled experiments to see which management actions are effective locally in producing habitat suitable for marsh birds.

- Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations, thus the regions most important for maintaining a breeding population. This research should also document such parameters as survival, age at first breeding, recruitment, dispersal, and the factors that affect them using color-banded or radio-tagged birds.

- Research population dynamics of listed mussel species including connectivity of populations or sub-populations and genetic distinctness of populations or sub-populations. High priority species within this Basin include black sandshell. As stated above, this effort could be combined with that of the Lake Champlain Ecosystem Team's Native Mussel initiative.

- Research flow requirements of freshwater bivalves and model the effects of flow changes both in volume and timing. High priority species for these actions includes black sandshell.

- Investigate diet and nutrition in relation to breeding habitat quality and prey populations (including insects, fish, and herpetofauna of freshwater wetlands) and how this translates into nesting and fledgling success for high priority marsh birds (American bittern, pied-billed grebe, black tern). This could include investigating the effects of pesticides on prey diversity and abundance. As wetlands are scattered throughout the Basin, this study should take place where and when opportunity allows; however, the marsh complexes associated with Lake Champlain may provide excellent opportunities for research.

- Determine the relationship between habitat quality, osprey survivorship, and changes in fisheries populations due to recreational and commercial harvest, changes in water quality, and effects of wildlife such as cormorants. This research should focus on occupied habitats in the Adirondack Park.

- Monitor lake pH levels in lakes within the Adirondack Park, survey forage base, and research the effects of lake acidification on breeding loons, round whitefish, amphibians, and heritage strain brook trout.

- The Lake Champlain Basin is the stronghold within NYS for sauger, so it is important to determine the effects degraded water quality on this species. In particular, conservation partners should monitor habitat for changes in turbidity and determine the effects on the survival of sauger.

- Research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, adults.

- Identify invasive species (including purple loosestrife, water chestnut, Eurasian water milfoil, and common reed) which have the potential to negatively affect marsh habitats and quantify the effect on habitat quality for appropriate SGCN. Additionally, investigate which control methods (biological vs. chemical vs. mechanical) are the most effective based on a particular species' habitat requirements and life history traits. This action should focus on:

  - Freshwater Marsh Nesting birds - American bittern, pied-billed grebe, black tern
  - Freshwater Wetland Amphibians - western chorus frog, four-toed salamander
  - Lake/River Reptiles - eastern ribbon snake, wood turtle
  - Uncommon Turtles of Wetlands - spotted turtle
  - Vernal Pool Salamanders - blue-spotted salamander, Jefferson salamander

- Round whitefish - one of the possible reasons for the decline in round whitefish populations is predation by, and competition from non-native fishes, for example yellow perch. Continue on-going studies to determine the effects of invasive fishes on round whitefish. Monitor yearly the success of reintroduction efforts of round whitefish in suitable habitat.

- Freshwater Bivalves - Conduct research on control of exotic bivalve species (e.g., zebra mussels) that compete with native mussels and exotic crustaceans or fish which may prey on them. High priority species include black sandshell.

- Evaluate cormorant control methods to determine if those actions encourage them to move to and colonize new sites.

GRASSLAND HABITATS

- Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations, thus the regions most important for maintaining a breeding population. This research should also document such parameters as survival, age at first breeding, recruitment, dispersal, and the factors that affect them using color-banded or radio-tagged birds. These efforts should focus on the regions within the basin with the highest concentrations of grasslands: the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County. High priority species include northern harrier, sedge wren, short-eared owl and upland sandpiper. Results of this research should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant.

- Grassland birds - evaluate the effects of specific farming and management practices, such as: timing of mowing, intensity of grazing, frequency of mowing, mowing versus haying versus prescribed fire, and width of buffer strips on productivity of all SGCN in this group (bobolink, Eastern meadowlark, grasshopper sparrow, horned lark, Northern harrier, sedge wren, short-eared owl, upland sandpiper, and vesper sparrow).

These efforts should focus on the regions within the basin with the highest concentrations of grasslands: the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County. High priority species include northern harrier, sedge wren, short-eared owl and upland sandpiper. Results of this research should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant.

Planning Recommendations

EXISTING PLANNING EFFORTS

The Lake Champlain Basin crosses both state and international boundaries. Conservation decisions regarding the Lake and its basin must include interstate and international cooperation. Fortunately, this region has several on-going planning endeavors that involve a diverse array of public and private partners and that cross both state and international borders. Examples of these efforts include:

- Lake Champlain Fish and Wildlife Management Cooperative (USFWS, DEC, Vermont Fish and Wildlife)
- Lake Champlain Basin Program (an international effort including federal, state, provincial, and local initiatives)
- Lake Champlain Ecosystem Team (USFWS, DEC, Vermont DEC, Vermont Fish and Wildlife, Vermont Nature Conservancy, Adirondack Nature Conservancy, Trout Unlimited)
- US Army Corps of Engineers General Management Plan (GMP) for the Lake Champlain Watershed
- Lake Champlain Research Consortium (universities from New York, Vermont, and Quebec).

Conservation partners interested in engaging in land use planning for this watershed should first consult the work of these entities.

NEW PLANNING RECOMMENDATIONS

Expand Basin Components of CWCS

This comprehensive strategic wildlife conservation strategy for the Lake Champlain Basin is intended as a framework for conservation planning in this region of New York State. The next step, within 2-5 years, is to develop a “stepped down”, more targeted plan for the Basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented “on the ground”. Some of the challenges in developing this more specific targeted plan will be to:

- Analyze and apply all of the information generated by the State Wildlife Grant research, survey, and inventory efforts and incorporate them into plans at varying spatial and temporal scales;

- Incorporate many of the on-going planning efforts being conducted by government agencies (e.g., Unit Management Plans, New York State Grassland Bird Management Plan, North American Waterbird Plan) and NGOs such as the “Strategic Plan: Upper Champlain Valley Program” of the Adirondack Nature Conservancy and Adirondack Land Trust; and

- Coordinate the diverse array of stakeholder groups that will need to be involved in land use planning for SGCN, particularly groups that may not have been traditionally involved in a large scale conservation planning process (e.g., economic development groups, town boards, local land trusts, etc.).

Landscape Mosaic Management Planning

There is a clear need for a habitat mosaic management plan for early successional forests/shrub habitat, mature forest stands, grasslands, and wetlands in this basin. Of the 106 SGCN occurring in the basin, 14 depend on barrens and woodlands, 45 depend on forested habitat, 41 depend on grasslands, and 18 depend on mineral soil wetlands. Some species depend on all four of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities among both wildlife (habitat quality and quantity) and people (timber, agriculture, residential and commercial development, water). The balance and active cooperative management of all of these habitat types among a diverse array of stakeholders is essential to the health and abundance of many of the SGCN currently living in this basin. Maintenance and restoration of wildlife corridors and connectivity of habitats is a key consideration in mosaic planning.

The management of public lands needs to be carried out with the cooperation of many agencies. Key partners to include are DEC, NYS Office of Parks, Recreation and Historic Preservation, USFWS, USGS-BRD, NRCS, and local governments. Private lands comprise 85% of the total land area of the State. Use of cooperative management programs like Farm Bill programs coordinated by USDA and NRCS, USFWS Wildlife Habitat Incentive Program (WHIP) and Partners for Wildlife Program, DEC Landowner Incentive Program (LIP) Northeast Brook Trout Initiative, and various conservation programs administered by non-governmental organizations (e.g., local land trusts such as the Lake Champlain Land Trust and the Adirondack Land Trust, The Nature Conservancy (TNC), Ducks Unlimited, Inc.) will be important to achieve effective habitat protection and enhancement for many SGCN.

Over 75% of the Lake Champlain Basin is forested. There is an opportunity to integrate the needs of many SGCN that rely on a variety of forested habitat types in both large scale management plans and smaller plans that may address only one species, habitat type, or geographic area (e.g., Wildlife Management Area, a private forest tract) . Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management. Some specific planning recommendations for species in forested habitats include:

- ❖ Develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for the suite of early successional forest/shrubland birds. High priority species include Canada warbler, golden-winged warbler, and whip-poor-will.

- ❖ Investigate the feasibility to manage forests in the basin with controlled burning. Draft a fire management plan in accordance with these findings. This would benefit many SGCN, including deciduous forest birds, early successional forest/shrubland birds, and forest breeding raptors.

- ❖ Develop a management plan for high elevation birds, including high altitude conifer forest birds (i.e., Bicknell's thrush). The results of the State Wildlife Grant study on boreal forest birds should be incorporated into this work.

Aquatic Habitats

About 10% of the Lake Champlain Basin is classified as aquatic habitat. About 2% of this is classified as wetlands, and the remaining 8% is the 5,400 miles of rivers and streams, estimated 2,800 ponds and lakes of the Adirondacks, and of course, Lake Champlain itself. Many SGCN within this watershed rely on these critical aquatic habitats during some stage in their life cycle. It is important that these habitats and the species that depend upon them be incorporated into land use planning on both the landscape and local scale for conservation efforts to succeed. As with forested habitats, wildlife biologists and researchers should develop habitat management guidelines for wetland types important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by land managers on public lands and made available to private wetland owners interested in wildlife management. Some specific planning recommendations for species in aquatic habitats include:

- Continue participation in the North American Waterbird Plan, Bird Conservation Regional Plan, and other regional planning efforts. Focus on and refine recommendations for common loon and freshwater marsh nesting birds (American bittern, pied-billed grebe, black tern).

- Work with USFWS, USDA APHIS Wildlife Services, and State agencies on the development of the “second phase” of the population management plan for the Interior Great Lakes population of double-crested cormorants, including Lake Champlain. The plan should include the potential effects of cormorants on SGCN such as colonial-nesting herons (e.g., black-crowned night heron, cattle egret, great egret) and other island-nesting waterbirds, and how to alleviate negative effects before they limit populations of at-risk species and the unique wildlife habitats currently found on NYS Forest Preserve islands found in Lake Champlain that are currently unoccupied by cormorants.

- Continue to evaluate and update the goals, objectives, and strategies outlined in the Lake Champlain Basin Aquatic Nuisance Species Management Plan (2000) coordinated by Vermont Department of Environmental Conservation and DEC. The plan currently focuses on the invasive plants purple loosestrife, Eurasian watermilfoil, and water chestnut, and the invasive animals sea lamprey, zebra mussel, and alewife. Ensure that the needs of SGCN affected by these invasive plants and animals are addressed by this plan (e.g., freshwater bivalves).

- Public and private conservation partners should continue to coordinate and expand the development of a monitoring and control plan for invasive exotic species in wetlands (i.e., water chestnut, purple loosestrife, Phragmites australis) in the Adirondacks and Champlain Valley including guidelines for various control methods (e.g., mechanical control, chemical control, biological control), and the compatibility of these control measures with SGCN life history and habitat requirements. This planning effort could be incorporated into , or modeled after, the aforementioned Lake Champlain

Basin Aquatic Nuisance Species Management Plan (2000) or the currently planned development of a and should incorporate the needs of:

- Freshwater Marsh Nesting birds - American bittern, pied-billed grebe, black tern
- Freshwater Wetland Amphibians - western chorus frog
- Lake/River Reptiles - Eastern ribbon snake, wood turtle
- Uncommon Turtles of Wetlands - spotted turtle
- Vernal Pool Salamanders - blue-spotted salamander, Jefferson salamander

❖ Develop and implement a lake sturgeon management plan that continues efforts to return this species back to its full range and abundance. Threats that should be addressed include overexploitation of stocks, construction of dams that cut off spawning and nursery areas, and habitats degraded by run off from development and channelization. Target waters in this Basin would be tributary bays of Lake Champlain.

Open Upland Habitats

Only about 4% of the Lake Champlain Basin is grasslands, but over 11% is classified as open habitat (pasture, hay land, and row crops) that is potentially valuable if managed in a sustainable manner that considers the needs of grassland-dependent wildlife. Planning efforts for grassland habitats should focus on the regions within the basin with the highest concentrations of grasslands: the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County. This planning process should focus on both public and private lands and include the benefits of this habitat to grassland birds such as northern harrier, sedge wren, short-eared owl, and upland sandpiper. Results of local planning efforts should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant.

❖ Complete the New York State Grassland Bird Management Plan currently being developed by DEC and others (State Wildlife Grant, 2003).

❖ As part of the grassland bird plan mentioned above, develop habitat management guidelines and action plans for priority focus grassland bird species. In addition, investigate the feasibility to manage grasslands in the basin with controlled burning. Draft a fire management plan in accordance with these findings.

❖ As part of the grassland bird plan mentioned above, develop a management plan specifically for the common nighthawk that includes potential conservation actions and strategies that address this species' unique dilemmas such as the loss of gravel rooftops for nesting.

❖ Work with public land managers, including NRCS, USFWS, DEC and others, to better direct funding and other resources to the highest priority areas and projects for grassland habitat management. The ability to focus funding sources in core priority grasslands will be of vital importance. If the funding sources from NRCS can not be adequately focused in priority areas, then this will cripple the ability to conserve the most critical grassland areas and will result in continued declines in grassland birds even within these focus areas.

Collisions

Anecdotal evidence and preliminary data gathering efforts have suggested that wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) can have significant population-level effects. The US Fish and Wildlife Service (USFWS) is currently investigating the effects of these types of structures on wildlife populations (specifically, migratory birds), but a more targeted effort should be made in the unique landscapes of the Lake Champlain Basin to determine the magnitude of this threat for SGCN based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics unique to this Basin. Species of Greatest Conservation need that should be included in this action include migratory birds such as the Bicknell's Thrush and other bird species (early successional forest/shrubland birds, deciduous forest birds, forest breeding raptors) and bats (Indiana bat, small-footed bat, tree bats).

Land Protection Recommendations

This category of actions encompasses a variety of protection mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of protection should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations. For many of the following species and species groups, the first step will be to gather accurate information on where species are located within the Basin and the location and status of the critical habitats they rely upon.

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development (residential and commercial, roads, power lines), dredging, and wetland draining, and natural changes such as succession. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar habitat types (or different yet complementary habitats) are needed for migration and dispersal. Isolated habitat patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, increased susceptibility to predation, reduction in population, and reduction in the types of species the patch can support. In addition, habitats fragmented by roads and power lines increase direct mortality of animals due to collisions.

Forested Habitats

The acquisition of forested habitats in and around the Adirondack Park is a complex issue. DEC has spent extensive effort on the acquisition through fee title or conservation easement of forested habitat in the Adirondack Park. These acquisitions have been funded through annual allocations from the NYS Legislature via the Environmental Protection Fund (EPF). Efforts to continue to protect large, undisturbed tracts of forested habitats should continue.

❖ Conservation partners should direct funding for SGCN to the eastern and southern portion of the Lake Champlain Basin where development pressures pose a relatively greater threat to species of concern and their habitats. This includes the Champlain Valley south through the northern extent of the Hudson Valley and the northern Taconic Highlands.

Alternately, there are privately owned sites within the park that are very important to certain SGCN. Public and private organizations looking to protect habitat through acquisition or easement should review acquisition/easement proposals on a case-by-case basis to determine which projects are most beneficial to SGCN and their habitats independent of their relation to Park boundaries.

❖ Early Successional Forest/Shrubland Birds - Implement a Landowner Incentive Project for early successional birds that will fund conservation and creation of habitat for early successional forest/shrub birds. Target species include:
  - Golden-winged warbler - primarily second growth, but also brushy hillsides, old fields, and stream edges. Much of the focus on this species has centered on the possible negative consequences for golden-winged warblers when they interact with the more numerous blue-winged

warblers (hybridization, competition). The results of the 2003 and 2004 State Wildlife Grant studies investigating this issue should guide where and when habitat acquisition and/or restoration occur for this species. BBA data (2000-04) indicate confirmed and probable breeding sites for golden-wings throughout the Basin, with concentrations in the Champlain Valley from Washington County northward.

- Canada Warbler - deciduous woodlands and riparian thickets. BBA (2000-04) data indicate that this species is found from the Adirondack Park from Franklin through Warren County.
- Whip-poor-will - open woodlands, from moist lowland deciduous forests to montane forests and pine-oak woodlands. BBA data (200-04) indicate a strong affinity for the northern Hudson River corridor, north through Lake George and South Bay and the Champlain Valley.
- American woodcock - moist woodlands and early second growth, thickets along streams, abandoned fields for courtship. BBA (2000-04) observations for this species are spread throughout the Basin with heavy concentrations in northern Essex County through Clinton County; however, the Champlain Valley is also an important migratory corridor for this species as it heads to breeding grounds in Quebec in the spring and wintering grounds along the Atlantic Coast in the fall. Protecting habitats for this species in the Champlain corridor will also benefit other migratory birds.

❖ Forest Breeding Raptors - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. Target species include:

- Long-eared Owl - coniferous and mixed coniferous-deciduous forests, especially near water. BBA (2000-04) data show breeding records for this species in central Essex County.

❖ High-altitude Conifer Forest Birds - the sole SGCN in this group is Bicknell's thrush. This relatively rare, forest interior species is often associated with the high peaks of the Adirondack Park (Essex County); however, BBA (2000-04) records exist from Warren County through Clinton and Franklin County. Key habitats include hemlock ravines and high elevation spruce-fir stands within a mosaic of northern hardwood forest types.

❖ Other moths - the noctuid moth, pine pinion moth, is found in rare pitch pine-heath barrens like those formed 12,000 years ago by the receding glacier at the Clintonville Pine Barrens (900 acres, Adirondack Nature Conservancy, Adirondack Land Trust) in the northeastern portion of the Adirondack Park. Pending further surveys, this may be one of the few places in the State that the pine pinion moth occurs. Conservation partners interested in conserving this species and other rare species of moth (e.g., Acadian swordgrass moth) should focus on occupied habitats in this region of the Basin (Clinton-Essex County border).

❖ Lizards - the sole SGCN in this group for this Basin is common five-lined skink. According to the New York State Herpetile Atlas (1990-99) there are two strongholds in this State for this species: the lower Hudson Valley and the southern Champlain Valley (northern Washington County, northeastern

Warren County, and southeastern Essex County). Key habitats include moist forests with abundant leaf litter, downed woody vegetation, and occasionally, rock outcrops.

- Woodland/Grassland Snakes - many of the den sites for snakes of conservation concern are on private lands. Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target species include:
  - Timber rattlesnake - relatively undisturbed forested habitats (mixed coniferous/deciduous), and open woodlands with talus/rocky outcrops. New York State Herpetile Atlas (1990-99) data report the occurrence of this species in several blocks in northern Washington County, northeastern Warren County, and northeastern Essex County.
- Vernal Pool Salamanders - vernal pools, dotted across the forested landscape, form an extensive system of small, unregulated wetlands that provide critical wildlife habitat. This group serves as a good transition between “forested habitats” and the next habitat affiliation “freshwater wetlands”, as vernal pool salamanders use both habitat types - vernal pools within forest stands and mineral soil wetlands. Securing habitats in large blocks that contain both forests and wetlands will be critical to the survival of this species group and many other SGCN. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target vernal pool salamanders include:
  - Blue-spotted Salamander & Jefferson Salamander - New York State Herpetile Atlas (1990-99) data show records for these species in the Champlain Valley from Washington County north through Clinton County.

WETLANDS AND OTHER AQUATIC HABITATS

Freshwater wetland habitats are scattered throughout the Basin, with heavy concentrations in Clinton County in the northern Champlain Valley. Conservation partners interested in acquiring wetland habitats should focus their resources on wetlands that support high biodiversity, provide habitat for one or more rare or declining species, are under immediate threat of development/conversion, or have some other unique ecological characteristics. An example of a rare wetland ecotype within this Basin is the boreal peatland complex near Lake Clear in Franklin County. Spring Pond Bog Preserve, a 4,200-acre parcel acquired by The Nature Conservancy, contains the second largest expanse of peatland in New York State.

A possible mechanism for those looking to acquire wetlands in this Basin is the Lake Champlain Wetlands Acquisition Strategy. The Wetlands Acquisition Strategy is a four phase, multi-year strategy to permanently protect almost 9,000 acres of wetlands in the Basin. Phase 1 of the acquisition strategy was completed in 1997, and protected 3,500 acres. It was funded, in part by the North American Wetlands Conservation Act (NAWCA). Phase II of the strategy began in 1998, again funded by NAWCA and others. The Vermont Chapter of the Nature

Conservancy is coordinating the acquisition project. Partners include DEC, Lake Champlain Basin Program, the Adirondack and Eastern New York Chapters of the Nature Conservancy, Vermont Fish and Wildlife, VT ANR, other organizations such as Ducks Unlimited, and willing landowners. Specific recommendations for SGCN include:

- Freshwater Marsh Nesting Birds - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. The results of the 2004 State Wildlife Grant work on marsh birds should help guide acquisition projects. Target species include:
  - American bittern - freshwater and brackish marshes with emergent vegetation. BBA (2000-04) data show concentrations of observations of this species in the Adirondacks (northern Warren and southern Essex counties) and the wetland complexes of Clinton County.
  - Pied-billed grebe - well vegetated lakes, ponds, and marshes. BBA (2000-04) observations for this species are spread throughout the Basin with several observations in eastern Clinton County.
  - Black tern - freshwater marshes, slough, wet meadows. BBA (2000-04) records are limited to the marshes of eastern Clinton County. Initially, acquisitions should focus on suitable habitats around Kings Bay Wildlife Management Area.

- Osprey - Pursue conservation easements or purchase of essential osprey habitat. Key habitats include wooded areas along lakes and rivers. BBA (2000-04) observations for this species are spread throughout the Basin from the lakes and ponds of the Adirondacks to the Champlain Valley

- Freshwater Wetland Amphibians - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target species include:

  - Western chorus frog - this species can be found in a variety of habitats including marshes, wet meadows, and other relatively open wetland habitats. Less frequently they can be found in fallow agricultural fields and wooded swamps. The New York State Herpetile Atlas (1990-99) effort observed this species in only three survey blocks in this Basin, two of these from the marshes of eastern Essex County.

- Uncommon Turtles of Wetlands - Secure habitats critical to species survival by acquisition of conservation easements for wetlands and adjacent uplands. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target species include:
  - Spotted Turtle - marshy meadows, small bogs and swamps. This species was not observed in this Basin during the New York State Herpetile Atlas (1990-99), so land acquisitions for spotted turtles are contingent upon locating this species and its critical habitats following State Wildlife Grant and other survey efforts.

- Freshwater Bivalves - In key locations acquire development rights to protect water quality for listed mussel populations such as tributaries of Lake George and Lake Champlain. High priority species in this Basin include the black sandshell. Acquisition efforts should coincide with zebra mussel monitoring efforts to protect critical habitats under threat from invasive exotic species.

GRASSLANDS

The lands owned by public agencies in the Basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially adjacent to existing protected grasslands. This will enable better management and protection of these habitats for grassland birds. Acquisitions should reflect the recommendations of priority grassland focus areas being developed by the New York State Grassland Bird Management Plan (State Wildlife Grant, 2003). Specific recommendations for SGCN include:

- Grassland Birds - Acquisitions focusing on grassland bird habitat should be directed toward protecting existing grasslands or acquiring and restoring grassland habitats within relatively close proximity to existing grasslands to avoid creating sink habitats. These efforts should focus on the regions within the basin with the highest concentrations of grasslands: the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County. Target species include:
  - Northern Harrier - open grasslands and grasslands adjacent to wetlands. BBA (2000-04) data indicate that this species is closely associated with the open habitat of the Champlain Valley from Washington through Clinton County.
  - Sedge Wren - grasslands and grassy uplands adjacent to wetlands with sedges. BBA (2000-04) observations for this species are limited to open habitats in central and northeastern Clinton County.
  - Short-eared owl - grasslands, meadows, and grassy uplands adjacent to marshes. During the BBA (2000-04) effort, this species was observed in only 16 blocks statewide, four of which were in this Basin. Short-eared owls were observed in the open habitats of eastern Clinton and Essex County (three blocks) and south-central Clinton County (one block).
  - Upland Sandpiper - grasslands, dry meadows and old fields with little woody vegetation. BBA (2000-04) observations for this species are restricted to the open habitats of northeastern Clinton County.

LIST OF POTENTIAL PROTECTION PRIORITIES

- Kings Bay WMA expansion (grasslands)
- Monty's Bay WMA expansion (emergent and forested wetlands, grasslands)
- Ausable Marsh and Wickham Marsh WMA expansion (Pine Barrens)
- Bulwagga Bay (emergent wetlands, forested wetlands)
- Gadway Sandstone Pavement Barrens*
- The Vly, Clinton County* (northern cedar swamp, grasslands)
- Lake Alice WMA expansion (forested wetlands, forested lands, grasslands)
- Cannon Corners Flat Rock* (black-spruce tamarack bog)
- Plains Road Barrens* (Pitch pine heath barrens)
- Trembleau Mountain *(Pitch pine heath barrens, pitch pine oak heath)
- Willsboro Bay Cliffs * (Peregrine Falcon protection)
- Champlain Valley-Essex * (red cedar woodland)
- Essex Station Sedge Marsh* (open grassland)

- Fort Ticonderoga Marsh and Lachute River Mouth (silver maple swamp, emergent marsh)
- Split Rock Wildway (a.k.a. Boquet Mountain Matrix Area; includes the Champlain Valley-Essex and Essex Station Sedge Marsh priority sites) (wetlands and forest)
- Westport Woods (forest)
- Altona Flatrock
- Fort Montgomery Wetlands
- Southern Lake Champlain Wetlands
- Mt. Discovery
- Boquet River
- Great Chazy River

* These items identified in the Adirondack Nature Conservancy & Land Trust's "Strategic Plan: Upper Champlain Valley Program" (December 3, 2003). Other listed items may have also been identified in both this plan and other documents of the DEC.

Management and Restoration Recommendations

Successful management and restoration activities will require a large scale cooperative effort among public and private stakeholders, where each organization contributes its strength to the management system. Partners must contribute a range of services from coordination to data collection, implementation, and monitoring/evaluation - so that habitat and species management goals can be achieved at the Basin level. DEC, the government entity tasked with conservation of the State's fish and wildlife resources, should take the lead in coordinating such an endeavor; however, stakeholders in this basin are fortunate to have several organizations that can partner with DEC to orchestrate such a large-scale effort. These organizations include the Lake Champlain Basin Program, Lake Champlain Fish and Wildlife Management Cooperative (New York, Vermont, and federal agencies), and USFWS Lake Champlain Ecosystem Team.

HUMAN-WILDLIFE INTERACTIONS

- Uncommon turtles of wetlands - conduct a variety of habitat management activities where needed to preserve wetland suitability for spotted turtles. This species experiences significant road mortality when migrating from over-wintering to egg-laying locations. Develop and implement mitigation measures to manage turtle population losses to vehicular road kill.

- Vernal pool salamanders - Develop and implement measures to manage reductions of wetland habitat quality caused by off-road vehicles by restricting or prohibiting their use in sensitive habitats. High-priority species include blue-spotted and Jefferson salamanders.

- Continue to manage at-risk peregrine falcon nest sites by closing rock climbing routes during critical nesting periods.

- Indiana bat - work with public and private landowners to erect gates to regulate access at selected existing and newly discovered Indiana bat hibernacula.

HABITAT LOSS AND DEGRADATION

Forested Habitats

- Boreal forest birds - work with private landowners to implement land management strategies that favor spruce grouse, olive-sided flycatcher, bay-breasted warbler, and other species dependent on early successional boreal forests. Within this Basin this action should focus on high elevation areas of the Adirondack Park (portions of Essex County).
- Early successional forest/shrubland birds - increase the amount of early successional forest and shrub habitat on public and private land throughout the Basin through sound planned timber management. High priority species include golden-winged warbler, Canada warbler, and whip-poor-will.
- Forest breeding raptors - maintain appropriate breeding habitat for long-eared owls around occupied nest sites. BBA (2000-04) data show breeding records for this species in central Essex County.
- Lizards – Carefully manage timber stands in areas occupied by common five-lined skink. According to the New York State Herpetile Atlas records (DEC, 2005a) there are two strongholds in this State for this species: the lower Hudson Valley and the southern Champlain Valley (northern Washington

County, northeastern Warren County, and southeastern Essex County). Key habitats include moist forests with abundant leaf litter, downed woody vegetation, and occasionally, rock outcrops.

- Woodland/Grassland snakes - timber rattlesnakes prefer relatively undisturbed forested habitats (mixed coniferous/deciduous), and open woodlands with talus/rocky outcrops, so it is important to develop and implement mitigation measures to manage the adverse effects of habitat fragmentation. New York State Herpetile Atlas (1990-99) data report the occurrence of this species in several blocks in northern Washington County, northeastern Warren County, and northeastern Essex County.

Wetlands and Other Aquatic Habitats

There are thousands of lakes, ponds, creeks, and streams distributed across the Adirondacks. Management actions should focus on public and private lands that support high biodiversity, provide habitat for one or more rare or declining species, are under immediate threat of development or conversion, or have some other unique ecological characteristics.

A potential mechanism for those interested in restoring wetland habitats is the Lake Champlain Wetlands Restoration Project. This pilot project to restore drained wetlands in the Basin began in 1993. The program is administered through the USFWS Partners for Wildlife Program in partnership with the DEC, VT ANR, US EPA, and willing private landowners. The project provides funding and technical assistance to landowners for wetland restoration on their property. Specific recommendations to benefit SGCN include:

- Breeding waterfowl - install nest boxes to increase populations or productivity of common goldeneye in appropriate locations in the Adirondacks and the Champlain Valley. Also, maintain or increase abundance and suitability of emergent marsh habitats for breeding black ducks in the Adirondacks.

- Common loon - use artificial nesting platforms to improve nesting success on lakes that have no loons currently nesting and that lack natural islands, have poor shoreline nesting habitat, or fluctuating water levels. Where water-level control structures exist seek to maintain constant water levels during peak nesting period. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities. This should focus on nesting locations in the Adirondack Park.

- Freshwater marsh nesting birds - use the Farm Bill, USFWS Wildlife Habitat Incentives Program (WHIP) and Partners for Wildlife Programs, and DEC's Landowner Incentive Program to manage and restore marsh habitats on private lands. It is crucial to adapt wetland management practices throughout the Basin so they can simultaneously benefit waterfowl (common goldeneye, blue-winged teal, American black duck), marsh birds (American bitterns, pied-billed grebe, black tern), and other water birds. Also, where water-level control structures exist (typically on publicly- owned lands), maintain constant water levels during peak nesting period. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities.

- Osprey - nest platforms should be maintained and new ones placed on nesting locations in the Adirondack Park and Champlain Valley.

- Eastern sand darter - habitat losses and recommendations for restoration in the Poultney River, as studied in Vermont, should be applied as appropriate. The ultimate goal is to maintain and monitor secure, healthy, and self-sustaining populations of eastern sand darters in at least five separate systems.

- Lake Sturgeon - spawning habitat should be restored, where appropriate, in Lake Champlain tributaries.

- Atlantic salmon (landlocked) - restore access to historic spawning habitat in tributaries to Lake Champlain. Protect spawning habitat from sedimentation. Control the effects of sea lamprey on Lake Champlain's salmon population. Evaluate available strains for their potential for re-establishing salmon in Lake Champlain.

- Freshwater wetland amphibians - manage the variety of factors which might be limiting wetland habitat suitability for high priority amphibian species (western chorus frog). As with marsh birds, use the Farm Bill, USFWS Wildlife Habitat Incentives Program (WHIP) and Partners for Wildlife Programs, and DEC's Landowner Incentive Program to manage and restore marsh habitats on private lands in the eastern part of the Basin with the highest amphibian diversity and the direst threats.

- Lake/river reptiles - manage uplands adjacent to aquatic habitat in order to provide adequate and secure nesting habitat sites and to provide dispersal routes for migrating animals. High priority species include Eastern ribbonsnake and wood turtles.

- Uncommon turtles of wetlands - develop and implement mitigation strategies to manage adverse effects of habitat fragmentation. This includes conducting a variety of habitat management activities where needed, including management of vegetation succession in order to preserve wetland suitability for spotted turtles. Management actions should focus on occupied (and adjacent) habitats in the Basin.

- Freshwater bivalves - develop an outreach program to private landowners through DEC's Landowner Incentive Program to initiate projects to prevent or repair negative effects from land use on mussels and to restore degraded habitat areas to allow for recolonization or reintroduction of listed mussels.

Grasslands

Most of the grasslands in the Lake Champlain Basin are in private ownership. If management of this habitat type is to be successful, public and private agencies are going to have to work closely with private landowners to protect, restore and manage grassland habitats. Management and restoration actions should reflect the recommendations of priority grassland focus areas being developed by the

New York State Grassland Bird Management Plan (State Wildlife Grant, 2003). Specific recommendations for SGCN include:

❖ Grassland birds - increase the amount of grassland habitat on public and private land in regions within the basin with the highest concentrations of grasslands (Champlain Valley, portions of Washington County). As mentioned above, use the Farm Bill, USFWS Wildlife Habitat Incentives Program (WHIP) and Partners for Wildlife Programs, and DEC's Landowner Incentive Program to aid in this effort. High priority species include northern harrier, sedge wren, short-eared owl, and upland sandpiper.

❖ Common nighthawk - increase use of prescribed fire in natural fire-adapted communities. Where this species is found in human-altered habitats (e.g., suburban, urban environments), evaluate feasibility of artificial nest structures on roof tops.

Invasive Species

❖ Reduce the spread and colonization of new sites by invasive exotic species (e.g., purple loosestrife), and where feasible, control invasive species which are known to have detrimental affects on aquatic wildlife through biological, chemical, or mechanical means. The location and method (biological vs. chemical vs. mechanical) will depend upon the exotic species being targeted, life history traits and management objectives for the SGCN to benefit from the action, scale of the infestation, and logistics (funding, cooperating partners, feasibility of using a particular method in a specific locale). This action should focus on:
  - Freshwater Marsh Nesting birds - American bittern, pied-billed grebe, black tern
  - Freshwater Wetland Amphibians - western chorus frog
  - Lake/River Reptiles - eastern ribbon snake, wood turtle
  - Uncommon Turtles of Wetlands - spotted turtle
  - Vernal Pool Salamanders - blue-spotted salamander, Jefferson salamander
  - Heritage strain brook trout - Native Adirondack strains of brook trout, referred to as Heritage strains, were historically abundant in head water lakes and ponds in the Champlain watershed. Competing and predacious non-native fishes have caused severe declines in their abundances. Where feasible and consistent with state land unit management plans, pond reclamations should be conducted to eliminate non-native fishes and restore brook trout. Natural barriers should be enhanced or man-made barriers constructed, at appropriate locations to prevent the spread/reintroduction of non-native fishes.
  - Round whitefish - competition and predation by non-native fishes is believed to be an important cause of the decline in round whitefish in the Adirondacks. Where feasible, pond reclamations should be conducted to eliminate non-native fishes. Natural barriers should be enhanced or man-made barriers constructed, at appropriate locations to prevent the spread of non-native fishes.
  - Champlain Canal - The Champlain Canal (and by extension, the Erie Canal) are vectors for introducing additional aquatic invasive species to the Champlain watershed. If viable techniques are identified to reduce or

prevent the spread of aquatic non-natives via the canals, they should be pursued.

- ❖ Based on the research and the monitoring/control plan to address the effects of exotic bivalves and crustaceans on freshwater bivalves (see "Data Collection" and "Planning" above), implement a management program for invasive species such as zebra mussel and other invasive mussel species.

DISRUPTED ECOLOGICAL PROCESSES

- ❖ Common loon - reduce predator caused breeding failure, where problematic, by increasing hunting or trapping opportunities. Evaluate the extent to which management actions can reduce nest and chick losses. This action should focus on nest sites in the Adirondack Park and will depend upon the ability of trained personnel to access important loon habitats, many of which may be on private lands or in remote wilderness areas.

- ❖ Deciduous/Mixed Forest Breeding Birds - manipulate habitat structure and composition through restoration and/or management (e.g., forest patch size, shape) to reduce nest losses to predators. Evaluate the extent to which management actions can reduce nest losses. This action should focus on areas within the Basin with highly fragmented forests and forest tracts under strong development pressures such as the southern Champlain Valley.

- ❖ Grassland Birds - manipulate habitat structure and composition through restoration and/or management (e.g., grassland patch size, shape) to reduce nest losses to predators. Evaluate the extent to which management actions can reduce nest losses. This action should focus on areas within the Basin with the highest concentration of grasslands under strong development pressures (the Champlain Valley, northern extent of the Hudson Valley). Highlight species include northern harrier, sedge wren, short-eared owl, and upland sandpiper.

- ❖ Freshwater marsh nesting birds - reduce predator caused breeding failure, where problematic, by increasing hunting or trapping opportunities and by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape) where feasible. Evaluate the extent to which management actions can reduce nest and chick losses. This action may be most easily accomplished on publicly owned wetlands, where appropriate, but if successful, should be expanded to private lands throughout the Basin. Highlight species include American bittern, pied-billed grebe, and black tern.

- ❖ Uncommon turtles of wetlands - reduce predator caused breeding failure, where problematic, by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape) where feasible. Evaluate the extent to which management actions can reduce egg losses. This action may be most easily accomplished on protected wetlands (publicly and privately owned wetlands in the Adirondacks and WMAs in the Champlain Valley), where appropriate, but if successful, should be expanded to private wetlands where species occur (e.g., spotted turtles).

- ❖ Vernal pool salamanders - develop and implement measures to manage reductions of wetland habitat quality and increased predation on adults, young, and eggs caused by introductions of fish and other predatory species. Management actions should focus on habitats occupied by blue-spotted and Jefferson salamanders, primarily in the Champlain Valley.

HABITAT LOSS AND DEGRADATION

- Boreal forest birds - review DEC's wildfire management for Forest Preserve Lands. Determine if these guidelines can be applied to other lands. If they can, work with public and private land managers to execute fire management for boreal forest bird species such as spruce grouse, olive-sided flycatcher, bay-breasted warbler, and other species dependent on boreal forests. Within this Basin this action should focus on high elevation areas of the Adirondack Park (portions of Essex County).

- Early successional forest/shrubland birds - Maintain, restore, and enhance fire-adapted early successional ecosystems through the use of prescribed fire. This habitat type exists throughout the basin. Highlight species include golden-winged warbler, Canada warbler, and whip-poor-will.

- Grassland birds - restore habitat function and manipulate habitat structure and composition through mowing and prescribed fire. This action should focus on areas within the Basin with the highest concentration of grasslands under strong development pressures (Champlain Valley, northern extent of the Hudson Valley). Highlight species include northern harrier, sedge wren, short-eared owl, and upland sandpiper.

WATER QUALITY

- Freshwater marsh nesting birds - improve the quality of existing wetlands by minimizing draw downs during peak nesting periods and by installing vegetated buffers between developed sites (housing, commercial, agriculture, etc.) and adjacent marsh habitats to minimize the effects of runoff from these sites. Management actions should focus on occupied (and adjacent) habitats in the parts of the Basin with the highest concentrations of wetlands and/or that contain the highlight species American bittern, pied-billed grebe, and black tern.

- Freshwater wetland amphibians - manage the variety of factors which might be limiting wetland habitat suitability for resident amphibian species including management of toxicants, adverse hydrological alterations, and anthropogenic inputs of sediments. Highlight species includes western chorus frog. Management actions should focus on occupied (and adjacent) habitats in the parts of the Basin with the highest amphibian diversity and the direst threats (the northern Champlain Valley in wetlands along the Lake, and the southern Champlain Valley in northern Washington County and northeastern Warren County).

- Lake/river reptiles - Manage the variety of adverse influences which might reduce lake/river habitat suitability for reptiles of concern (eastern ribbonsnake and wood turtle) including management of toxicants and adverse hydrological alterations. Management actions should focus on occupied (and adjacent) habitats in northern Washington and east-central Essex counties.

- Uncommon turtles of wetlands - Conduct a variety of habitat management activities where needed, including maintenance of hydrological regimes and curtailment of contaminant inputs in order to preserve wetland suitability for these species (e.g., spotted turtles). Management actions should focus on occupied (and adjacent) habitats in the Champlain Valley (Clinton through Washington County) and the Adirondacks.

- Freshwater bivalves - manage areas of important mussel populations, where identified, by controlling degradation factors (e.g. controlling livestock access, point source or non-point source pollution, flow alteration).

POPULATION RESTORATION

- Lake/river reptiles - pending the results of surveys for the presence of this species within the Lake Champlain Basin (see “Data Collection” above), employ restoration techniques for the spiny softshell at selected sites as needed, including captive breeding, head starting, nest protection, and repatriation/relocation strategies. Restoration efforts, if needed, should focus on suitable habitats in close proximity to locations where this species is observed.

- Woodland/grassland snakes - employ restoration techniques for timber rattlesnakes at selected sites as needed, including head starting and repatriation/relocation strategies. New York State Herpetile Atlas (1990-99) data report the occurrence of this species in several blocks in far eastern Essex County, northeastern Warren County, and northern Washington County. Restoration efforts should focus on suitable habitats in these areas.

- Round whitefish - pending the results of the 2003 State Wildlife Grant study on round whitefish in the Adirondacks, enhance remnant stocks of this species through artificial propagation and stocking of young in selected habitat appropriate waters.

- Freshwater bivalves - where appropriate, reintroduce listed mussels into appropriate habitat within their historic range. NYNHP element occurrence records for this species group in this Basin are found in the Champlain Valley (eastern Clinton and Essex counties through northern Washington County). Restoration efforts should focus on suitable aquatic habitats in these areas.

Information Dissemination Recommendations

The sharing of information between natural resource managers and public and private groups is one of the most powerful tools in wildlife conservation. It allows people to make informed decisions about activities that may help or harm SGCN. For example, land use objectives may conflict with the needs of wildlife. By providing accurate, complete information to stakeholders on a species (or a species group) and its critical habitats, we can begin to institute land use practices that have ecological objectives that are compatible with traditional economic and social objectives.

Information dissemination may take many forms including education and outreach programs, development of fact sheets, web site design and delivery, development and dissemination of best management practices, and technical guidance for land managers.

HUMAN-WILDLIFE INTERACTIONS

Human behavior that directly affects wildlife (e.g., direct or indirect harassment, uncontrolled collection and/or harvest, collisions, entanglement/impingement) can be mitigated through education and outreach. An informational campaign directed at a particular natural resource user group may be a more cost-effective and efficient method for exacting change than implementing a regulatory, legislative, or management action. Specific recommendations include:

- To reduce the detrimental affects of human disturbance on freshwater marsh nesting birds (i.e., American bittern, pied-billed grebe, and black tern), osprey, and peregrine falcons, develop signs and/or displays informing the public of the presence of these species, their respective threats and critical conservation issues, and the need for protection, and post where appropriate.

- Continue current efforts to improve public understanding of common loon conservation issues, including the effect of human disturbance on loon nesting success. Install, maintain, and repair interpretive signs at boat ramps, beaches, campgrounds and other public access points, particularly in the Adirondack Park. Produce and distribute informational brochures, posters, press releases and other educational materials. Provide educational programs to schools, lake associations and other groups.

- Provide technical guidance to State and private entities planning the siting and installation of tall structures (e.g., wind towers, cell towers, and power lines) that are likely to adversely effect populations of migrating birds and bats. The US Fish and Wildlife Service (USFWS) is currently investigating the effects of these types of structures on wildlife. Final guidelines developed by USFWS should be consulted when considering the placement and installation of wind towers, cell towers, etc. In addition, a pilot study funded by the 2004 State Wildlife Program will focus on landscape scale pathways of migratory birds and bats. This study currently focuses on western and central New York State, but when completed, could be expanded throughout the State. Ultimately, when key migratory pathways are discovered, this information should be disseminated to State and private planning groups and incorporated into the siting and installation of tall structures. Species of Greatest Conservation need that will benefit from this action include various migratory birds (early successional forest/shrubland birds, deciduous forest birds, etc.) and bats (tree bats, Indiana bat).

- Enhance public education to limit killing, collection/translocation, and the (illegal) sale of herpetofauna in the pet trade. High priority species include:
  - Uncommon Turtles of Wetlands - spotted turtle, stinkpot, wood turtle
  - Woodland/Grassland Snakes - black ratsnake, northern black racer, smooth greensnake, timber rattlesnake

- Public misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals. Develop and educational campaign about the ecological benefits of snakes in an effort to encourage the public to abandon misconceptions about the menace/threat of woodland/grassland snakes. This could take the form of fact sheets, web-based educational modules geared to both adults and children, and popular magazine articles (e.g., DEC's *Conservationist* magazine). High priority species include black ratsnake, northern black racer, smooth greensnake, and timber rattlesnake.

INVASIVE SPECIES

- Address the negative effects of invasive exotic species on freshwater bivalves by developing signs for markets dealing in live bivalves, fish, and crustacea explaining the dangers of releasing exotic invasive animals into New York State.

- Support Federal and State legislation to control hazards of invasive species introduction as a result of ocean-going shipping entering and transiting New York State waters.

HABITAT LOSS

- In an effort to reduce habitat loss, develop a series of geographic information system (GIS)-based modules that help provide the public with the knowledge to appreciate and understand species of greatest conservation need and their habitats. The modules, with interactive maps embedded in appropriate sections of text, would focus on the fish, wildlife, and natural resources associated with the diverse landscapes and water bodies of the Lake Champlain Basin and the opportunities to observe and learn about them and the network of public lands owned and managed for natural resource conservation. Information on the natural history and ecology of SGCN and on management concerns for these species and their habitats should be included along with an efficient means to identify specific lands where New York State residents could participate in wildlife conservation opportunities.

- As the forests in New York are now predominantly even-aged northern hardwoods, an in the absence of natural disturbances, public reluctance to practice forestry may result in a homogenous forested landscape with relatively little structural and vegetative species diversity. This may be exacerbated by the tendency of landowners that do harvest trees to favor the same species. It is important to educate the public to the benefits and need for early successional forest management and restoration including even-aged forest stand management and the development of multiple seral stages across a forested landscape. This educational program should focus on both public and private lands and include the benefits of this habitat to early successional forest/shrubland birds such as golden-winged warbler, Canada warbler, and whip-poor-will. Information should also be made available to public and private landowners to encourage land management strategies that favor boreal forest birds such as spruce grouse, olive-sided flycatcher, and other species dependent on early successional boreal forests.

❖ Provide information and technical guidance to utilities agencies to manage rights-of-way in a manner that will provide maximum benefit to early successional forest/shrubland birds such as those mentioned above.

INCOMPATIBLE AGRICULTURAL AND SILVICULTURAL PRACTICES

❖ Promote the establishment of buffer areas around agricultural fields and developments adjacent to marsh habitats. Species that would benefit from this action include freshwater wetland amphibians (i.e., northern cricket frog, Fowler's toad), freshwater marsh nesting birds (i.e., American bittern, pied-billed grebe, black tern), and various odonates.

❖ There are several SGCN that reside in forested habitats. When selecting a forest management regime (e.g., light thinning, partial harvest, clear cut, etc.) it may be difficult for public and private forest managers to coordinate the wide array of habitat needs of these species with their timber management goals. It is important that informational materials be developed for forest managers that explain the habitat needs of species that rely on various forested habitats (i.e., varying seral stages, vertical structure, tree and shrub species composition, etc.) and how to accommodate SGCN with seemingly competing habitat requirements. This information should then be available to land management partners developing/modifying best management practices (BMPs) in an effort to minimize the potential negative effects of traditional forestry practices on wildlife. A number of private NGO's and organizations are working on development of BMPs that would meet these needs. Funding should be directed toward the development of forest management BMPs for the following high-priority species:
   - Deciduous/Mixed Forest Breeding Birds - wood thrush
   - Early Successional Forest/Shrubland Birds - golden-winged warbler, Canada warbler, whip-poor-will
   - Forest Breeding Raptors - long-eared owl
   - Vernal Pool Salamanders - blue-spotted salamander, Jefferson's salamander
   - Woodland Snakes - timber rattlesnake
   - Tree Bats - Eastern red bat, hoary bat

❖ Provide information to farmers and grassland owners about the benefits of grasslands, threats to this habitat type, and species of conservation concern that use grasslands. Furthermore, provide information and technical guidance on how to incorporate wildlife management objectives into farming practices to maximize the benefits for wildlife (e.g., timing and frequency of mowing/haying, use of prescribed fire, Integrated Pest Management, etc.) while still allowing farmers to accomplish their harvest goals. These efforts should focus on the regions within the basin with the highest concentrations of grasslands: the Champlain Valley (eastern Clinton County, eastern Essex County) and the northern extent of the Hudson Valley in central Washington County. This educational program should focus on both public and private lands and include the benefits of this habitat to grassland birds such as northern harrier, sedge wren, short-eared owl, and upland sandpiper, and other birds of open habitats such as common nighthawk.

Regulatory and Legislative Recommendations

Regulatory and legislative proposals will likely be made at the statewide level, although local governments may have opportunities to modify or create laws and regulations to enhance local protection of SGCN. For example, local zoning and land use policies can be used to discourage sprawl and habitat fragmentation.

HABITAT LOSS

- Pursue protection of wetlands less than 12.4 acres that provide habitat for herpetofauna of greatest conservation need through existing provisions for wetlands of 'unique local significance' under Article 24 of the Environmental Conservation Law (ECL). Upland buffers associated with these wetlands should reflect actual usage by foraging herpetofauna species. Priority species that will benefit from this action include freshwater wetland amphibians (i.e., western chorus frog), uncommon turtles of wetlands (i.e., spotted turtles), and vernal pool salamanders (i.e., Jefferson and blue-spotted salamanders). All water-dependent species and overall water quality would benefit from this protection.

- Review all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species need expanded protection either under Article 24 of the ECL or by local ordinance. Priority species include pied-billed grebe, king rail, least bittern, and American bittern.

- Identify and protect known common loon nesting areas with focus on the Adirondacks.

- Increase regional permit oversight of development and highway projects that may affect native freshwater bivalves.

HUMAN-WILDLIFE INTERACTIONS

- The best strategy for minimizing illegal collection of herpetofauna of conservation concern may be to designate them as protected species. Implement pending legislation which designates the following as protected game species:
  - Freshwater Wetland Amphibians - four-toed salamander
  - Lake/River Reptiles - eastern ribbonsnake, spiny softshell
  - Lizards - common five-lined skink
  - Uncommon Turtles of Wetlands - spotted turtle, stinkpot, wood turtle
  - Vernal Pool Salamanders - blue-spotted salamander, Jefferson salamander
  - Woodland/Grassland Snakes - black ratsnake, northern black racer, smooth greensnake, timber rattlesnake

INVASIVE SPECIES

- Implement the regulatory recommendations of the Governor's Invasive Species Task Force to control the introduction and distribution of invasive exotic species. Species that would benefit from this action include freshwater marsh nesting birds (i.e., American bittern, pied-billed grebe, black tern).

- Review existing regulations that control the importation of invasive species. Evaluate whether regulatory "gaps" exist relative to species which should be prohibited. Also assess the appropriateness of the penalties and the enforceability of the regulations.

- Develop a coordinated policy between DEC and other land use agencies, such as the APA, to plan and implement comprehensive sampling, inventory and reclamation of appropriate waters within the Adirondack Park.

DATA GAPS

For many SGCN, particularly invertebrate species, there is a lack of information on abundance, distribution, and population trends; however, preliminary data suggest that these species may warrant protective status. It is important to complete more thorough investigations into the population status, trends, and threats to these species to determine if regulatory action is needed.

- A comprehensive statewide inventory of odonates (dragonflies and damselflies) was selected for State Wildlife Grant funding in 2003. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state. Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. High priority species include:
  - Odonates of Rivers and Streams - American rubyspot, arrow clubtail, boreal snaketail, brook snaketail, rapids clubtail

Incentives

An incentive program geared towards private landowners will be a key first step in engaging the public about the importance of their lands to SGCN. So much of the critical habitats for these species exists on private lands that landowner cooperation will be the ultimate deciding factor on whether species declines can be halted. Their cooperation at the level needed for meaningful change will probably hinge on some form of enrollment process and financial and/or logistical support similar to that used in Farm Bill programs coordinated by USDA and NRCS, USFWS Wildlife Habitat Incentive Program (WHIP) and Partners for Wildlife Program, DEC Landowner Incentive Program, and various conservation programs administered by non-governmental organizations (e.g., local land trusts, The Nature Conservancy, Ducks Unlimited, Inc. etc.). Specific recommendations include:

- ❖ Cooperate with NYS farmers and grassland owners to establish the best possible nesting and foraging opportunities for grassland birds (i.e., northern harrier, sedge wren, short-eared owl, and upland sandpiper) and common nighthawk.

- ❖ Incentives focusing on grassland bird habitat should be directed toward protecting existing grasslands or restoring grassland habitats within relatively close proximity to existing grasslands to avoid creating sink habitats. These efforts should focus on the regions within the basin with the highest concentrations of grasslands.

- ❖ Conservation efforts to benefit common nighthawks should concentrate on areas where they are already known to breed. Breeding Bird Atlas (2000-04) breeding records are spread throughout the Basin, with probable breeding in several blocks from central Clinton County.

- ❖ Incentive-based programs are often associated with agricultural habitats, but they may be a valuable mechanism for addressing conservation concerns in other ecotypes. Conservation partners should cooperate with private landowners to encourage land management strategies that favor spruce grouse, olive-sided flycatcher, and other boreal forest birds.

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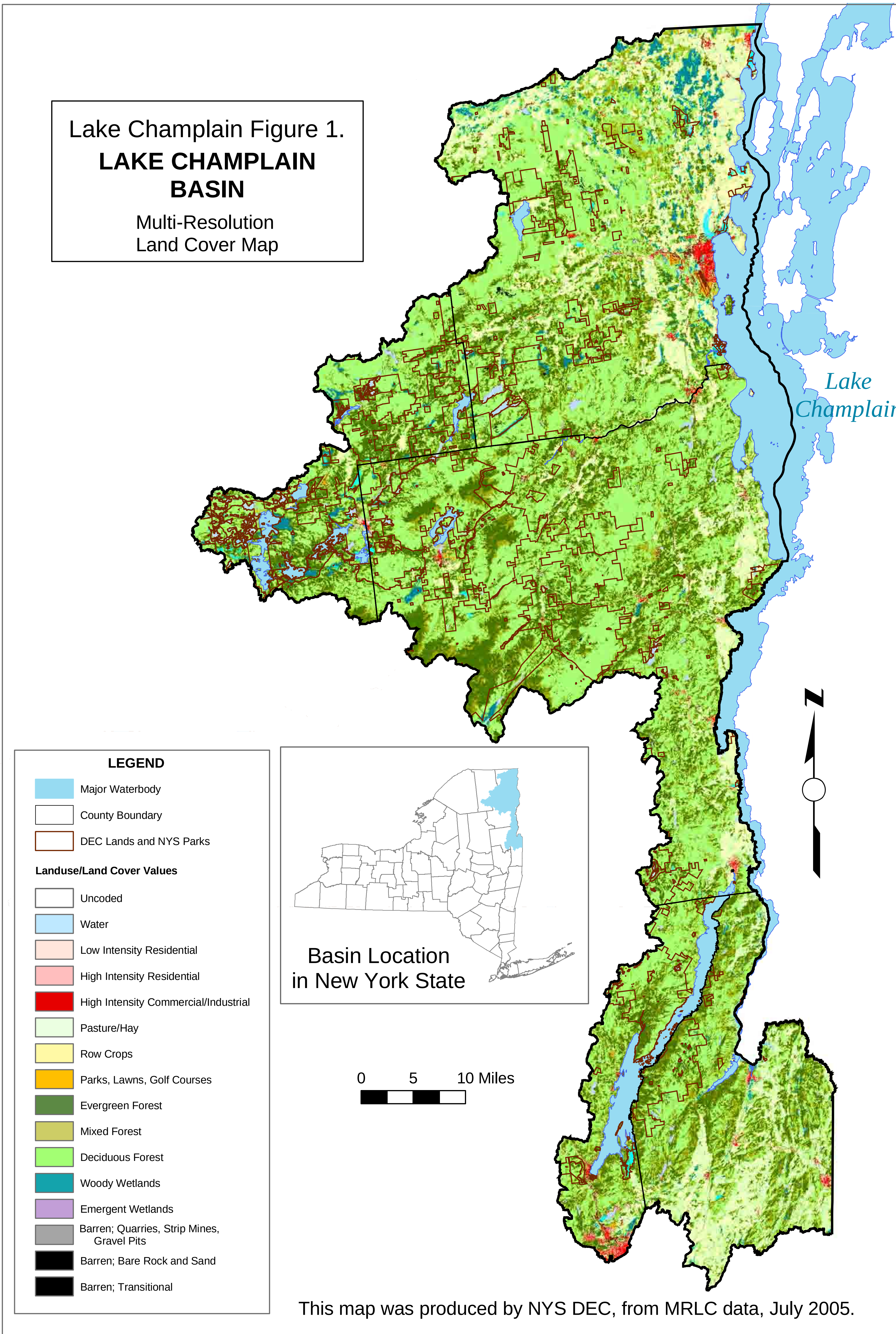
Tables and Figures

Tables

Figures


Lake Champlain Figure 1.
LAKE CHAMPLAIN BASIN
Multi-Resolution Land Cover Map
Lake Champlain
LEGEND
Major Waterbody
County Boundary
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
Basin Location in New York State
0 5 10 Miles
N
This map was produced by NYS DEC, from MRLC data, July 2005.

Lake Champlain Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Lake Champlain Basin.

Classification	% Cover
Deciduous Forest	43.64
Evergreen Forest	18.64
Mixed Forest	13.32
Water	8.15
Row Crops	7.78
Pasture/Hay	4.11
Woody Wetlands	1.91
High Intensity Commercial/Industrial	0.77
Emergent Wetlands	0.47
High Intensity Residential	0.46
Low Intensity Residential	0.39
Parks, Lawns, Golf Courses	0.16
Barren; Quarries, Strip Mines, Gravel Pits	0.14

Lake Champlain Table 2. Species of Greatest Conservation Need currently occurring in the Lake Champlain Basin (n=106). Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Boreal forest birds	Bay-breasted warbler	Decreasing
Bird	Boreal forest birds	Cape May warbler	Unknown
Bird	Boreal forest birds	Olive-sided flycatcher	Decreasing
Bird	Boreal forest birds	Rusty blackbird	Unknown
Bird	Boreal forest birds	Spruce grouse	Decreasing
Bird	Boreal forest birds	Tennessee warbler	Unknown
Bird	Boreal forest birds	Three-toed woodpecker	Unknown
Bird	Breeding waterfowl	American black duck	Decreasing
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Breeding waterfowl	Common goldeneye	Unknown
Bird	Colonial-nesting herons	Black-crowned night-heron	Stable
Bird	Colonial-nesting herons	Cattle egret	Decreasing
Bird	Colonial-nesting herons	Great egret	Unknown
Bird	Common loon	Common loon	Increasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Forest breeding raptors	Cooper's hawk	Stable
Bird	Forest breeding raptors	Golden eagle	Decreasing
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Black tern	Decreasing
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	High Altitude Conifer Forest Birds	Bicknell's thrush	Unknown
Bird	Osprey	Osprey	Stable
Bird	Peregrine falcon	Peregrine falcon	Increasing
Freshwater fish	Blackchin shiner	Blackchin shiner	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Unknown
Freshwater fish	Eastern sand darter	Eastern sand darter	Increasing
Freshwater fish	Lake sturgeon	Lake sturgeon	Increasing
Freshwater fish	Mooneye	Mooneye	Unknown
Freshwater fish	Round whitefish	Round whitefish	Decreasing
Freshwater fish	Sauger	Sauger	Decreasing
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Northern map turtle	Unknown
Herpetofauna	Lake/river reptiles	Spiny softshell	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Lizards	Common five-lined skink	Unknown
Herpetofauna	Mudpuppy	Common mudpuppy	Decreasing

Lake Champlain Table 2. (continued)

TaxaGroup	Species	SpeciesGroup	Stability
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Northern black racer	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Arrow clubtail	Unknown
Insect	Odonates of rivers/streams	Boreal snaketail	Unknown
Insect	Odonates of rivers/streams	Brook snaketail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Other butterflies	Jutta arctic	Unknown
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Silvery blue	Decreasing
Insect	Other butterflies	Tawny crescent	Decreasing
Insect	Other moths	*Agrotis obliqua*	Stable
Insect	Other moths	*Anomogyna rhaetica*	Unknown
Insect	Other moths	Maroonwing	Stable
Insect	Other moths	Acadian swordgrass	Unknown
Insect	Other moths	*Lithophane lepida lepida*	Unknown
Insect	Riparian tiger beetles	*Cicindela ancocisconensis*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Heptagenia culacantha*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Rhithrogena uhari*	Unknown
Mammal	Furbearers	American marten	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Indiana Bat	Indiana bat	Increasing
Mammal	Small-footed bat	Small-footed bat	Unknown
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	American eel	American eel	Unknown
Mollusk	Freshwater bivalves	Black sandshell	Unknown
Mollusk	Freshwater bivalves	Kidneyshell	Unknown
Mollusk	Freshwater bivalves	Pink heelsplitter	Unknown
Mollusk	Freshwater bivalves	Pocketbook	Unknown

Lake Champlain Table 3. Lake Champlain Basin species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**14**	**53**	**118**	**44.9**
Bald Eagle		1		
Boreal Forest Birds		7	7	100.0
Breeding Waterfowl		3	4	75.0
Colonial-Nesting Herons		3	8	37.5
Common Loon		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		6	9	66.7
Early Successional Forest Breeding Birds		10	12	83.3
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		3	6	50.0
Grassland Birds		9	11	81.8
High-Altitude Conifer Forest Birds		1	1	100.0
Osprey		1		
Peregrine Falcon		1		
FRESHWATER FISH	**7**	**7**	**40**	**17.5**
Blackchin Shiner		1		
Heritage-Strain Brook Trout		1		
Eastern Sand Darter		1		
Lake Sturgeon		1		
Mooneye		1		
Round Whitefish		1		
Sauger		1		
HERPETOFAUNA	**8**	**17**	**44**	**38.6**
Freshwater Wetland Amphibian		2	5	40.0
Lake/River Reptiles		4	5	80.0
Lizards		1	3	33.3
Mudpuppy		1		
Snapping Turtle		1		
Uncommon Turtles of Wetlands		2	5	40.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		4	8	50.0
INSECT	**5**	**18**	**197**	**9.1**
Odonates of Rivers/Streams		5	19	26.3
Other Butterflies		5	18	27.8
Other Moths		5	92	5.4
Riparian Tiger Beetles		1	2	50.0
Stoneflies/Mayflies - Lotic		2	20	10.0
MAMMAL	**4**	**6**	**21**	**28.6**
Furbearers		2	2	100.0
Indiana Bat		1		
Small-footed Bat		1		
Tree Bats		2	3	66.7
MARINE FISH	**1**	**1**	**51**	**2.0**
American Eel		1		
MOLLUSK	**1**	**4**	**59**	**6.8**
Freshwater Bivalves		4	39	10.3
TOTAL	**40**	**106**	**530**	**20.0**
% of all spp groups statewide	**31.3**			

Lake Champlain Table 4. SGCN that historically occurred in the Lake Champlain Basin, but are now believed to be extirpated from the basin (n=21).

Taxa Group	Species Group	Species
Bird	Loggerhead Shrike	Loggerhead shrike
Freshwater fish	Extirpated Fishes	Atlantic salmon *
Freshwater fish	Iowa darter	Iowa darter
Herpetofauna	Uncommon turtles of wetlands	Bog turtle
Insect	Odonates of rivers/streams	Elusive clubtail
Insect	Odonates of rivers/streams	Russet-tipped clubtail
Insect	Odonates of seeps/rivulets	Tiger spiketail
Insect	Other moths	Bay underwing
Insect	Pine barrens tiger beetles	*Cicindela patruela*
Insect	Pine barrens tiger beetles	*Cicindela unipunctata*
Insect	Stoneflies/Mayflies of lotic waters	*Procloeon mendax*
Insect	Stoneflies/Mayflies of lotic waters	*Rhithrogena anomala*
Mammal	Extirpated large mammals	Canada lynx
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Game species of concern	New England cottontail
Mammal	Tree bats	Silver-haired bat
Mollusk	Freshwater gastropods	Globe siltsnail
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater gastropods	Mossy valvata
Mollusk	Freshwater gastropods	Spindle lymnaea

* Current management efforts are attempting to re-establish this species in Lake Champlain and tributaries where they were native.

Lake Champlain Table 5. Office of Parks, Recreation & Historic Preservation (OPRHP) land units (n=4) within the Lake Champlain Basin. All areas are within NYSDEC Region 5

Unit Name (DEC Region)	County	Acres
Point Au Roche State Park	Clinton	850
Cumberland Bay State Park	Clinton	294
Crab Island State Park	Clinton	42
Macomb Reservation State Park	Clinton	597

Lake Champlain Table 6. NYSDEC Wildlife Management Area (WMA) land units (n=9) within the Lake Champlain Basin. All areas are within NYSDEC Region 5.

Unit Name (DEC Region)	County	Acres
Ausable Marsh Wildlife Management Area	Clinton	576
Kings Bay Wildlife Management Area	Clinton	653
Lake Alice Wildlife Management Area	Clinton	1,468
Lewis Preserve Wildlife Management Area	Clinton	1,356
Montys Bay Wildlife Management Area	Clinton	216
Pauline Murdock Wildlife Management Area	Essex	68
Putts Creek Wildlife Management Area	Essex	114
Wickham Marsh Wildlife Management Area	Essex	862
East Bay Wildlife Management Area	Washington	38

Lake Champlain Table 7. NYSDEC State Forest, Wild Forest, Wilderness, Primitive Area, and Unique Area land units (n=31) within the Lake Champlain Basin. All areas are within NYSDEC Region 5. This list does not include 19 Intensive Use areas, many of which are smaller parcels within the public forests listed here.

Unit Name	**County**	**Acres**
Spring Brook State Forest	Clinton	991
Macomb State Forest	Clinton	1,081
Flat Rock State Forest	Clinton	1,978
Cadyville State Forest	Clinton	370
Valcour Island Primitive Area	Clinton	1,100
Dunkins Reserve State Forest	Clinton	167
Dannemora State Forest	Clinton	2,450
Terry Mountain State Forest	Clinton	4,887
Moon Pond State Forest	Clinton	914
Burnt Hill State Forest	Clinton	1,626
Garden Island Wild Forest	Clinton	1
Taylor Pond Wild Forest	Clinton/Essex	38,311
Wilmington Wild Forest	Clinton/Essex	17,623
Dix Mountain Wilderness	Essex	44,707
Giant Mountain Wilderness	Essex	23,150
Hammond Pond Wild Forest	Essex	38,174
Hurrican Mountain Primitive Area	Essex	13,768
Jay Mountain Wilderness	Essex	7,734
McKenzie Mountain Wilderness	Essex	37,323
Pharoah Lake Wilderness	Essex	44,534
Sentinel Range Wilderness	Essex	23,904
Split Rock Wild Forest	Essex	3,630
Bald Ledge Primitive Area	Essex	529
Hague Brook Primitive Area	Essex	211
Johns Brook Primitive Area	Essex	146
Schuyler Island Primitive Area	Essex	123
High Peaks Wilderness	Essex/Franklin	190,466
Saranac Lakes Wild Forest	Essex/Franklin	73,269
St. Regis State Forest	Franklin	17,599
Debar Mountain Wild Forest	Franklin	90,381
Lake George Wild Forest	Warren/Washington	60,545

Lake Champlain Table 8. Bird Conservation Areas (BCA) within the Lake Champlain Basin (n=2). NYSDEC's BCA Program, established in 1997, is modeled after the National Audubon Society's Important Bird Areas (IBA) program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to state-owned properties.

Bird Conservation Area	County	Acres	Description
Adirondack Sub-alpine Forest	Franklin/Clinton/Essex/Warren	69,000	This BCA includes Adirondack Mountain summits above 2,800 feet in Clinton, Essex, Franklin, Hamilton and Warren counties. Surveyed and confirmed nesting locations for Bicknell's Thrush include: Mount Marcy, Algonquin Peak, Blue Mountain, Cascade Mountain, Giant Mountain, Kilburn Mountain, Hurricane Mountain, Lower Wolfjaw Mountain, Lyon Mountain, Mount Haystack, Phelps Mountain, Porter Mountain, Rocky Ridge Peak, Santanoni Peak, Snowy Mountain, Vanderwhacker Mountain, Wakely Mountain, Whiteface Mountain and Wright Peak. Critical habitats include dense subalpine coniferous thickets, and to a lesser degree, young or stunted and heavy second growth of cherry or birch.
Lake Champlain Marshes	Clinton/Essex/Washington	2,800	This BCA includes six Wildlife Management Areas (WMAs) along the western shore of Lake Champlain (Kings Bay, Montys Bay, Wickham Marsh, Ausable Marsh, Putts Creek, East Bay) from near the Canadian border to the southern tip of the lake. These WMAs all include shoreline wetland complexes. Most include large marshes, forested swamps, and shrub swamps; as well as some upland forests, grasslands, and shrublands. They provide habitat for a wide variety of bird species for breeding and during migration. They also provide important migration stopover areas for a tremendous diversity of water and land birds. Some species of interest include American bittern (special concern), least bittern (threatened), osprey (special concern), upland sandpiper (threatened), black tern (endangered), northern harrier (threatened), pied-billed grebe (threatened), short-eared owl (endangered), vesper sparrow (special concern), and grasshopper sparrow (special concern).

Lake Champlain Table 9. Critical Environmental Areas (CEA) within the Lake Champlain Basin (n=4). CEAs are traditionally designated by DEC to protect drinking water supplies; however, DEC and other government agencies may designate CEAs to protect wildlife and their habitats and other natural resource elements. All areas are within NYSDEC Region 5.

Critical Environmental Area	Location	Reason for Designation
Rush Pond	Queensbury, Warren County	Unique pond & wetland of undisturbed beauty
Glen Lake	Queensbury, Warren County	Benefit to human health, natural setting
Round Pond	Queensbury, Warren County	Unique glacial kettle pond
Lake George	Lake George, Warren County	Protect the resources of the park

Lake Champlain Table 10. Critical **aquatic** habitats found in the Lake Champlain Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Riverine	coldwater stream	17
Palustrine	mineral soil wetland	18
Riverine	warmwater stream	14
Lacustrine	warm water shallow	12
Lacustrine	cold water deep	9
Riverine	deep water river	7
Lacustrine	cold water shallow	6
Riverine	coastal plain stream	4
Palustrine	peatlands	4
Lacustrine	warm water deep	4
Lacustrine	unknown	3
Riverine	warm water deep	1
Riverine	cold water deep	1
Riverine	unknown	1
Palustrine	unknown	1
Lacustrine	coastal plain	1
Palustrine	warm water stream	1

Lake Champlain Table 11. Critical **terrestrial** habitats found in the Lake Champlain Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Terrestrial	forested	45
Terrestrial	open upland	41
Terrestrial	barrens/woodlands	14
Terrestrial	alpine/mountain	6
Subterranean	natural/cultural	1

Lake Champlain Table 12. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the Lake Champlain Basin. For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Habitat Loss - cultural conversion (e.g., development)	27	67.5	10.7
Contaminants	18	45.0	7.1
Human Disturbance - illegal/unregulated harvest	15	37.5	6.0
Degradation of Water Quality	14	35.0	5.6
Disrupted Predator/Prey Cycles	14	35.0	5.6
Human Disturbance - collisions	13	32.5	5.2
Interspecific Competition for Resources	12	30.0	4.8
Disease	11	27.5	4.4
Fragmentation	11	27.5	4.4
Barriers to Movement in Aquatic Habitats (e.g., dams, weirs, culverts)	10	25.0	4.0
Habitat Loss - natural (e.g., succession)	9	22.5	3.6
Insensitive/Unsustainable Agricultural/Silvicultural Practices	8	20.0	3.2
Human Disturbance - general	7	17.5	2.8
Active Alteration/Suppression of Natural Processes (e.g., fire)	7	17.5	2.8
Competition from Invasive Exotic Species	6	15.0	2.4
Habitat Composition Altered by Terrestrial Invasive Species	5	12.5	2.0
Sedimentation/Erosion (impacts on aquatic habitats)	5	12.5	2.0
Loss of Streamside Buffers	4	10.0	1.6
Pollution (e.g., acid rain, soil contamination)	4	10.0	1.6
Altered Hydrology (water level management/extraction)	4	10.0	1.6
Reduction of Patch Size/Shape/Area	4	10.0	1.6
Loss of Connectivity/Metapopulation Dynamics	4	10.0	1.6
Human Disturbance - entanglement, entrainment, impingement	4	10.0	1.6
Detrimental Hybridization	4	10.0	1.6
Susceptibility to Stochastic Events (isolated populations)	4	10.0	1.6
Climate Change (change in species range, distb'n, migration)	4	10.0	1.6
Unknown Threats	4	10.0	1.6
Habitat Composition Altered by Aquatic Invasive Species	3	7.5	1.2
Susceptibility to Stochastic Events (storms)	3	7.5	1.2
Barriers to Movement in Terrestrial Habitats (roads, powerlines)	2	5.0	0.8
Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	5.0	0.8
Loss of Host Species	2	5.0	0.8
Parasites	2	5.0	0.8
Susceptibility to Stochastic Events (rare species)	2	5.0	0.8
Aquatic Habitat Composition Altered by Overuse (e.g., swans, muskrat)	1	2.5	0.4
Negative Edge Effects (i.e., increased predation, "ecological traps")	1	2.5	0.4
Climate Change (change in water level, temperature)	1	2.5	0.4
Impacts of Erosion on Terrestrial Habitats	1	2.5	0.4

Lake Champlain Table 13. Approved State Wildlife Grant studies relevant to the Lake Champlain Basin (Coordination Grant T-1, Wildlife Grants T-2-1 and T-2-2, and Fish/Marine Grant T-3).

State Wildlife Grant Study	Location	Description
COORDINATION GRANT		
Project 1: Comprehensive Wildlife Conservation Planning & Coordination		
Job 1: SWG Coordination & Development of the Comprehensive Wildlife Conservation Strategy	Statewide	New York will develop a Comprehensive Wildlife Conservation Strategy by October 2005, focusing on species of greatest conservation need in the state. We will work closely with partner organizations and the public to develop the plan, which will identify management needs, goals and strategies for more than 500 animal species that are rare, declining, vulnerable, or status unknown in New York State.
WILDLIFE CONSERVATION GRANT		
Project 1: Conservation Planning for Species of Greatest Conservation Need		
Bird Conservation		
Job 1: New York State's 2nd Breeding Bird Atlas	Statewide	New York completed its first Breeding Bird Atlas during 1980-1985, and the second atlas project (2000-2004) is underway. State Wildlife Grant funding will ensure completion of the second atlas, which will document the current distribution of breeding birds in New York State and quantify changes in distributions of species between the two atlas periods. Once completed, Atlas results will be made available in book and web-based formats for use by conservation biologists, planners, and the public.
Job 2: Developing a Grassland Bird Conservation Plan for New York State	Statewide, where grassland habitats are present	Because of widespread loss and fragmentation of grassland habitat, grassland bird populations are declining in New York and throughout North America. This project will develop a comprehensive plan to guide and direct grassland bird conservation and management on public and private lands in New York State. The plan will help direct conservation efforts to the most important areas, provide guidance to grassland owners and managers, and identify monitoring and research needs for grassland birds.
Job 3: Spruce Grouse in Lowland Boreal Habitat of New York State: Distribution, Populations and Movements	Essex, Hamilton, Herkimer counties	The spruce grouse is an endangered species in New York, where some of its spruce-fir forest habitat has been lost due to forest maturation, habitat fragmentation, and logging. Confusion with the more common ruffed grouse has led to accidental hunting, and the species' unwariness has made it vulnerable to human disturbance. Urgently needed are: surveys to determine status and distribution; research to assess factors causing rarity or declines; population or habitat protection and management to secure the species' status; and completion and implementation of a state recovery plan. This project will help address those needs.
Job 4: Common Loon Migration and Wintering Areas	Adirondack Park	We know very little about where common loons, a species of special concern in New York State, spend their non-breeding periods. This project will use satellite telemetry to determine migration routes, wintering areas and seasonal movements of loons that summer in New York. The results will help identify potential threats to common loons during non-breeding periods, including coastal energy developments, exposure to Type E botulism in the Great Lakes, ocean contaminants, and commercial fishing gear.
Job 17: Marshbird Conservation in New York State	Statewide, where freshwater emergent marshes are present	Baseline information on distribution and abundance is needed for many marsh-nesting species in New York State. Species of concern include pied-billed grebe, black tern, least bittern, American bittern, and king rail. This project will survey representative freshwater marsh habitats across the state during 2004-2006 to quantify abundance and habitat use of marsh birds, identify focus areas for marsh bird conservation, and develop a long-term monitoring program.
Job 18: Coordinated Comprehensive Bird Monitoring Plan for New York State	Statewide	Comprehensive and coordinated monitoring programs are needed to reliably assess the status of all bird "species of greatest conservation need" in New York State. This project will document details of existing bird monitoring and survey programs in New York and assess their utility for monitoring various species of concern. We will form a bird monitoring partnership, involving agencies, organizations, and individuals, to recommend and help implement new or improved monitoring and survey programs for all bird species in New York State.
Job 19: Assesment of Boreal Forest Bird Habitats in the Adirondack Park	Adirondack Park	Boreal forests are recognized as critical breeding grounds for a variety of bird species that occur nowhere else in New York State. Within the state there are two relatively distinct assemblages of bird species found in "low elevation" and "high elevation" boreal forest types, each of which includes a number of New York's "species of greatest conservation need." The overall goal of this project is to better quantify the status and habitat requirements of various low and high elevation boreal forest birds.
Mammal Conservation		
Job 7: Determining Winter Roost Selection of *M. leibii* and summer destination of hibernating *M. sodalis* and *M. Leibii*	Essex County	The small-footed bat is the least common bat encountered during winter surveys in the eastern U.S., and 75 percent occur in New York. The species may be more common than winter counts suggest because it hibernates in hidden locations (under rocks, in crevices). DEC plans to radio-tag a sample of these bats as they enter a major hibernaculum to determine how many are detected during routine surveys. We also plan to radio-tag Indiana and small-footed bats as they emerge from their hibernacula and follow them by airplane to determine summer distribution and habitat preferences.

Lake Champlain Table 13. (continued)

State Wildlife Grant Study	Location	Description
Job 8: Feasibility of Implementing a Robust Design Mark-Recapture Study for Indiana Bats	Statewide, where Indiana bats are present	The Indiana bat, a federally endangered species, has declined from roughly 600,000 in the 1960s to about 350,000 today. Population declines in southern portions of its range, primarily Kentucky and Missouri, have far exceeded increases in the north, including New York. We hope to conduct a large scale mark-recapture study to identify causes of the decline and regional differences in population trends. The first step is a feasibility study to determine if we can adequately address assumptions of the study design.
Job 9: Determining the Feasibility of a Statewide Summer Survey of Tree Bats	Statewide, north of NYC and Long Island	Tree bats (red, hoary and silver-haired bats) are among the least understood vertebrates in the state. We do not know the current status or distribution of any of these species, and the most comprehensive surveys were conducted more than 100 years ago. Recent technical innovations have increased the reliability of field sampling while reducing costs. We plan to conduct initial surveys to determine the costs and effectiveness of conducting a statewide status survey for tree bats in New York State.
Reptile & Amphibian Conservation		
Job 10: Assessment of the Status and Abundance of High Priority Reptile and Amphibian Species	Statewide	As a group, a higher proportion of amphibian and reptile species have suffered significant declines than any other vertebrate groups in New York State. To date, much effort has been placed on documenting distribution of these endangered and threatened species. This project will focus on collecting information on the status of known populations, following standard protocols, so that conservation efforts can be prioritized on those in greatest need.
Job 12: Reducing Turtle Mortality During Nesting	Statewide	Certain turtle species experience high mortality of females when they migrate from over-wintering locations to traditional egg-laying sites. This project will investigate methods of reducing this mortality through use of subsurface tunnels for crossing roadways, creation of protected nesting sites, and predator exclusions.
Job 25: Spiny Softshell Turtle Survey and Life History Studies	DEC Regions 5, 7, 8, 9	Spiny softshells have experienced declines due to habitat loss and fragmentation, and unregulated/illegal collection. Assess the status and distribution of spiny softshells in the Allegheny River, Finger Lakes, southern shoreline of Lake Ontario, Lake Champlain, and adjacent waterways. Monitor the movements and seasonal habitat use in locations where this species is identified, Quantify habitat, environmental parameters, and land uses associated with nesting and overwintering areas and seasonal activity centers.
Job 26: Reptile and Amphibian Species Inventory (cont'd from Job 10, Grant T-2-1)	Statewide	Previous studies have identified many reptile and amphibian species in need of conservation, which is the first step in developing baseline information to measure changes in populations. This project will help complete surveys of other reptile and amphibian species that are listed as species of special concern by New York State. Completion of these surveys will produce a mechanism to assure continuity of surveys for this group of species, as gather well as data to determine the status of special concern reptile and amphibian species.
Invertebrate Conservation		
Job 15: Odonate Inventory	Statewide	There is a need for a comprehensive survey or inventory for odonates (dragonflies and damselflies) statewide. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state.
Job 27: Tiger Beetle Inventory	Statewide	There are 26 species or subspecies of tiger beetle reported from New York State. Of the 26 species, nine are considered globally rare or rare in New York State, while another five are thought to be uncommon in the state (Gordon 1939, New York Natural Heritage Program 2004.) Nearly all of the species of concern are found in habitats that have been heavily impacted by development or other deleterious factors. DEC will conduct status assessments for nine species (including one subspecies) of tiger beetles in New York State that will clarify the need for conservation actions in order to maintain these species.
FISH AND MARINE CONSERVATION GRANT		
Project 1: Conservation Planning for Aquatic Resources		
Freshwater Fish Conservation		
Job 1: Adirondack Round Whitefish Investigation	Adirondack Park	Round whitefish are classified as threatened in New York and their recovery plan calls for an investigation of causes for and solutions to their decline. This project will include field studies to develop sampling protocols in Adirondack lakes, evaluate existing stocking efforts, and prioritize historic waters for likelihood of successful reestablishment.
Job 2: Conservation of Lesser Known Species of Fish	Statewide	This project involves review of DEC and New York State Museum fish records to identify information needs about the status of rare species. Findings will be used to plan new surveys that will eventually allow a complete assessment of the status and distribution of these "lesser known" freshwater fish species of New York State.

For more information on these projects visit NYSDEC website at www.dec.state.ny.us
or contact NYSDEC at:
State Wildlife Grants Program Coordinator
New York Division of Fish, Wildlife and Marine Resources
625 Broadway
Albany, NY 12233-4754
Phone: (518) 402-8924
Fax: (518) 402-8925
swgidea@gw.dec.state.ny.us

Lake Champlain Table 14. Existing management plans and agreements within the Lake Champlain Basin. This is an assortment of the major planning efforts within the Basin and is not a comprehensive list. Other planning efforts may exist at both the local and landscape scale and should be consulted before implementing conservation actions.

Plan/Agreement Name	Involved Parties	Information
Lake George - Planning for the Future - Draft Plan for Public Review and Comment (2001)	Lake George Planning for the Future Committee, Lake George Watershed Conference	Water quality issues; water quality management
Opportunities for Action: An Evolving Plan for the Future of the Lake Champlain Basin (1993, 1996, 2003)	Lake Champlain Basin Program	Water quality; natural resources; recreation; implementation; economics
Lake Champlain Research Consortium: Five Year Research Priorities	Lake Champlain Research Consortium	Research needs, interdisciplinary research
Lake Champlain Watershed General Management Plan (2004)	U.S. Army Corps of Engineers, Lake Champlain Basin Program	Overview, threats to the watershed, goals for conservation, monitoring programs
Lake Champlain Wetlands Acquisition Strategy (1997)	Vermont Nature Conservancy, Lake Champlain Basin Program, NYSDEC, Vermont DEC, Vermont Fish and Wildlife, Adirondack Nature Conservancy, E. NY Nature Conservancy	Four-phase wetlands acquisition strategy, acquisition objectives
Lake Champlain Basin Aquatic Nuisance Species Management Plan (2000)	Lake Champlain Basin Program, Vermont DEC, NYSDEC	Scope of aquatic nuisance problem, goals, management strategies and priorities, coordinated aquatic nuisance species management efforts
Lake Champlain 2003 Zebra Mussel Monitoring Program Final Report (2004)	Lake Champlain Basin Program, Vermont DEC	Goals and objectives, sampling methods, results of sampling, recommendations for future monitoring efforts
St. Lawrence-Champlain Valley Ecoregion Biodiversity Conservation Plan (2002)	The Nature Conservancy	Vision, ecological description, threats assessment, issues and information needs
Strategic Plan: Upper Champlain Valley Program (2003)	Adirondack Nature Conservancy, Adirondack Land Trust	High priority habitats, conservation recommendations
Final Supplemental Environmental Impact Statement: A Long-term Program of Sea Lamprey Control in Lake Champlain (2001)	U.S. Fish & Wildlife Service, Vermont Department of Fish & Wildlife, NYSDEC	History of sea lamprey control, evaluation of action alternatives, selection of an alternative and justification
Final Environmental Impact Statement Double-crested Cormorant Management in the United States (2003)	U.S. Fish and Wildlife Service, USDA APHIS Wildlife Services	Cormorant population trends and impacts on wildlife and habitats, public input process, evaluation of action alternatives, selection of an alternative and justification
NYSDEC Unit Management Plans	NYSDEC	Assessment of the natural and physical resources present within a unit; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Chazy Highland Unit (Draft) Debar Mountain Wild Forest (Draft) Dix Mountain Wilderness (Draft) Giant Mountain Wilderness (Draft) High Peaks Wilderness (1999) Lake George Wild Forest (Draft) Pharoah Lake Wilderness (1992) Saranac Lakes Wild Forest (Draft) Sentinel Range Wilderness (Draft) Split Rock Wild Forest (Draft) St. Regis State Forest (Draft) Wilmington Wild Forest (Draft)		
Bird Conservation Area Management Guidance Summaries	NYSDEC	A physical description of the site, BCA criteria met, important species & habitat types, guidance for management, op/maintenance, research, education and outreach. Includes local contacts.
Adirondack Sub-alpine Forest Lake Champlain Marshes		
Wildlife Management Area Plans	NYSDEC	Assessment of the wildlife, habitats and physical resources present; history of the property; management, op/maintenance, research, education and outreach objectives; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Kings Bay (1969) Lake Alice (1975) Pauline Murdock (1974) Wickham Marsh (1971)		

Description of the Basin

The Lake Erie Basin covers an area of approximately 2,300 square miles (1.5 million acres) in the far western portion of New York State. The entire Lake Erie Basin includes portions of Ontario, New York, Pennsylvania, Ohio, and Michigan, but in this report the basin is the section of the Lake Erie Basin in New York State. The basin spans 3 ecoregions: Great Lakes, Western Allegheny Plateau, and High Allegheny Plateau. The boundary between these ecoregions is physiographically distinct, with an abrupt escarpment between the Appalachian Plateau to the southeast and the Great Lakes Plain closer to Lake Erie. The largest rivers of the basin, with the exception of rivers in the northern portion like Tonawanda Creek, typically pass through steep-sided gorges in this escarpment. Four sub-watersheds are found in the Lake Erie Basin as defined by the U.S. Geological Survey's hydrologic unit code (HUC) system at the 8-digit scale. They are the Buffalo River in the central portion of the basin; Tonawanda Creek/Niagara River in the north; Cattaraugus Creek in the southeast; and Chautauqua Creek/Lake Erie in the southwest. The Niagara River drains a large part of western New York, and is the conduit for waters exiting the 4 Great Lakes upstream of Lake Ontario. Underlying bedrock geology is primarily calcareous shales and siltstones, while the surficial geology is primarily till in the Appalachian uplands and fine lacustrine sediments in the Lake Plain (NYNHP). Precipitation is high relative to other areas of the state due to lake effects. The major municipalities within the basin are Buffalo, Niagara Falls, and Dunkirk. There are all or part of 6 counties in the basin (Erie, Cattaraugus, Chautauqua, Genesee, Niagara, and Wyoming), and there was an estimated population of 1.4 million people basin-wide in 2000. Buffalo and Niagara Falls account for most of the basin's population and contain the largest concentration of heavy industry in New York. Heavy industry in the basin is no longer as significant as it was in former times, but there is still active industry in the area, and lingering effects from inactive sites are also still present. Both the Buffalo River and the Niagara River are designated as Areas of Concern in the Great Lakes Basin by the International Joint Commission.

The Lake Erie Basin varies from heavily developed areas in the west along the lake to suburban areas in the central portion and rural/agricultural in the east. Urban sprawl, both residential and commercial, is a significant issue in this basin. Fragmented forests are the primary land cover in the southeastern portion of the basin. The predominant land cover classifications are agricultural lands (46%) and deciduous and mixed forest (42% combined) lands, according to the U.S. Environmental Protection Agency's multi-resolution land classification (MRLC) map information (Lake Erie Table 1, Lake Erie Figure 1). Agricultural lands are classified as row crops or pasture/hay lands based on MRLC interpreted data. The MLRC national data distinguishes between natural grassland and old fields, hay, pasture, and row crops. There are no lands classified as natural grasslands in the basin. In NY, our pasture/hay lands and row crops are often referred to as grasslands by many management agencies, including DEC. Over 10% of the basin is classified as developed land. As land use changes, urban areas are expected to develop primarily on agricultural land (Ohio River Basin Commission, 1980). The data provided here relates to the entire Lake Erie basin. However, where available, more detailed information is provided below for the lake itself, and the 4 sub-watersheds mentioned above.

Lake Erie is the smallest of the Great Lakes and has the second smallest surface area. The New York portion of the lake consists of 380,000 acres and is the shallowest of the Great Lakes. Compared to the rest of the Great Lakes, Lake Erie warms quickly in the spring and summer and cools quickly in the fall. However, compared to most other lakes in New York, Lake Erie actually warms and cools slowly. The shallowness and warmer temperatures of Lake Erie make it the most biologically productive of the Great Lakes. Lake Erie also has the fastest flushing rate of any of the Great Lakes (2.6 years), compared to Lake Ontario which is estimated at 6.0 years and Lake Superior which is estimated at 191 years. Lake Erie is naturally divided into 3 basins, eastern, western and central, with the NY portion of the lake being in the eastern basin. The eastern basin is the deepest, with an average depth of 82 feet, and a maximum depth of 210 feet. Because of this depth, the eastern basin provides cold-water habitat which supports a cold-water fish community. In comparison, the western basin is very shallow; average depth is 24 feet and maximum depth is 62 feet. The central basin is fairly uniform in depth, with the average being 60 feet and the maximum being 82 feet. The central and eastern basins thermally stratify every year, while stratification in the shallow western basin is very rare and very brief if it does occur. Stratification affects the dynamics and physical characteristics of the lake, which cause it to function as virtually 3 separate lakes. Lake Erie's long, narrow orientation parallels the direction of the prevailing southwest winds. These strong winds cause extreme seiches, or oscillation of the water surface, creating a difference in water depth as high as 14 feet between Toledo and Buffalo. Overall, current and wave patterns are complex and highly variable in Lake Erie, and as a result of such wave action and ice scouring, the NY side of Lake Erie is a very high energy shoreline.

Eighty percent of the Lake's total water inflow comes from the Detroit River; 11% is from precipitation; and the remaining 9% comes from direct tributaries to the lake from Michigan, Ohio, Pennsylvania, New York, and Ontario. Approximately 1/3rd of the total population of the Great Lakes basin resides within the Lake Erie watershed. This equals 11.6 million people and 17 large metropolitan areas. The lake provides drinking water for 11 million people. Obviously, with such urbanization, industrialization, and agricultural lands, Lake Erie is the most highly stressed of the Great Lakes.

The following descriptions of the sub-watersheds or portions thereof were taken from the 2002 NYNHP document *Lake Erie Gorges Biodiversity Inventory and Landscape Integrity Analysis* summarizing the study.

The northwest portion of the Buffalo River sub-watershed includes much of the Buffalo metropolitan area, while the southern and eastern portions are dominated by agricultural and forested lands. The study area was focused on the less developed southeastern portion of the sub-watershed, which accounts for approximately 70% of its total land area. The study area was further refined into 5 separate 11-digit resolution HUC sub-watersheds from west to east; Big Sister Creek; Little Sister Creek; Eighteenmile Creek; Cazenovia Creek; and Buffalo Creek. Big Sister Creek is approximately 32,000 acres with moderate forest cover (45%). The main stem has low water quality. The middle reaches are shallow, rocky streams with a bordering shale cliff and talus community. Other tributaries in the middle to upper portions of the watershed include marsh headwater streams in fair condition and with little to no forest buffer. A beech-maple mesic forest in fairly good condition and Great Lakes dunes are found at the mouth of the creek. Little Sister Creek watershed is only about 6,000 acres with 52% forest cover. It flows through a suburban setting within a successional southern hardwood forest matrix. The main stem is of low quality and a short, rocky, headwater stream. Eighteenmile Creek watershed is large (77,000 acres), with 49% forest cover. It is heavily logged and cleared for agriculture, with many residential and urban areas throughout. Dominant second-growth forest types include beech-maple mesic forest, maple-basswood rich mesic forest, and successional northern and southern hardwoods. Good quality is found in headwater streams, the middle sections are in residential and commercial areas, and the lower sections are of moderate to low quality. Cazenovia Creek is large (89,000 acres) with 56% forest cover. Fair to good examples of headwater streams are present due to several contiguous forest areas of moderate size. The lower reaches are small, moderately deep midreach streams, and the main stem is of moderate quality. Buffalo Creek is large (93,000 acres) with 42% forest cover. Rocky headwater streams of high quality are found in the more heavily forested upper portions of the watershed. The lower reaches are wide, shallow midreach streams with an adjacent floodplain forest.

The Cattaraugus Creek sub-watershed was studied as a whole at the 8-digit HUC scale. It encompasses about 358,000 acres, or 550 square miles, in the southeast portion of the Lake Erie basin. It has moderately high (56%) natural cover, including forests, wetlands, and open water. The remainder of the sub-watershed is primarily agricultural lands with scattered rural residential sites and small villages. The main matrix forests include both climax (hemlock-northern hardwood forest; beech-maple mesic forest; maple-basswood forest) and successional (mix of northern and southern hardwoods) forest types. There are a large number of intermittent and perennial streams flowing into the main stem of the Cattaraugus Creek. This main stem is about 50 miles long, the largest river in the gorge study area. There are high quality riverine communities in small headwater streams with intact forests, and more affected larger streams from upstream agricultural runoff in the lower part of the watershed.

The Chautauqua Creek sub-watershed is located in the southwestern portion of the Lake Erie basin. The study area was focused on the less developed eastern portion of the sub-watershed, which accounts for approximately 50% of the total land area. There are several small metropolitan areas along Lake Erie, but the rest of the sub-watershed is comprised mostly of agricultural and forested lands. The study area was further refined into 8 separate 11-digit HUC watersheds from south to north: Twentymile Creek; Belson Creek; Chautauqua Creek; Little Chautauqua Creek; Little Canadaway Creek; Canadaway Creek; Walnut Creek; and Silver Creek. The Twentymile Creek-Belson Creek sub-watershed is fairly small, covering an area of 21,000 acres with relatively high forest cover (68%). The watershed is primarily comprised of agricultural lands and successional forests, with residential areas prevalent in the lower half. The Chautauqua Creek - Little Chautauqua Creek watershed, with about 23,000 acres, is of moderate size. It has relatively high forest cover (73%), which is a mix of selectively-logged climax forests and successional hardwoods. Agricultural fields are primarily located in the western portion of the sub-watershed, adjacent to Lake Erie. Chautauqua Creek is about 15 miles long, while the Little Chautauqua Creek is approximately 7 miles in length. Little Canadaway watershed is small with 4,300 acres, 68% of which are forest cover. The upper reaches are fair to good quality shallow rocky headwater streams with primarily bedrock reaches and good forest buffer. Fifty-six percent of the 26,000 acres comprising the Canadaway Creek Watershed are in forest cover. The middle reaches consist of shallow rocky headwater streams with cobble or bedrock substrate. The upper portion of the watershed is of good quality; the main stem of Canadaway Creek is of moderate quality. Walnut Creek Watershed covers 17,000 acres with 57% forest cover. The main stem is a rocky headwater stream. The lower reaches contain shale cliff and talus communities bordered by a narrow forest buffer and surrounded by agricultural lands. Silver Creek Watershed is also 17,000 acres with about 50% forest cover. Like Walnut Creek, the main stem is a rocky headwater stream, but with uncertain quality. The middle and lower reaches contain shale cliff and talus communities bordered by a narrow forest buffer.

The Tonawanda Creek/Niagara River sub-watershed, which was not included in the gorge study, is in the northeastern part of the basin and has several unique features and an interesting geological history. Tonawanda Creek, which flows into the Niagara River to the east of Grand Island, runs through relatively flat and poorly drained lowland, the site of the former Glacial Lake Tonawanda. This area contains significant wetland habitat, including large areas of emergent marsh habitat at the Tonawanda WMA (the majority of which is within the sub-watershed), which are used by SGCN freshwater marsh nesting birds and other species. A portion of the sub-watershed has also been designated as “grassland wildlife zone” by a consortium of the agencies and organizations active in grassland conservation in New York, led by Audubon New York. These zones are being developed to focus conservation efforts and spending for grassland bird populations and their habitat. At 102 miles in length, Tonawanda Creek has a main channel longer than Cattaraugus Creek (67 miles long), the other large tributary in the basin. Even though the streambed characteristics are similar to those in the Buffalo River sub-watershed, the zoogeographic history is quite different, and as a result, several unique fish and mussel species occur here. For example, one of the smallest sub-watersheds north of Tonawanda Creek (Cayuga/Bergholtz Creek - 11 miles long), has historically served as a refugium for some Midwestern species that have not been found elsewhere in the basin. The Erie Canal, which runs from the Niagara River to the Hudson River, follows the path of the Tonawanda Creek until the town of Pendleton, where it breaks off and heads north to Lockport before continuing eastward. The canal provides water to certain basin tributaries, thereby affecting water quantity and quality. The Tonawanda plain lies between two east-west ridges, the Niagara Escarpment to the north and the Onondaga Escarpment to the south. These escarpments provide unique rocky wooded forest habitat, and the associated vernal pools at the base of the escarpments provide critical habitat for blue spotted complex and spotted salamanders. The former species and its associated hybrids are listed as one of the most critical SGCN in the basin. The Onondaga Escarpment runs along the northern shoreline of Lake Erie and then travels east in the basin through the towns of Amherst, Clarence, and Newstead. In western NY, the Niagara Escarpment is primarily located in the SW Lake Ontario Basin, but in the Erie Basin the Niagara Escarpment is the cliff over which the Niagara River flows to create Niagara Falls. Over time, the falls have eroded the escarpment south toward Lake Erie, resulting in the formation of the 7 mile long Niagara Gorge downstream of the falls. The Niagara River upstream of Niagara Falls is 32 miles long, and contains some weedy and shallow habitat, and has extensive shoreline because the large Grand Island is entirely on the American side of the international border with Canada. The approximately 15 mile section downstream of Niagara Falls is swifter and deeper. The Niagara Power Project, which generates large amounts of hydroelectric power, results in significant daily water level fluctuations with effects to the habitat along the upper and lower Niagara River. The Lewiston Reservoir, which is a component of the Niagara Power Project, is a large body of water in the sub-watershed, but because of large water level fluctuations on a daily basis, the reservoir provides minimal habitat value. Niagara Falls serves as a major natural barrier to fish passage and prevents fish from traveling upstream from Lake Ontario to Lake Erie via the Niagara River (the artificial Welland Canal in Ontario, however, connects the two great lakes). On portions of the Niagara River and in the Buffalo Harbor, common tern, one of the most critical SGCN in the Lake Erie Basin, nest on manmade structures such as breakwalls and water intake structures.

There are 16 state parks in the basin, all in DEC region 9 (Lake Erie Table 2). Buckhorn Island, Joseph Davis, and Knox Farm State parks provide upland habitats for many SGCN. Buckhorn Island and Knox Farm provide important wetland habitat. Knox Farm State Park also provides grassland habitat. Acreage estimates were only provided for Buckhorn Island and Knox Farm.

There are approximately 8,353 acres in 5 DEC wildlife management areas (WMA) in the basin (Lake Erie Table 3). They range in size from 56 acres to over 5,700 acres, and are located in DEC Region 9. These WMAs provide multiple habitats for fish and wildlife, including upland and wetland systems. These lands should include habitat management regimes for SCGN. There are 10 state forests in the Lake Erie basin that total 24,841 acres; prime areas for protection and management of multiple species.

There are also some county, city or town properties in the basin that provide significant habitat for species of greatest conservation need (SGCN); for example, several of the Erie County Parks provide potential habitat, and Tift Nature Preserve, which was originally purchased by the City of a Buffalo for a landfill and is now a department of the Buffalo Museum of Science, contains 246 acres of wildlife habitat near downtown Buffalo. SGCN habitat can also be found on land governed by the Seneca Nation of Indians, including the Cattaraugus Reservation and the Tonawanda Reservation (a portion of the Tonawanda reservation is in the basin), and on Tuscarora Nation reservation land. Protected lands owned by non-governmental organizations (NGO) such as the Nature Conservancy, which owns lands in the Zoar Valley Area, and the Western NY Land Conservancy, are also key SGCN habitat areas.

There are also other areas of land in the basin that are protected by means other than ownership by a government agency or NGO. For example, some privately owned lands are protected by a conservation easement or are under a formal cooperative agreement through programs offered by organizations like the USDA, NRCS and FWS.

There are 5 state designated critical environmental areas (CEA) in the basin, all in DEC Region 9 (Lake Erie Table 4). CEAs are traditionally designated by DEC to protect drinking water supplies. These may be either surface waters or ground water aquifers. Other government bodies may designate CEAs for other reasons, such as to protect wetlands, wooded properties, steeply sloped areas, designated open space, and lands within 100 feet of major waterways. In the Lake Erie Basin, 2 CEAs are designated to preserve wildlife and green areas (Cayuga Creek and John Stiglmeier Park), while 18 Mile Creek protects exceptional or unique character. Approved criteria for the other 2 CEAs in the basin were not provided.

There are 17 areas designated as significant coastal fish and wildlife habitat by the New York Department of State in the Lake Erie Basin (Lake Erie Table 5). Together, they comprise over 8,000 acres that provide habitat to SGCN found in the basin.

Five areas have been designated within the Lake Erie Basin as draft Important Bird Areas (IBA) by Audubon (Lake Erie Table 6), totaling over 115,000 acres. The Dunkirk Harbor/Point Gratiot IBA is located in Chautauqua County. It was designated for the common tern, a species at risk, and congregation of gulls, waterfowl, and red-breasted merganser. It is located on Lake Erie's southeastern shoreline with beaches and bluffs. The harbor is kept ice-free during winter by a power plant that discharges warm water. This proves attractive for gulls, ducks, and other waterbirds. It is also a well-known migratory stopover site for a great diversity of land bird species.

The Niagara River Corridor IBA is located in Niagara and Erie counties, and was designated for species at risk (common tern), waterfowl congregation areas and shrub/scrub habitat. This corridor includes 32 miles of the Niagara River from Lake Erie to Lake Ontario. The Niagara River annually supports one of the world's highest concentrations of gulls. The habitats along the river edge support an exceptional diversity of migratory songbirds during spring and fall migrations. This site is listed in the 2002 New York State Open Space Conservation Plan (OSP) as a priority acquisition. Protection of the remaining wetland, forest, and shrub habitats along the shoreline is a priority to protect SGCN.

The Ripley Hawk Watch IBA is located in Chautauqua County, and was designated for spring congregations of raptors. It is a mosaic of generally lowland forests, pastures, agricultural fields, and vineyards. Regular and more comprehensive monitoring of spring hawk numbers should continue. The Tifft Nature Preserve IBA is located in Erie County. It was designated for species at risk (least bittern, pied-billed grebe). Once a landfill, this site now includes a 75-acre cattail marsh with open water ponds, and a 50-acre upland mound with grasslands. This site represents exceptional bird diversity for its size. This site is listed in the 2002 OSP as a priority acquisition. The focus of the preserve is research and education to ensure biological integrity of the site.

Wheeler's Gulf IBA is located in Chautauqua County. It was designated because it provides habitat for the cerulean warbler, a species at risk. Mature forests on both sides of a steep valley with a beaver pond dominate the site. Beech-hemlock forests are on the south-facing slope, while oak-hickory forests occur on the north-facing slope. This site supports an unusual diversity of breeding birds for the region. Efforts should be made to acquire conservation easements or fee titles for the land.

There are 117 state classified inactive hazardous waste sites in the basin, the second highest concentration of waste sites in the state. Most of these sites are in Buffalo, Niagara Falls, and Tonawanda. All the sites range in classification from Class 2 to Class 5, with 39% being Class 4, those that are properly closed but require continued management. Thirty-eight percent are Class 2 sites that pose a significant threat to the public health or environment and require action. Class 3 sites (18%) do not present a significant threat to public health or the environment. One of the more highly publicized hazardous waste sites in New York history was Love Canal near Niagara Falls in the Cayuga/Bergholtz Creek sub-watershed.

Critical Habitats of the Basin and the Species That Use Them

DEC staff members who compiled the SGCN information in the State Wildlife Grants database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in Lake Erie Tables 7 and 8. The last column of the table indicates the number of species that indicated the System-Subsystem as critical habitat. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger et al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by DEC fisheries managers, e.g. "cold water-shallow". There are 4 aquatic habitat systems that support 99 species in the Lake Erie basin (lacustrine, palustrine, riverine, and subterranean), which are further refined into 16 subsystems. Within the terrestrial habitat system are 4 subsystems that support 87 SGCN in this basin.

Each of these systems and subsystems are further refined into a habitat category in the SWG species database and can be viewed in the taxa reports in Appendix A. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. These critical habitats are not a comprehensive listing of all the habitat associations found in the basin, rather it is a subset of the habitats deemed critical to SGCN that occur in the basin (Lake Erie Tables 7 and 8). In addition, a single species may require multiple habitats throughout its life cycle, so total of the final columns may exceed the 142 SGCN that presently or historically occurred in the basin.

According to the NYNHP Lake Erie Gorge study, the matrix forests in the basin before settlement are thought to have had flat to rolling topography and deep soils. There are maple-basswood rich mesic forests in the lake plain of the Great Lakes ecoregion, beech-maple mesic forest and hemlock-northern hardwood forest in the High Allegheny Plateau ecoregion, and rich mesophytic forest and hemlock-northern hardwood forest in the Western Allegheny Plateau ecoregion. Based on original survey records, up to 14 distinct forest community types may have occurred in the Lake Erie basin. Today, remnants of these matrix communities can be found in about 30,000 acres of contiguous forested areas unbounded by roads. Patches of other forest types characteristic of local conditions are also found in contiguous forested areas.

Numerous streams drain the Lake Erie Basin. The most intact are those in less agriculturally productive, more acidic, and hilly upper parts of the basin. The most degraded streams tend to be in high agricultural areas in the lower portions of the basin, especially near population centers.

Overall trends in the basin

The Nature Conservancy recently assessed the landscape condition of New York via a watershed approach. Six indicators of watershed condition were used in the analysis: population density; road density; protected lands; dam density; natural land cover; and interior forest cover (Stratton and Seleen, 2003). The landscape condition of the Lake Erie Basin is rated as quite poor, second only to western Long Island. Landscape condition tends to be better in the Cattaraugus Creek and Chautauqua Creek sub-watersheds, with condition declining in the highly developed Buffalo and Niagara Falls metropolitan areas. Correspondingly, the predicted water quality of the basin, based on percent forest cover and impervious surface, is rated as heavily impacted near Buffalo, and somewhat impacted to good in the eastern basin, when compared to the rest of the state. This is directly correlated to the high percentage of developed land (11%) and relatively high human population.

As noted previously, agricultural lands constitute an average of 46% of the Lake Erie Basin. The Tonawanda/Niagara River sub-watershed contains a major grassland wildlife zone as defined by the U.S. Department of Agriculture, and is contiguous to one of the most important grassland areas of the state in the Southwest Lake Ontario basin. Also, the NYNHP considers the Tonawanda/Niagara sub-watershed and most of the Chautauqua Creek sub-watershed as having high grassland related biodiversity areas.

According to DEC data, wetland types of the Appalachian highlands (a portion of which is in the basin) during the 1990s were 59% forested, 22% shrub, 11% emergent, and 8% open water. These wetland areas, totaling 446,000 acres, provide critical habitat for many SGCN in the basin. Wetland types of the Great Lakes plain (a portion of which is in the basin) during the 1990s were 67% forested, 21% shrub, 8% emergent, and 3% open water. The total acreage of wetlands in the lake plain is 942,000. Though there has been an overall gain in total wetland area in both the Appalachian Highlands and the lake plain, there have been losses of shrub and emergent marsh systems. This area of the state contains a high amount of wetlands when compared to the rest of New York. Therefore, wetland conservation in this basin should be considered a priority.

NYNHP's database indicates the Lake Erie basin is biologically diverse for a number of taxa groups that are tracked by the program: mollusks, crustacea, insects, and fish. Lake Erie Table 9 provides a summary of species diversity by comparing the number of SGCN found in the Lake Erie basin to the total number of SGCN statewide: herpetofauna and birds are particularly noted. Studies of biodiversity should continue in the basin in order to assess SGCN and their habitats and recommend appropriate conservation actions.

As mentioned previously, the goal of the NYNHP Lake Erie Gorges study was to prioritize large scale sites surrounding gorges based on the best chance for conserving biodiversity. The primary focus was on large-scale functional landscapes with relatively high integrity. The secondary focus was an assessment of the quality of large streams in the gorges. As a result of the preliminary watershed analysis, 4 priority watersheds were chosen for community inventory efforts, out of the 14 11-digit HUC watersheds previously mentioned. The priority watersheds were: Cattaraugus Creek, Chautauqua Creek, Twentymile Creek, and Eighteenmile Creek. These watersheds appear to have the most intact terrestrial and aquatic landscapes, which are described below.

The forest matrix in portions of Cattaraugus Creek, Chautauqua Creek, and Twentymile Creek consists of hemlock-northern hardwood and rich mesophytic forests on the slopes and shoulders of the gorges. Patches of mature forests with trees up to 525 years old and 150 feet tall were also found at all 3 sites. The hemlock-northern hardwood areas have high tree species diversity (19 species) and 78 native species in the herb layer. The rich mesophytic forests are characterized by a canopy with a large number of co-dominant trees (up to 18 species) and a sparse but diverse herb layer. The Cattaraugus Creek area contains the largest stands of mature forests, followed by Chautauqua Creek Gorge, then Twentymile Creek Gulf. Open Canopy Riverside and Valley Slope Communities support a good diversity of plant and animal species, especially herbaceous plants and insects. The diversity in these communities is a function of the orientation of the gorges, including variations in moisture and shading, water levels in the main rivers, and the presence of seeps and waterfalls. Large, high quality shale cliff and talus communities are found in all 4 gorge sites surveyed. The substrate is a mix of pebble-gravel size shale and bedrock, and slopes average 75 degrees. Vegetation is sparse on dry cliff faces. Riverside sand/gravel bars are found in Cattaraugus Creek and Chautauqua Creek Gorges. Trees and shrubs are very sparse, while herbs are more prevalent. This community type has both wet and dry zones due to variable water flows. Cobble shores and Calcareous Shoreline Outcrop communities have similar definitions. Palustrine communities in the study area are globally rare rich fens. These fens are relatively small compared to others in New York, but they have good landscape condition. If their hydrology is maintained and invasive species controlled, it is expected that these fens will remain in good condition.

Riverine aquatic communities in the study area include large streams, headwater streams, rocky headwater streams, intermittent streams, and springs. Large streams are primarily midreach streams from 3rd to 6th order in this area, with good to excellent species diversity and few local effects. They are somewhat cool, slightly to moderately turbid, slightly basic, and low gradient streams with patterns of riffle, run, and pool sections. Headwater streams are both perennial and intermittent. Little is known about these streams, but the intact forest areas and relatively few road crossings suggest good condition.

Rocky headwater streams are the rocky portions of headwater streams, characterized by alternating riffle and pool sections. These streams are generally 1st to 3rd order, flashy, and have low flows. Intermittent streams tend to have excellent landscape position, tend to have excellent conditions, and may be fairly diverse. They are generally very shallow, very narrow, cool, slightly to moderately turbid, and flashy. Springs are typically on steep slopes, at a consistent source of water, and have uniform cool temperatures year round.

There are 104 SGCN that currently occur in the basin and 38 species that historically occurred in the basin but are now believed to be extirpated (Lake Erie Tables 10-11). Of those 104 SGCN currently occurring in the basin, it is believed that the populations of 34 species are decreasing, 8 are increasing, 8 are stable, and 54 are of unknown status. Given the fact that 30% of the species have been lost in this basin, priority must be given to conserving the remaining species in the Lake Erie Basin.

According to the CWCS Planning Database, 17 mollusks, 5 birds, 8 fish, 5 mammals, 1 herp, and 6 insects of greatest conservation need that historically occurred in the basin are no longer found there. There are some species, such as bigeye chub, black redhorse, redfin shiner, longear sunfish, cobblestone tiger beetle, devil crawfish, slippershell mussel, Wabash pigtoe, and threeridge that are found in very limited distribution statewide. One of these species, slippershell, only occurs in the Lake Erie basin, and the rest are found only in 1 other basin statewide.

Lake Erie and the upper Niagara River historically contained 98 fish taxa, of which 84 are native. Eight of these have since become extirpated in this watershed. The excessive eutrophication of 50 years ago has been moderated, and summertime die offs of fish and blue-green algae are no longer annual events. The human population of the Lake Erie basin has declined since the 1950s, and this trend is expected to continue. The basin currently is 11% developed, primarily in the Buffalo and Niagara Falls area. Development over 10% is considered high enough to cause effects on aquatic habitat, which is what we are seeing in the Lake Erie basin. A remnant of the heavy period of industrialization is the second heaviest concentration of inactive hazardous waste sites in New York.

Land use in the basin has shifted from predominantly agricultural before 1900 (86%) to a period of intense industrialization beginning in the early 1900s. Today the basin is 45% agricultural, primarily in the Tonawanda Creek sub-watershed. Reduction of agricultural land results in loss of grasslands used for haying and pasture. The nature of the remaining agriculture has changed as well. Cropland diversity has decreased as row crop monocultures have become the dominant agricultural land use practice. As smaller farms have been consolidated into larger units, monocultures have become more expansive. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the basin.

The Lake Erie basin is 42% deciduous and mixed forest especially in the Cattaraugus Creek sub-watershed. Increases in mature secondary growth forest cover have been accompanying the decline in agricultural acreage in this basin and statewide. Not surprisingly, early successional forest/shrubland birds are declining across the state. Approximately half of forest breeding birds are either stable or increasing, as forests mature in this basin. Zoar Valley, within the Cattaraugus sub-watershed, has a fairly large area of late-successional forest, as do Chautauqua Creek Gorge and Twentymile Creek Gulf, though to a lesser extent. These forests provide unique habitat that is not common across the state.

Emergent marshes in the Appalachian Highlands have declined significantly since the 1900s. Wetlands in the entire region increased by 3,000 acres between the 1980s and 1990s according to DEC Bureau of Habitat information on statewide wetland trends. However, the acreage of shrub swamp decreased by 5,000 acres and the acreage of emergent marsh decreased by 16,000 acres in that same period. The net gain in total acreage in that decade came from increases in open water and forested wetland, which increased by 7,000 and 17,000 acres, respectively. This trend is also obvious in the Lake Plains. A 67% increase in forested wetlands and a 3% increase in open water wetlands accompanied a 21% and 8% decrease in shrub and emergent marsh wetlands, respectively. Not surprisingly, populations of freshwater marsh nesting birds, grassland birds, lizards, and salamanders in the Lake Erie basin are generally in decline.

Aquatic habitats in Lake Erie and the Niagara River have improved significantly due to pollution abatement. Water quality in Lake Erie is no longer hyper-eutrophic. However, daily water level fluctuations resulting from the operation of the Niagara Power Project have had effects on the habitat along the upper and lower Niagara River. Potential effects range from dewatering of fish and amphibian spawning and nursery areas, desiccation of benthic macroinvertebrates and an increase in predation during low water periods.

Water quality in inland aquatic and riparian habitats has improved due to a reduction in point-source municipal and industrial pollutants by the construction of better waste water treatment systems. However, non-point sources (NPS) of pollution, altered hydrology from storm water management, riparian corridor degradation, river/stream channel manipulation and exotic species invasions are now a larger component of the threats to water and aquatic habitat quality.

Threats

General Discussion

Of all the Great Lakes, Lake Erie is exposed to the greatest stress from urbanization, industrialization, and agriculture. It receives the largest amount of effluent from sewage treatment plants, and is most subjected to sediment loading. It was also the first Great Lake to have a serious eutrophication problem. Contaminants from industry such as mercury, polychlorinated biphenyls (PCB), chlordane, polycyclic aromatic hydrocarbons (PAH), and lead cause impairments across the basin. Approximately 132 non-native invasive species (NIS) are found in the Lake Erie basin, including: algae (20 species), submerged plants (8 species), marsh plants (39 species), trees/shrubs (5 species), disease pathogens (3 species), mollusks (12 species), oligochaetes (9 species), crustaceans (9 species) other invertebrates (4 species), and fishes (23 species). The 20th century saw an increase in NIS due to the shift from solid to water ballast in cargo ships and the opening of the St. Lawrence Seaway in 1959. The corridor between Lake Huron and Lake Erie is known as 1 of the 4 invasion "hot spots." These areas constitute less than 6% of the total Great Lakes water surface area, but account for more than 2 of the NIS (LaMP, 2004).

The above stressors affect the basin in many ways. In the more densely populated areas of the basin, degraded water quality from nutrients and toxic substances and habitat destruction are of greater magnitude and are related to residential, commercial and industrial development. Critical pollutants have been discovered in high concentrations in fish tissues and sediments. The diversity of invertebrates has markedly decreased in the wave-washed zone of the shoreline since the 1970s. The average water temperature of the Lake has risen over the past 18 years and is expected to continue rising, affecting the aquatic ecosystem. Blue-green algae, some of which are toxic to wildlife, are blooming in certain places at different times of the year. Since 1999 there have been annual die-offs of fish, fish-eating birds, and mudpuppies, most of which were caused by type-E botulism (LaMP, 2004).

The Lake Erie LaMP identifies habitat loss and degradation as one of the top three stressors in the Basin. Human alteration of the landscape, as evidenced by loss of forests, wetlands, grasslands, and changing hydrology, has significantly affected fish and wildlife populations, biotic processes, and ecological function. Fish habitat in tributaries to the lake, coastal wetlands, and nearshore areas are impaired, but are still surprisingly diverse. More than 80% of coastal wetlands have been lost; and those that remain are degraded. Aquatic and benthic habitats are also degraded.

The New York Natural Heritage Program identifies threats and disturbances to the 3 dominant ecosystems in the gorge study area: matrix forests, stream systems, and wetland complexes. Poor forestry practices are the primary threat to matrix forests. Other disturbances are caused by fragmentation of forests by second home development, expanding road networks, and tree diseases. Siltation, chemical pollutants, and geomorphologic changes, due to human land use, are the major threats to stream systems. Removal of riparian buffer strips, all terrain vehicle (ATV) use, invasive species, fragmentation of forest buffers, and new dams or road crossings further degrade streams in the Lake Erie basin. In areas of the basin dominated by agriculture, fertilizer, pesticide, herbicide runoff, and soil erosion are of significant threats. Wetlands are affected by loss of forest buffers, exotic plants, and altered hydrology.

Specific Threats to SGCN

The most frequently cited threat to both aquatic and terrestrial species groups occurring in the Lake Erie Basin was outright loss of habitat via conversion to a human dominated land use. This threat includes hardening of the landscape with buildings and roads, but can also include activities like land clearing and wetland draining for agriculture and mining. Complicating the picture is habitat function that is provided by agricultural lands in the northern basin at this time. Pasture and hay lands provide a surrogate for natural grasslands in the Great Lakes Plateau ecoregion. When managed appropriately, these agricultural uses may actually be beneficial to wildlife. But when agricultural management activities like mowing of hayfields occurs at the wrong time of year, grassland nesting species may be disturbed or killed. Mature forests in the southern portions of the basin provide a unique habitat complex for SGCN. Such areas are rare throughout the state, and tend to be fairly small. The mature forest complex in the Cattaraugus Creek sub-watershed is considered to be the second largest contiguous mature forest area in western New York, behind Allegany State Park.

Toxic contaminants were listed as the second most common threat to terrestrial and aquatic species in the basin. Degradation of water quality, which may include contaminants, was the third most common threat listed to aquatic species groups in the basin. Fish consumption advisories are in effect for several major water bodies, including the Barge Canal and lower Tonawanda Creek, the Buffalo River and Harbor, and the Niagara River (DEC, 2002).

Pesticide use on agricultural lands is of concern to herpetofauna, insects, mussels and freshwater crustacea. Agricultural pesticides are generally non-specific in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Amphibians are also particularly susceptible to pesticides and other toxins.

Degradation of water quality also comes from soil erosion and runoff, nutrient-induced algal blooms, and reduced dissolved oxygen caused by excessive algae decay or increased temperatures. On-site septic systems were a major source of water quality impairment cited in the 1996 DEC Priority Waterbodies List for the Niagara River and Tonawanda Creek sub-watersheds, respectively. Due to the highly industrialized Buffalo and Niagara Falls area, mercury, PCBs, chlordane, total PAHs, and lead are affecting the fish and wildlife resources of the Basin.

Atmospheric deposition is a significant statewide issue because NY State is downwind from major mid-western sources of airborne pollution. Atmospheric deposition results in mercury increases in waters of the basin, and has serious implications for forest health.

Human disturbance is considered a significant threat to both aquatic and terrestrial species in the Lake Erie basin. The development of roads and utility rights-of-way directly affects the number of species struck by cars on roads and colliding with power lines, cell towers, and wind towers. In the aquatic arena, collisions can also occur with boats and personal water craft, and entrainment and impingement of aquatic species can occur at hydroelectric plants. Both terrestrial and aquatic SGCN are affected by illegal or unregulated harvest by humans.

Daily water level fluctuations resulting from the operation of the Niagara Power Project up to 1.5 feet per day on the upper river and up to 12 feet per day on the lower river have had effects on the habitat along the upper and lower Niagara River. Water fluctuations have the greatest effect in the 0 to 15 foot depth zone. Potential effects range are dewatering of fish and amphibian spawning and nursery areas, desiccation of benthic macroinvertebrates, desiccation and exposure of submerged and emergent aquatic plants, flooding of turtle and bird nests and increased exposure to predation during low water periods.

Exotic species have threatened the Great Lakes since Europeans first settled in the region. Since the 1800s, more than 140 exotic aquatic organisms of all types, including plants, fish, algae and mollusks, have become established in the Great Lakes. As human activity has increased in the Great Lakes watershed, the rate of introduction of exotic species has increased. More than one-third of the organisms have been introduced in the past 30 years, a surge coinciding with the opening of the St. Lawrence Seaway.

Several exotic and/or invasive species are a significant concern to SGCN in the basin. In addition, diseases, in particular type E botulism in Lakes Erie and Ontario, are another potential threat to certain SGCN. Exotic/invasive species and diseases in the basin that pose a significant threat to SGCN include:

CRUSTACEANS:

- Exotic Spiny water flea (*Bythotrephes cederstroemi*) and fish hook water flea (*Cercopagis pengoi*) compete with and prey on native zooplankton species. Its sharp spine makes it extremely hard for fish to eat. These species have induced changes at all trophic levels where found.
- Rusty crayfish (*Orconectes rusticus*) are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations.

FISH:

- Common carp (*Cyprinus carpio*) degrade shallow lakes by causing excessive turbidity, which can lead to declines in waterfowl and important native fish species.
- Ruffe (*Gymnocephalus cernuus*) can displace other species in newly invaded areas is due to its high reproductive rate, its feeding efficiency across a wide range of environmental conditions, and characteristics such as sharp spines on their gill covers, dorsal and anal fins that may discourage would be predators.
- White perch (*Morone americana*) are native to Atlantic coastal regions and invaded the Great Lakes through the Erie and Welland canals in 1950. Prolific competitors of native Great Lakes fish species, white perch are believed to have the potential to cause declines of Great Lakes walleye populations.
- Sea lamprey (*Petromyzon marinus*) is a predaceous, eel-like fish that has contributed greatly to the decline of whitefish and lake trout in the Great Lakes. Since 1956, the governments of the United States and Canada, working jointly through the Great Lakes Fishery Commission, have implemented a successful sea lamprey control program.

- Alewife (*Alosa pseudoharengus*) reduces zooplankton biomass due to grazing and competes with native forage fish, which in turn appears to induce thiamine deficiencies in salmonids.
- Round goby (*Neogobius melanostomus*) is a bottom-dwelling fish that competes for spawning sites and other habitat with native fish like mottled sculpin, logperch and darters. Round goby thrive in the Great Lakes Basin because they are aggressive, voracious feeders which can forage in total darkness. Goby can survive in degraded water conditions, and spawn more often and over a longer period than native fish. Round goby have shown a rapid range expansion through the Great Lakes.

MOLLUSKS:

- Zebra mussels (*Dreissena polymorpha*) and (*Dreissena bugensis*) have spread to all of the Great Lakes and waterways in many states, as well as Ontario and Quebec. Zebra mussels compete with native mussels and reduce phytoplankton biomass. This has induced changes at all trophic levels in Lake Erie. Diving ducks and freshwater drum eat zebra mussels, but will not significantly control them.

PLANTS:

- Purple loosestrife (*Lythrum salicaria*) can form dense, impenetrable stands that are unsuitable as cover, food or nesting sites for a wide range of native wetland animals, including ducks, geese, rails, bitterns, muskrats, frogs, toads and turtles. Adults can disperse 2 million seeds annually and there is a lack of effective predators in North America. Recently, however, several host specific European insects have been released as a long-term biological control in North America.
- Common reed (*Phragmites australis*) can in some circumstances, particularly in disturbed areas, become invasive and out-compete other plant species resulting in a degraded system with negative effects on some wildlife species, including several SGCN.
  Curly-leaf pondweed (*Potamogeton crispus*) is an exotic plant that forms surface mats that interfere with aquatic recreation. The plant usually drops to the lake bottom by early July. Curly-leaf pondweed was the most severe nuisance aquatic plant in the Midwest until Eurasian watermilfoil appeared. It was accidentally introduced along with the common carp.
- Eurasian watermilfoil (*Myriophyllum spicatum*) was accidentally introduced from Europe. In nutrient-rich lakes it can form thick underwater stands and vast mats at the water's surface. In shallow areas the plant can interfere with boating, fishing, and swimming. The plant's floating canopy can crowd out important native water plants. A key factor in the plant's success is its ability to reproduce through stem fragmentation and underground runners. In some lakes the plant appears to coexist with native flora but little is known how these plants affect fish and other aquatic animals.
- Flowering rush (*Butomus umbellatus*) is a perennial plant from Europe and Asia that was introduced as an ornamental plant. It grows in shallow areas of lakes as an emergent, and as a submersed form in water up to 10 feet deep. Its dense stands crowd out native species like bulrush. The emergent form has pink, umbellate-shaped flowers, and is three feet tall with triangular-shaped stems.

Birds:
Mute swan (*Cygnus olor*) displaces other waterbirds, including SGCN, with its aggressive behavior and reduces the amount of submerged aquatic vegetation available for native wildlife.

Disease:
Type E botulism, a disease caused by *Clostridium botulinum* bacteria, has been recognized as a major cause of mortality in migratory birds since the 1900s. Although type C botulism has caused the die-off of thousands of waterfowl (especially ducks) across the western United States, type E botulism has been mainly restricted to fish-eating birds in the Great Lakes. Other outbreaks of type E have sporadically occurred in Alaska, Florida and California, and periodic outbreaks have occurred in Lake Michigan and Lake Huron over a 20-year period beginning in 1964. From 1999 through 2004, a large die-off of waterbirds occurred in Lake Erie. In 2001, a large die-off of benthic fishes like sheepshead occurred along the shores, followed in the fall by another die-off of fish-eating birds. Fish and waterbird mortality events were documented on Lake Ontario in 2002 through 2004. Type E botulism was isolated in each of these outbreaks.

Priority Issues in basin

The priority issues in this basin have been discussed in the sections above.

Vision, Goals and Objectives for the Basin

Vision

The Lake Erie Basin will continue to have unique habitat types that support healthy populations of SGCN. The urban areas of this basin have suffered negative environmental effects of a similar magnitude as Long Island and New York City, as evidenced by landscape condition and predicted water quality. Yet the basin has unique habitat types not found in other areas of the state which support many SGCN. Therefore, the primary goal for the Lake Erie Basin is to ensure the quantity and quality of essential habitats via the following:

Goals and Objectives

- Determine the current and historical extent of grasslands, mature forests, early successional forest and shrub, deciduous/mixed forest cover, and wetlands in the basin. Conduct habitat mosaic planning and set target goals for these habitat types (e.g.; protect X acres of mature forest, double the amount of early successional forest and shrub habitat; maintain X acres of wetlands).

- Assess the current condition of these habitat types in the Tonawanda/Niagara River sub-watershed and near-shore areas of Lake Erie. This will complement the biodiversity assessment done the NYNHP in the gorge areas of the basin.

- Determine locations and monitor trends of SGCN in the basin.

- Protect and maintain existing, functional core areas of mature forests.

- Maintain stream systems by protecting intact gorge landscapes and riparian buffers.

- Reduce pollution and siltation runoff into streams and tributaries.

- Protect and maintain Lake Erie and Niagara River near shore habitat and natural shoreline habitat, including beds of submerged and emergent aquatic vegetation.

- Improve connectivity and habitat function of protected areas in the basin.

- Restore priority habitats affected by land use practices.

- Prevent further introductions of aquatic and terrestrial non-native invasive species.

- Monitor the quality and quantity of habitats on a 10-year rotational cycle.

- Identify specific threats to SGCN in order to prioritize habitat protection and restoration efforts.

- Pursue opportunities to acquire and/or protect habitat for SGCN.

- Explore opportunities for restoration of extirpated species.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations for Habitats

AGRICULTURE AND GRASSLANDS

In some parts of the basin, trends in modern farm operations toward increased field size and loss of adjacent edge habitat negatively affect some wildlife species, but can actually benefit some grassland songbird species that require large areas of contiguous grassland. Additionally, farm management practices such as conventional tillage, may have negative consequences such as loss of food source, like waste grain and wheat seeds from post-harvest fields, and increased soil erosion and loss of cover. Large row-crop monocultures and decreased crop diversity negatively affect wildlife and their habitats in agriculturally dominated ecosystems. Agriculture also has possible effects on freshwater fish and bivalves through pesticide runoff and loss of riparian areas.

❖ Specific recommendations for grassland birds include a recommendation to evaluate the effects of specific farming and management practices on productivity of grassland birds. Specific investigations should include: timing and frequency of mowing; intensity of grazing; comparative effects of management regimes like mowing, haying, and prescribed fire; and buffer strip characteristics. The highest priority species are Henslow's sparrow, upland sandpiper, Northern harrier, sedge wren and short-eared owl.

❖ Specific recommendations for freshwater bivalves include a recommendation to evaluate the effects of specific farming and management practices on the survival of freshwater bivalves. Specific investigations should include the effects of intensity of grazing, buffer strip characteristics and siltation on productivity and survival. The highest priority species are Wabash pigtoe, threeridge and slippershell mussel.

FOREST AND RIPARIAN HABITAT

Sustainable timber harvest is a way to manage habitat for forest dwelling species. With proper forest management, such as proper erosion control, detrimental effects on other wildlife can be minimized. Specific management techniques for many SGCN do not yet exist.

❖ Specific recommendations for forest breeding raptors include a recommendation to experiment with different management techniques in order to provide the critical habitat needs of this suite of species. Investigations may include different cutting regimes, different buffer distances, and fire management for forest breeding raptors. The highest priority species is long-eared owl.

- ❖ Specific recommendations for freshwater fish and bivalves include a recommendation to experiment with different management techniques in order to provide the critical habitat needs of this suite of species. Investigations may include different cutting regimes, different buffer distances, and adherence to best management techniques. The highest priority species are Wabash pigtoe, threeridge and slippershell mussel and redfin shiner.

FRAGMENTATION

Fragmentation and loss of habitats in the basin is a common threat to several species groups. There are many issues that influence the effects and severity of fragmentation on given species groups. These include patch size and shape, edge effects, and connectivity of remaining habitat patches.

Juxtaposition of wetland and grassland habitats has been shown to positively influence wildlife species diversity. Portions of this basin contain significant amounts of both habitat types and provide opportunities for landscape management of species that depend on these systems.

Fragmentation is a threat to aquatic species as well. Altered hydrology in the watershed prevents or affects migration and dispersal of a variety of aquatic species including freshwater fish and bivalves. Isolated populations are more vulnerable to extirpation by both natural and anthropogenic events.

- ❖ Specific recommendation for freshwater fish and bivalves is to locate dams and other hydrological alterations in order to identify areas for possible restoration activities.

- ❖ Specific recommendations for freshwater marsh nesting birds and grassland birds include demographic studies to identify source and sink populations, and metapopulation dynamics, focusing on survival, age at first breeding, recruitment, and dispersal. Controlled experiments to identify management actions effective in producing suitable habitat and nest selection should also be conducted, including artificial nest platforms to increase nest success or densities of black tern. Invasive species that may affect marsh birds need to be identified. The most critical species for freshwater marsh nesting birds are pied-billed grebe, American bittern, black tern, king rail, and least bittern. The most critical species for grassland birds are Henslow’s sparrow, sedge wren, upland sandpiper, northern harrier, and short-eared owl.

- ❖ Specific recommendations for freshwater bivalves include investigations into the flow requirements of freshwater bivalves and modeling the effects of flow changes both in volume and timing. Additional research is needed on population dynamics of listed mussel species (including connectivity and genetic distinctiveness of populations and subpopulations) and controlling exotic bivalve species. The most critical species within this group are slippershell mussel and threeridge.

- A specific recommendation for early successional forest/shrubland birds is to monitor status and trends of golden-winged warbler and blue-winged warbler in areas common to both species and in areas along the front of the blue-winged warbler invasion. Also, develop guidelines for habitat management for golden-winged warbler, and research into causes for declines of Canada warbler and potential for forestry practices to be beneficial by opening up the canopy and promoting ground growth and thickets. The effects of viburnum leaf beetle on applicable habitats and species utilizing them also need to be determined. The most critical species within this group are golden-winged warbler, whip-poor-will, and Canada warbler. The ruffed-grouse, also a SGCN early successional forest/shrubland bird, can also be monitored, with well established methods, as a good indicator of early forest succession.

- Specific recommendations for beach and island ground-nesting birds include recommendations to explore opportunities for future habitat creation and maintenance. The most critical (and only) species within this group is the common tern. Currently, in the Lake Erie Basin the only nesting habitat for common tern is on manmade structures (breakwalls, water intake structures, and other), and these structures require labor intensive annual maintenance activities (replacement of gravel, chick shelters and fencing).

    - Investigate the use of man made anchored rafts for use as common tern nesting habitat.

    - Explore the possibility of making permanent improvements to existing structures currently used as nesting habitat for common tern.

- A specific recommendation for riparian tiger beetles is to research invasion by non-native plants, such as *Polygonum cuspidatum* and *Lythrum salicaria*, in riparian areas, and to determine where barrier mitigation could be undertaken to restore suitable habitat. The most critical species within this group is a tiger beetle (*Cicindela ancocisconensis*) and a cobblestone tiger beetle (*Cicindela marginipennis*).

- A specific recommendation for other butterflies is to determine precise habitat needs of all life stages, ascertain food plants, and determine the relationship between food availability and species numbers. The most critical species within this group is southern grizzled skipper.

Human-Wildlife Interactions

Human effects on species and their habitats is a threat to 4 species groups in the basin. Human disturbance may be caused by collisions with structures, illegal or unregulated harvest, entanglement, entrainment, and impingement.

- A specific recommendation for forest breeding raptors is to monitor wind farms for mortality. The most critical species within this group is long-eared owl. Also see related recommendation in the planning section of the report.

- A specific recommendation for riparian tiger beetles is to research threats due to development. The most critical (and only) species within this group is a tiger beetle (*Cicindela ancocisconensis*) and a cobblestone tiger beetle (*Cicindela marginipennis*).

- A specific recommendation for beach and island ground-nesting birds includes assessing degree and location of human disturbance. The most critical (and only) species within this group is common tern.

- A specific recommendation for freshwater fish is to research threats due to entrainment and impingement at hydroelectric plants. The most critical species within this group are lake sturgeon and mooneye.

INTERSPECIFIC INTERACTIONS

Interspecific interactions are a common threat to 4 species groups in a number of taxa. Such interactions result in loss of host species, disrupted predator/prey cycles, competition for life support from non-natives species or species in places or numbers not historically found, detrimental hybridization, and parasites.

- A specific recommendation for freshwater marsh nesting birds is to investigate diet and nutrition in relation to breeding habitat quality and prey populations. The most critical species within this group are pied-billed grebe and American bittern.

- A specific recommendation for lake/river reptiles is to document life history parameters, including predator/prey relationships. The most critical species within the lake/river reptiles group are Eastern ribbonsnake, queen snake, and wood turtle.

- Specific recommendations for early successional forest/shrubland birds are to monitor status and trends and develop habitat management guidelines for golden-winged warblers, including those techniques that can favor golden-wings over blue-wings. The most critical species within this group are Canada warbler, golden-winged warbler, and whip-poor-will.

- A specific recommendation for other butterflies is to identify exotic competitor species and determine how best to control these exotics without harming butterfly populations. The most critical species within this group is southern grizzled skipper.

- A specific recommendation for freshwater fish and bivalves is to document predator/prey relationships with invasive species and habitat loss resulting from invasive species expansion. The most critical species within this group are lake sturgeon, Wabash pigtoe, and slippershell mussel.

- A specific recommendation is to support research into the Type E botulism cycle in Lake Erie and effects from botulism on populations of SGCN that use the lake, including common loon, long-tailed duck, and lake sturgeon.

Data Collection Recommendations for SGCN

There are a number of priority species and groups that need population, habitat, and life history research to address critical data gaps. This information will help more clearly identify threats and establish baseline information for these most critical species. Only those most critical species not yet identified in text will be listed here within each group; the reader can refer to previous sections for most critical species already identified. The research items are listed below by species group. This type of data collection will address multiple threats to many species.

CONTAMINANTS

Contaminant monitoring in fauna is recommended for 8 species in 3 taxa. As outlined in the Threats section above, contaminants (pathogens, metals, PCBs) and pesticides are of concern in this basin. Due to the high agricultural land use in this basin, monitoring the effects of pesticides on sensitive species is warranted, especially since these species may occur adjacent to or near agricultural lands.

- ❖ Specific recommendations for freshwater marsh nesting birds include a recommendation to periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. One possible way to gather this information is to sample more common species, such as American coot and red-winged blackbird, which use the same habitats as SGCN marsh birds. The highest priority species within this group are pied-billed grebe, American bittern, black tern, king rail, and least bittern.

- ❖ Specific recommendations for freshwater bivalves and freshwater fish include a recommendation to research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, and adults. The highest priority species within this group are slippershell mussel and threeridge.

- ❖ Specific recommendations for other butterflies include a recommendation to determine the sensitivity of species to chemical formulations, particularly diflubenzuron and other common agricultural pesticides, and the effect of BTK used in Gypsy moth spraying on butterflies. The highest priority species within this group is southern grizzled skipper.

- ❖ A specific recommendation for freshwater fish is to review current fish sampling programs to ensure they are adequate for contaminant monitoring for SGCN freshwater fish.

BEACH AND ISLAND GROUND-NESTING BIRDS

- ❖ Survey population status of common tern annually at known breeding locations.

EARLY SUCCESSIONAL FOREST/SHRUBLAND BIRDS

- ❖ Complete an inventory and analysis for most critical species that identifies core habitats within the basin.

- ❖ Monitor trends of all species.

- ❖ Develop a long term monitoring program for golden-winged warblers.

- ❖ Encourage full completion of Breeding Bird Survey routes.

FRESHWATER MARSH NESTING BIRDS

- Initiate a baseline population survey to determine abundance and distribution. Refine monitoring techniques to better detect population trends.

- Inventory breeding sites and map at a coarse scale to select key monitoring locations. Analyze habitats at multiple scales to better understand characteristic important to nest site selection. Identify key migratory staging, molting, and wintering areas.

- Investigate aspects of life history such as mate selection, coloniality, dispersal, and foraging habits.

- Conduct studies of habitat use, prey availability, and diet at migratory staging, molting, and wintering areas to assess threats and limiting factors.

GRASSLAND BIRDS

- Complete an inventory of potential grassland habitat including species present, distribution, and relative abundance of priority species. Develop and implement monitoring program to supplement BBS for grassland bird species to determine population trends and evaluate effectiveness of conservation efforts in the basin. This effort has already been initiated by a New York State grassland bird group led by Audubon New York.

LONGEAR SUNFISH, MOONEYE, REDFIN SHINER, EASTERN SAND DARTER, LAKE STURGEON AND PIRATE PERCH

- Continue surveys to understand current distributions.

- Evaluate Lake Erie and Cattaraugus Creek mooneye populations and critical habitats.

- Determine the status of redfin shiner in New York, especially in the Tonawanda Creek and Niagara River area. Research threats to habitats and populations.

- Determine if habitat for pirate perch in Cayuga/Bergholtz Creeks is suitable.

- Evaluate Lake Erie lake sturgeon populations and critical habitats and lake sturgeon spawning downstream of Niagara Falls.

LAKE/RIVER REPTILES

- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.

- Periodically resurvey areas of known occurrence to detect population trends.

- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.

Uncommon turtles of wetlands (The most critical species are Blanding's turtle and spotted turtle)

- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat

- Determine significance of specific threats to populations of uncommon turtles of wetlands and develop management recommendations to address significant threats

- Periodically resurvey areas of known occurrence to detect population trends.

Vernal pool salamanders (The most critical species are blue spotted salamander and Jefferson salamander)

- Conduct research to document the extent of upland habitat required by vernal pool breeding salamanders.

- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.

- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.

- Determine significance of specific threats to populations of vernal pool salamanders and develop management recommendations to address significant threats.

Other butterflies

- Determine best management regimes for species in each locality.

- Determine the duration of all life stages and conduct taxonomic research for related species.

- Conduct an inventory of species within historical range and define the list of species that need to be addressed.

Riparian tiger beetles

- Compile baseline data on existing threats, including gravel mining, high ATV use, and hydrologic flow alterations, and encourage research to determine the effect of these threats.

- Conduct baseline population surveys to determine extent of occupied habitat.

- Determine where larval habitat is for *Cicindela marginipennis*, and determine adult beetle dispersal. Determine habitat characteristics such as vegetation density, cobble size and sand/cobble interspersion for these species.

Freshwater bivalves

- Evaluate threats to mussels and prioritize areas within the basin for remedial action.

- Develop standard survey protocols for development projects in the basin to prevent further decline of these species.

- Investigate the best survey methods to detect rare species and evaluate status and trends of all species that occur in the basin. Determine population distribution and abundance of freshwater bivalve species-at-risk in this basin. Consider listing as a species at risk.

- Conduct research to determine the habitat parameters necessary to sustain populations of at risk mussel species including temperature, substrate, flow, fish hosts, and forage base.

- Determine breeding phenology necessary for successful mussel reproduction including mussel density, abundance and diversity of fish hosts, water temperature, and flow.

- Determine fish hosts for species.

TREE BATS (THE MOST CRITICAL SPECIES ARE EASTERN RED AND HOARY BATS)

- Research threats to critical habitats and populations.

- Conduct surveys of migrants to determine timing, distribution, species composition, and elevation of migrating bats.

Planning Recommendations

Several existing management plans address natural resource conservation issues within the Lake Erie Basin (Table 14). The goals and objectives of these plans vary in their focus (e.g., water quality, biodiversity, restoration) and cooperating partners; however, they all provide valuable information on conservation threats and strategies in this region of New York State and should be consulted prior to implementation.

There is a clear need for a habitat mosaic management plan for grassland, early successional forests, shrub habitat, mature forest stands, and wetlands in this basin. Of the 99 SGCN occurring in the basin, 42 depend on grasslands, 8 depend on barrens and woodlands, 34 depend on forested habitat, and 27 depend on wetlands. Some species depend on all four of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities. The balance and active cooperative management of all of these habitat types is the key to the health and abundance of many of the SGCN currently living in this basin.

It is very important to consider both public and private lands in planning efforts and to incorporate both strategies that focus on land protection and management on public lands and strategies that deal with partnerships with private landowners. The management of public lands needs to be carried out with the cooperation of many agencies. Key partners to include are DEC, NYS OPRHP, USFWS, NPS, NRCS, DOT, Trust for Public Land, and local governments. Private lands comprise 85% of the total land area of the state. Use of cooperative management programs like the Landowner Incentive Program, Wildlife Habitat Improvement Program, and others will be important to achieve effective habitat protection and enhancement for many SGCN. Partners in these efforts should include: NY Audubon, TNC and the Natural Heritage Program, local land trusts, New York Forest Owners Association, Ducks Unlimited, Inc, Pheasants Forever, National Wild Turkey Federation, Ruffed Grouse Association, watershed groups, partners in the forestry industry, The American Farmland Trust, and others.

Part of this habitat mosaic management planning effort should involve the development of a protected lands GIS data layer as a powerful tool for conservation planning and determining measures of success at the regional scale. Such a data layer would incorporate all the protected lands in public and private ownership and assign each site to a category reflecting its protection status (easement, fee ownership, etc.). Combining this data layer with SGCN occurrences and other landscape features would provide an excellent and unique analysis of the conservation status of each SGCN and the role played by each priority site in achieving goals at the regional basin and statewide scales.

The Cattaraugus Creek sub-watershed is primarily deciduous and mixed forest cover. This is an opportunity to integrate the needs of early successional forest/shrubland birds, forest breeding raptors, tree bats, woodland snakes, and vernal pool salamanders. These species often need heterogeneous forest structure during different life stages. Herpetofauna also need wetlands within the forest to breed.

The most critical bird species mentioned previously all require varying types of vertical forest structure. Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management. Specific planning recommendations for this sub-watershed include:

❖ Develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for Canada warbler and golden-winged warbler. Identify the causes for decline in Canada warblers.

The Tonawanda Creek/Niagara River sub-watersheds are dominated by grasslands with several large wetland complexes interspersed in the landscape. The Buffalo River sub-watershed also contains grasslands in the eastern portion, and the Lake Erie sub-watershed contains grasslands along the lake shore. This is an opportunity to integrate the needs of wetland and grassland-dependant species into a holistic management plan for the basin. Components of this larger picture are:

❖ Develop a management plan for the basin that includes land acquisition and management targets for all wetland and grassland-dependent species of greatest conservation need. Minimum management area sizes for various animal classes should be determined, targets for acquisition, and temporal and spatial targets for management actions (mowing, water control) should be set. This should be a component of the above mentioned mosaic management plan, and incorporate basin specific objectives from a statewide grassland bird management plan (already being developed by a consortium of agencies and organizations active in grassland conservation in New York led by Audubon NY) and existing wetland planning efforts including North American Waterbird Plan, Bird Conservation Regional Plans, and others. Specific tasks associated with this planning include:
    - Develop habitat management guidelines and actions for high priority grassland bird species in the Erie basin (Henslow's sparrow, upland sandpiper, Northern harrier, short-eared owl, and sedge wren) for incorporation in the above mosaic management plan and the NYS Open Space Plan in order to better coordinate conservation actions. Identify opportunities in the plan for directing federal funds to grassland habitat.
    - Investigate the feasibility to manage grasslands in the basin with controlled burning. Draft a fire management plan in accordance with these findings.
    - Work with USDA and other partners to develop grassland management incentives that benefit SGCN in this basin.
    - Protect nesting and foraging habitat, including artificial nesting structures and associated upland buffers for beach and island ground-nesting birds (common tern).
    - Develop a long term plan that establishes population objectives for beach and island ground-nesting birds (common tern) and recommends appropriate management options. Secure funding to initiate programs.

- Review existing planning documents and participate in ongoing planning efforts to take advantage of opportunities to protect and manage lands for SGCN in this basin.
    - Review state park master plans, DEC Unit Management Plans and Wildlife Management Area plans for opportunities to better manage state lands for SGCN in the basin.
    - Continue participation in North American waterbird planning. Focus on and refine recommendations for American bittern, black tern, king rail, least bittern, and pied-billed grebe
    - Participate in other planning efforts in the basin (such as watershed plans, lake plans, etc.). As these plans are developed and revised, incorporate information about SGCN and opportunities to benefit SGCN in the basin.
- Continue to develop recovery plans for all fish SGCN and review opportunities to better manage for aquatic SGCN in the basin, including opportunities for control of invasive species.
    - Develop a monitoring and control plan that includes measures to detect invasive bivalves and actions to control them before they become threats.
    - Incorporate freshwater mussel goals and objectives into regional and state water quality and fish management plans and policies.
  - Develop and carry out a recovery plan for longear sunfish and lake sturgeon.
- Develop an avian and bat migration route map using advanced radar imaging and other methodology, and also investigate the effects of landform factors on travel routes. The development of this map and other related information for use as a planning tool is a high priority as new wind power proposals are developed for areas within the Lake Erie Basin.

Land Protection Recommendations

This category of actions encompasses a variety of protection mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of protection should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations.

WATER QUALITY DEGRADATION

A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects. The specific recommendation for water quality is:

- ❖ In key locations, acquire development rights to protect water quality for listed mussel and freshwater fish populations. The high priority species groups that will benefit from this recommendation are freshwater bivalves and freshwater fish.

HABITAT LOSS

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development, dredging, wetland draining, river/stream channel manipulation, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar or different, yet complementary habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support. Habitats fragmented by roads and power lines increase direct mortality of animals due to collisions. Smaller dams affect SGCN by being a physical barrier to dispersal and migration of young and adult aquatic species. Larger hydropower dams also cause impingement and entrainment mortality of fish and wildlife at various life stages. Dams affect water quality downstream by altering temperature, sediment, debris and nutrient transport. Specific recommendations related to habitat loss are:

- ❖ The lands owned by the state government in the basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially adjacent to existing public forest stands. This will enable better management and protection of these habitats for grassland species. Acquisitions should reflect the recommendations of priority grassland focus areas from the NYS grassland bird management plan. Priority species that would benefit from these acquisitions include grassland birds and early successional forest/shrubland birds.
- ❖ Acquisition of forested and grassland upland tracts adjacent to wetland properties is critical to protection and restoration of amphibian, reptile, and freshwater marsh nesting bird species in this basin. Ideally these will be parcels where road building has not fragmented the two cover types. Identification of candidate parcels with these characteristics should occur immediately. The most critical species groups that would benefit from these

acquisitions are vernal pool salamanders, freshwater marsh nesting birds, and uncommon turtles of wetlands.

Over 50% of the wetlands of New York State have been lost over the past century. Emergent marsh habitat and lands with wetland restoration potential adjacent to state owned land should be acquired through fee title or easement. Studies have demonstrated that large emergent habitat parcels are more likely to support certain freshwater marsh nesting species such as black tern, bitterns and rails. Other species which benefit from contiguous wetland habitat include various herons, waterfowl and shorebirds. Specific recommendations related to wetlands are:

- Acquire large wetland parcels or purchase wetland parcels adjoining wetlands in public ownership.
- Acquire parcels with wetland restoration potential that adjoin wetlands in public ownership.

RECOMMENDATIONS FROM THE 2002 NYS OPEN SPACE CONSERVATION PLAN

There are a number of priority acquisitions from the 2002 New York State Open Space Plan that will benefit SGCN.

- Coastal areas along Lake Erie and the Niagara River provide unique habitat for beach and island ground-nesting birds and transient shorebirds. Acquisition of coastal areas will enable restoration of beach and dune habitat.
- Eighteen Mile Creek/Hampton Brook Woods corridor in Region 9. This acquisition priority appears in the Open Space Plan of 2002. The site provides habitat for a diverse assemblage of resident plant and animal species.
- Exceptional forest communities (Region 9) in Zoar Valley, Cattaraugus Creek sub-watershed. The acquisition of the remaining mature forest is a priority in the Open Space Plan of 2002.
- Any tributaries that provide habitat for SGCN in the basin. In particular, Lake Erie tributary gorges in Region 9 are identified in the current Open Space Plan. These gorges are unique ecological and geological areas, and provide steep gorge terrain and habitat.
- Shumla Falls/Canadaway Creek Gorge in Region 9. Canadaway Creek enters a steep sided valley with a shale bottom and several talus slopes. There is a wide diversity of habitats that support SGCN, as noted in the Open Space Plan of 2002.

Management and Restoration Recommendations

HABITAT RESTORATION

Overall alteration of the landscape, primarily since European settlement, has disrupted the natural cycle of habitat disturbance (e.g., fire, wind throw, flooding cycles etc.). Although some of the alterations to the landscape provide important habitat, as in the case of hay and pasture lands, in many cases, management actions such as mowing, burning, silviculture, water-level manipulation, and control of exotic/invasive species, are necessary to mimic natural processes and maintain or manipulate habitats to benefit SGCN. In addition, in many areas where habitat has been severely degraded or altered, habitat restoration is often needed to provide habitat for SGCN.

Early Successional Forest/Shrubland Birds

- ❖ Conduct sustainable silvicultural operations with the goal of doubling the amount of early successional habitat for wildlife on public and private land.
- ❖ Maintain, restore, and enhance early successional habitats through the use of prescribed fire, mowing, and other management tools.

Forest Breeding Raptors

- ❖ Maintain appropriate breeding habitat for forest breeding raptors around occupied nest sites with emphasis on long-eared owl.

Freshwater Marsh-Nesting Birds

- ❖ Manage water levels in nesting areas to prevent nest loss for freshwater marsh-nesting birds, and optimize water and vegetation cover for waterfowl and uncommon turtles of wetlands.
- ❖ Restore emergent marsh to benefit freshwater marsh-nesting birds.
- ❖ Manage predators in nesting areas to reduce egg and chick loss.

Grassland Birds

- ❖ Use mowing and/or prescribed fire to manage the vegetative structure of established grasslands. This should be incorporated into Landowner Incentive and Farm Bill programs.

Beach and Island Ground-Nesting Birds and Transient Shorebirds

- ❖ Expand nesting opportunities for common tern, possibly using man-made tern nesting rafts.
- ❖ Reestablish high-quality transient shorebird foraging habitats by manufacturing sand flats, mudflats, or overwash fans.
- ❖ Control density and composition of vegetation at breeding sites.
- ❖ Create ephemeral pools adjacent to nesting sites.

Lake and River Reptiles

- ❖ Manage uplands adjacent to aquatic habitat and restore hardened shoreline areas to provide adequate and secure nesting sites and dispersal routes for migrating animals.
- ❖ Restore selected habitat for queen snake, including captive breeding, head starting, and relocation strategies.

Freshwater Fish

- Restore habitat and minimize/mitigate flow fluctuations at the Niagara Power Project for lake sturgeon as part of the facility re-licensing process.
- Research lake sturgeon genetics in Lake Erie.
- Ascertain whether reintroduction of eastern sand darter is feasible in Cattaraugus Creek.
- Restore instream and riparian habitat to benefit SGCN.

Uncommon Turtles of Wetlands

- Conduct a variety of habitat management techniques to preserve wetland quality, including maintaining hydrological regimes and vegetation succession.
- Manage adverse effects of habitat fragmentation.
- Mitigate turtle population losses to egg predators.
- Restore Blanding's turtle at selected sites via captive breeding, head starting, nest protection, and restoration strategies.

Freshwater Mussels

- Restore degraded habitat sites to allow for recolonization or reintroduction of listed mussels.

Water Quality

A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land management can be used to prevent or remediate these effects.

- Implement Best Management Practices for forest management in riparian areas in order to maintain, enhance, and restore early successional forest/shrublands. Identify opportunities in the plan for directing federal funds into such habitats.

Lake and River Reptiles

- Manage water-borne pollutants that adversely affect lake and river reptiles.

Freshwater Bivalves and Freshwater Fish

- Manage or restore areas of important mussel and freshwater fish populations by controlling degradation factors, including livestock access, point and nonpoint source pollution, and flow alterations.

Uncommon Turtles of Wetlands

- Curtail contaminant inputs to wetlands.

Invasive Species

Invasive species threaten many SGCN in the Lake Erie Basin. This threat may be through direct competition for nesting sites, prey, and other limited resources, or by alteration of the structure and quality of habitat, as in the case of invasive plants like purple loosestrife. Displacement of native species by invasive species disrupts ecological processes.

Freshwater Marsh Nesting Birds

- Control purple loosestrife and *Phragmites* where they are known to negatively affect marsh-nesting birds. Techniques could include biological controls.

Lake and River Reptiles

- Control invasive aquatic plants where they are negatively affecting salamanders. Techniques could include biological, chemical, and mechanical means.
- Control invasive species such as Japanese knotweed along riparian areas.

Vernal Pool Salamanders

- Control invasive aquatic plants where they negatively affect salamanders. Techniques could include biological, chemical, and mechanical means.
- Limit introductions of fish and other predatory species into habitats critical to vernal pool salamanders.

Uncommon Turtles of Wetlands

- Control invasive species to preserve suitable wetland habitat.

Freshwater Fish and Freshwater Bivalves

- Control invasive species where they negatively affect freshwater fish and bivalves. Techniques could include biological, chemical, and mechanical control methods.
- Monitor the status of eastern sand darter in the areas of Lake Erie they formerly occupied to determine their relationships with the invasive goby now abundant there.

Human-Wildlife Interactions

There are a variety of threats to SGCN in the basin from direct interactions with humans. These include vehicle and structure collisions, illegal and unregulated harvest, and unintentional entanglement. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines and roads, are a significant source of mortality. Collection of wild animals for pets and food also may contribute to species declines.

Lake and River Reptiles

- Reduce excessive disturbance by watercraft in habitats critical to lake and river reptiles.
- Reduce incidental take of lake and river reptiles by fishing gear.

Vernal Pool Salamanders

- Reduce habitat destruction and collisions by off-road vehicles in vernal pools occupied by salamanders.

Uncommon Turtles of Wetlands

- Limit human access to sensitive wetland habitat where they provide habitat to these turtles.
- Mitigate population losses to vehicular road kill.

Beach and Island Ground-Nesting Birds (Common Tern)

- Protect nesting sites from human disturbance by posting and fencing.
- Establish and maintain enforcement of no-work windows within breeding habitats.

Riparian Tiger Beetles

- Mitigate detrimental ATV use on cobble bars.

Information Dissemination Recommendations

Sharing of information allows stakeholder groups to make informed decisions about activities that may help or harm SGCN. Sharing of information may take many forms, including best management practices, fact sheets, and educational outreach programs.

Land Management

Traditional agricultural, silvicultural and public and private land-management operations may lack wildlife-based objectives, thus may be detrimental to wildlife. Providing information to public and private land managers may help mitigate detrimental practices.

- ❖ Make information available to public and private land managers regarding the benefits and need for early successional habitat, including even-aged forest stand management and sustainable silvicultural practices, for early successional forest/shrubland birds.
- ❖ Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrubland birds.
- ❖ Develop an outreach program for public and private land managers to increase awareness of the benefits of grasslands and wildlife-friendly agricultural practices. Species groups that will benefit include freshwater marsh-nesting birds and grassland birds.
- ❖ Promote the establishment of vegetated buffers around agricultural fields to protect wetlands and streams from runoff and benefit freshwater marsh-nesting birds, freshwater fish, and bivalves.
- ❖ Provide education and outreach to forest managers regarding silvicultural practices compatible with forest breeding raptors, early successional forest/shrubland birds, freshwater fish, and bivalves.

Invasive Species

Introduction and spread of exotic species can often be minimized or prevented through increased awareness of natural resource users to the negative effects of these species on native wildlife. Awareness should be accompanied by specific actions that natural resource users can employ to prevent spread of invasive and exotic species.

- ❖ Develop and post educational signs in appropriate languages at markets dealing in live bivalves, fish, and crustacea, explaining the dangers of releasing exotic animals into New York State.
- ❖ Provide education and outreach to contractors on best management practices to prevent the spread of invasive species during road and bridge construction and maintenance.

Human-Wildlife Interactions

Human behavior can be altered by education and outreach. Providing information about negative effects of human disturbance on wildlife can help reduce detrimental interactions.

- ❖ Enhance public education to curtail collection and translocation of turtles.
- ❖ Develop an outreach and educational tool to highlight the possible detrimental effects of human disturbance on wetland dependent wildlife. An example could be off-road vehicle effect on vernal pool and marsh-nesting species.
- ❖ Develop outreach material to educate the public about the benefits of grasslands, freshwater mussel life history, and at-risk Lepidoptera.

- Review and respond to projects involving tall structures that may adversely affect tree bats.
- Develop outreach materials on the effects of domestic cats to beach and island ground-nesting birds. Post interpretive signage at all public nesting locations. Update endangered species fact sheets to reflect current status of species.
- Make information available to municipal planners, public land managers, and NGOs regarding the benefits of providing habitat for SGCN and other wildlife, the habitat requirements of different species, and the techniques needed to provide and maintain the habitat.

Regulatory and Legislative Recommendations

Regulatory proposals will likely be made at the statewide level-though local governments have opportunities to modify or create laws and regulations to enhance local protection of SGCN.

Habitat Protection

Local zoning and taxation policies can be used to discourage sprawl and habitat fragmentation without growth, an issue of particular importance in this basin. Regulatory proposals related to prevention of habitat loss include:

- ❖ Pursue protection of wetlands less than 12.4 acres that provide habitat for herpetofauna of greatest conservation need through existing provisions for wetlands of 'unique local significance' under Article 24 of the Environmental Conservation Law (ECL). Upland buffers associated with these wetlands should reflect actual usage by foraging herpetofauna species.
- ❖ Review all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species need expanded protection either under Article 24 of the ECL or by local ordinance.
- ❖ Increase regional permit oversight of development and highway projects that may affect freshwater bivalves.
- ❖ Mitigate habitat effects to beach and island ground-nesting birds from development and public work projects to meet no net-loss goal.
- ❖ Eliminate detrimental ATV use on cobble bars inhabited by riparian tiger beetles.
- ❖ Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN.

Water Quality Protection

Regulatory proposals related to protection of water quality include:

- ❖ Limit the use of pesticides on publicly owned marshes to prevent reduction of insect populations and contamination of wetlands used by SGCN, including freshwater marsh-nesting birds.
- ❖ Require testing of all new pesticides, consistent with current DEC and EPA regulations, for effects on all life stages of freshwater bivalves prior to approval for use in the state.
- ❖ Improve implementation and enforcement of water quality regulations on stream segments that provide habitat for SGCN.

Uncontrolled Harvest and Collection

Regulatory proposals related to protection of animals from uncontrolled collection and/or harvest include:

- ❖ Implement pending legislation that includes small game protections for uncommon turtles of wetlands, vernal pool salamanders, riparian tiger beetles, and lake and river reptiles. Protection should also be provided for freshwater bivalves.
- ❖ Enhance law enforcement to limit collection and translocation of wood turtles.

Invasive Species

Regulatory proposals related to the prevention of the introduction and spread of exotic and invasive species include:

- Implement regulatory recommendations of the Governor's Invasive Species Task Force to control the introduction and distribution of exotic and invasive species such as purple loosestrife. This will benefit multiple taxa.
- Ban the importation of fish that feed on native freshwater bivalves.

Incentives

No recommendations at this time

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Tables and Figures

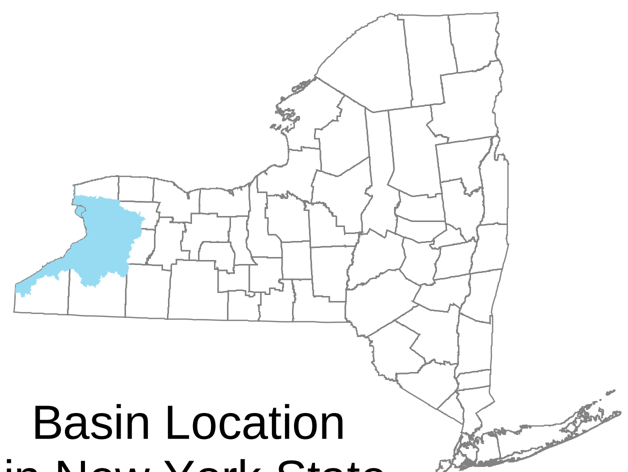
Tables

Figures

Lake Erie Figure 1.

LAKE ERIE BASIN

Multi-Resolution
Land Cover Map



Basin Location
in New York State

LEGEND

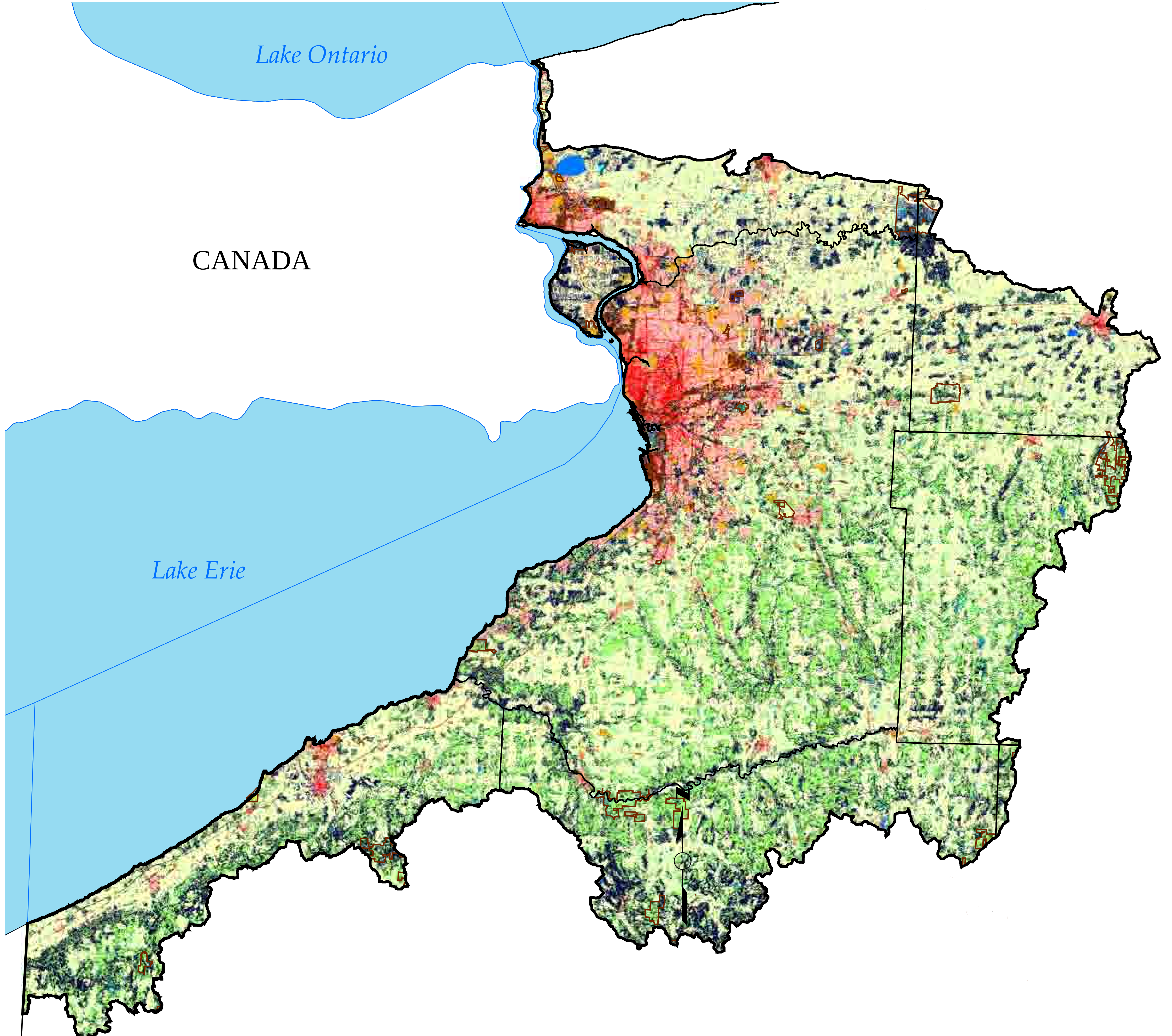
- Major Waterbody
- County Boundary
- DEC Lands and NYS Parks

Landuse/Land Cover Values

- Uncoded
- Water
- Low Intensity Residential
- High Intensity Residential
- High Intensity Commercial/Industrial
- Pasture/Hay
- Row Crops
- Parks, Lawns, Golf Courses
- Evergreen Forest
- Mixed Forest
- Deciduous Forest
- Woody Wetlands
- Emergent Wetlands
- Barren; Quarries, Strip Mines, Gravel Pits
- Barren; Bare Rock and Sand
- Barren; Transitional

0 5 10 Miles

This map was produced by NYS DEC,
from MRLC data, July 2005.



Lake Erie Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Lake Erie Basin

Classification	% Cover
Row Crops	27.98
Deciduous Forest	21.35
Mixed Forest	20.69
Pasture/Hay	17.87
Low Intensity Residential	5.49
Parks, Lawns, Golf Courses	1.84
High Intensity Commercial/Industrial	1.51
High Intensity Residential	1.49
Water	0.62
Evergreen Forest	0.50
Woody Wetlands	0.36
Barren; Quarries, Strip Mines, Grave	0.2
Emergent Wetlands	0.1

Lake Erie Table 2. State Parks within the Lake Erie Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
BUCKHORN ISLAND (9)	895	UPLAND/WETLAND
FORT NIAGARA	272	
JOSEPH DAVIS (9)	382	UPLAND
KNOX FARM (9)	633	UPLAND/WETLAND/GRASSLAND
EARL W. BRUDGES ARTPARK (9)	219	X
DEVILS HOLE (9)	37	X
WHIRLPOOL (9)	101	X
NIAGARA RESERVATION (9)	221	X
BIG SIX MILE CREEK MARINA (9)	20.6	X
BEAVER ISLAND (9)	795.7	X
WOODLAWN BEACH (9)	97	X
EVANGOLA (9)	733	X
LAKE ERIE (9)	349	X

Lake Erie Table 3. NYSDEC land units within the Lake Erie Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
STATE FORESTS (9 total))	16,488	MULTIPLE
ZOAR VALLEY MULTIPLE USE AREA	X	X
CANADAWAY CREEK WMA (9)	2,080	UPLAND
GREAT BAEHRE WMA (9)	271	WETLAND
HAMPTON BROOK WOODS WMA (9)	56	UPLAND
TILLMAN ROAD WMA (9)	230	UPLAND/WETLAND
TONAWANDA WMA (9)	5,716	UPLAND/WETLAND

Lake Erie Table 4. Critical Environmental Areas within the Lake Erie Basin

Unit Name (DEC Region)	Location	Approved Criteria
18 MILE CREEK (9)	HAMBURG	EXCEPTIONAL OR UNIQUE CHARACTER
CAYUGA CREEK (9)	CHEEKTOWAGA	PRESERVE WILDLIFE AND GREEN AREAS
JOHN STIGLMEIER PARK (9)	CHEEKTOWAGA	PRESERVE WILDLIFE AND GREEN AREAS
REINSTEIN WOODS (9)	CHEEKTOWAGA	NONE GIVEN
WETLANDS	CHEEKTOWAGA	NONE GIVEN

Lake Erie Table 5. Significant Coastal Areas within the Lake Erie Basin.

Unit Name (DEC Region)	Acres	Location
CATTARAUGUS CREEK (9)	1,328	HANOVER
DUNKIRK HARBOR (9)	478	DUNKIRK
BIG SISTER CREEK (9)	23	EVANS
SMALL BOAT HARBOR - BUFFALO (9)	181	BUFFALO
SMOKE CREEK SHOALS (9)	529	LACKAWANA
STRAWBERRY ISLAND - MOTOR ISLAND SHALLOWS (9)	458	GRAND ISLAND
TIFFT FARM NATURE PRESERVE (9)	278	BUFFALO
TIMES BEACH DIKED DISPOSAL AREA (9)	62	BUFFALO
LOWER NIAGARA RIVER RAPIDS	141	NIAGARA FALLS
CANADAWAY CREEK (9)	85	DUNKIRK
CHAUTAUQUA CREEK (9)	41	WESTFIELD
SILVER CREEK & WALNUT CREEK (9)	8	SILVER CREEK
VAN BUREN POINT (9)	2,827	PORTLAND
BUCKHORN ISLAND - GOAT ISLANDS RAPIDS (9)	902	NIAGARA FALLS
BUCKHORN ISLAND WETLANDS (9)	541	GRAND ISLAND
18 MILE CREEK - LAKE ERIE (9)	80	HAMBURG
GRAND ISLAND TRIBUTARIES (9)	42	GRAND ISLAND

Lake Erie Table 6. Draft Audubon Important Bird Areas within the Lake Erie Basin.

Unit Name (DEC Region)	Acres	Approved Criteria
DUNKIRK HARBOR/POINT GRATIOT (9)	755	% POPULATION; SPECIES AT RISK; WATERBIRDS/FOWL
NIAGARA RIVER CORRIDOR (9)	98,000	% POPULATION; SP AT RISK; SHRUB/SCRUB; WATERBIRDS
RIPLEY HAWK WATCH (9)	16,000	RAPTORS
TIFFT NATURE PRESERVE (9)	275	SPECIES AT RISK
WHEELER'S GULF (9)	210	SPECIES AT RISK

Lake Erie Table 7. Critical **aquatic** habitats found in Lake Erie basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	# of Species
Lacustrine	cold water deep	13
Lacustrine	cold water shallow	4
Lacustrine	unknown	2
Lacustrine	warm water deep	5
Lacustrine	warm water shallow	7
Palustrine	mineral soil wetland	24
Palustrine	peatlands	2
Palustrine	warmwater stream	1
Riverine	coldwater deep	1
Riverine	coldwater stream	13
Riverine	deepwater river	10
Riverine	unknown	1
Riverine	warmwater deep	1
Riverine	warmwater shallow	1
Riverine	warm water stream	14
Subterranean	natural	1

Lake Erie Table 8. Critical **terrestrial** habitats found in Lake Erie basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	# of Species
Terrestrial	barrens/woodlands	8
Terrestrial	coastal	3
Terrestrial	forested	34
Terrestrial	open upland	42

Lake Erie Table 9. Lake Erie current species diversity relative to the total number of SGCN statewide

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**14**	**63**	**118**	**53.4**
Bald Eagle		1		
Beach and Island Ground-Nesting Birds		1	7	14.3
Breeding Waterfowl		2	4	50.0
Colonial-Nesting Herons		1	8	12.5
Common Loon		1		
Common Nighthawk		2		
Deciduous/Mixed Forest Breeding Birds		3	9	33.3
Early Successional Forest Breeding Birds		4	12	33.3
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		6	6	100.0
Grassland Birds		6	11	54.5
Peregrine Falcon		8		
Transient Shorebirds		11	14	78.6
Wintering Waterbirds		11	19	57.9
CRUSTACEA	**1**	**1**	**7**	**14.3**
Freshwater Crustacea		1	2	50.0
FRESHWATER FISH	**9**	**10**	**40**	**25.0**
Bigeye chub		1		
Black redhorse		1		
Brook trout, Heritage strains		1		
Eastern sand darter		1		
Iowa darter		1		
Lake sturgeon		1		
Longear sunfish		1		
Mooneye		1		
Redfin shiner		1		
W. pirate perch		1		
HERPETOFAUNA	**7**	**15**	**44**	**34.1**
Freshwater Wetland Amphibian		3	5	60.0
Lake/River Reptiles		4	5	80.0
Mudpuppy		1		
Snapping Turtle		1		
Uncommon Turtles of Wetlands		2	5	40.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		2	8	25.0
INSECT	**3**	**7**	**197**	**3.6**
Odonates of Rivers/Streams		2	19	10.5
Other Butterflies		3	18	16.7
Riparian Tiger Beetles		2	2	100.0
MAMMAL	**2**	**3**	**21**	**14.3**
Furbearers		1	2	50.0
Tree Bats		2	3	66.7
MARINE FISH	**1**	**1**	**51**	**2.0**
American Eel		1		
MOLLUSK	**1**	**5**	**59**	**8.5**
Freshwater Bivalves		5	39	12.8
TOTAL	**38**	**104**	**537**	**19.4**
% of all spp groups statewide	**29.7**			

Lake Erie Table 10. Species of Greatest Conservation Need currently occurring in the Lake Erie Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Beach and Island ground-nesting birds	Common tern	Unknown
Bird	Breeding waterfowl	American black duck	Unknown
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Colonial-nesting herons	Black-crowned night-heron	Decreasing
Bird	Colonial-nesting herons	Great egret	Increasing
Bird	Common loon	Common loon	Unknown
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Unknown
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Decreasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Black tern	Decreasing
Bird	Freshwater marsh nesting birds	King rail	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Freshwater marsh nesting birds	Yellow rail	Unknown
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Dickcissel	Unknown
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Osprey	Osprey	Unknown
Bird	Peregrine falcon	Peregrine falcon	Stable
Bird	Transient shorebirds	American golden-plover	Unknown
Bird	Transient shorebirds	Buff-breasted sandpiper	Unknown
Bird	Transient shorebirds	Greater yellowlegs	Unknown
Bird	Wintering waterbirds	Bonaparte's gull	Unknown
Bird	Wintering waterbirds	Greater scaup	Increasing
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Lesser scaup	Stable
Bird	Wintering waterbirds	Little gull	Unknown
Bird	Wintering waterbirds	Long-tailed duck	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Bird	Wintering waterbirds	Thayer's gull	Unknown
Crustacea/Meristomata	Freshwater crustacea	Devil crawfish	Stable
Freshwater fish	Bigeye chub	Bigeye chub	Stable
Freshwater fish	Black redhorse	Black redhorse	Stable

Lake Erie Table 10. (continued)

Taxa Group	Species Group	Species	Stability
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Eastern sand darter	Eastern sand darter	Decreasing
Freshwater fish	Iowa darter	Iowa darter	Unknown
Freshwater fish	Lake sturgeon	Lake sturgeon	Unknown
Freshwater fish	Longear sunfish	Longear sunfish	Unknown
Freshwater fish	Mooneye	Mooneye	Unknown
Freshwater fish	Redfin shiner	Redfin shiner	Decreasing
Freshwater fish	Western pirate perch	Western pirate perch	Unknown
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Fowler’s toad	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Northern map turtle	Unknown
Herpetofauna	Lake/river reptiles	Queen snake	Decreasing
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Mudpuppy	Common mudpuppy	Decreasing
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Blanding's turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Blue-tipped dancer	Unknown
Insect	Other butterflies	Checkered white	Decreasing
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Southern grizzled skipper	Unknown
Insect	Riparian tiger beetles	*Cicindela ancocisconensis*	Unknown
Insect	Riparian tiger beetles	Cobblestone tiger beetle	Unknown
Mammal	Furbearers	River otter	Unknown
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	American eel	American eel	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Kidneyshell	Unknown
Mollusk	Freshwater bivalves	Slippershell mussel	Unknown
Mollusk	Freshwater bivalves	Threeridge	Unknown
Mollusk	Freshwater bivalves	Wabash pigtoe	Unknown

Lake Erie Table 11. SGCN that historically occurred in Lake Erie Basin, but are now believed to be extirpated from the basin.

Taxa Group	Species Group	Species
Bird	Loggerhead Shrike	Loggerhead shrike
Freshwater fish	Extirpated fishes	Atlantic salmon
Freshwater fish	Blackchin shiner	Blackchin shiner
Freshwater fish	Deepwater sculpin	Deepwater sculpin
Freshwater fish	Extirpated Fishes	Lake chubsucker
Freshwater fish	Sauger	Sauger
Freshwater fish	Extirpated Fishes	Shortjaw cisco
Freshwater fish	Extirpated Fishes	Silver chub
Freshwater fish	Extirpated Fishes	Spoonhead sculpin
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake
Insect	Other moths	*Papaipema aerata*
Insect	Stoneflies/Mayflies of lotic waters	*Epeorus punctatus*
Insect	American burying beetle	American burying beetle
Insect	Other moths	Culvers root borer
Insect	Odonates of rivers/streams	Midland clubtail
Insect	Odonates of small forest streams	Mocha emerald
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mammal	Small mammals of uncertain/questionable residency	Least weasel
Mammal	Tree bats	Silver-haired bat
Mollusk	Freshwater bivalves	Black sandshell
Mollusk	Freshwater gastropods	Buffalo pebblesnail
Mollusk	Freshwater gastropods	Campeloma spire snail
Mollusk	Freshwater bivalves	Eastern pondmussel
Mollusk	Freshwater bivalves	Fawnsfoot
Mollusk	Freshwater gastropods	Globe siltsnail
Mollusk	Freshwater gastropods	Gravel pyrg
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater bivalves	Mapleleaf
Mollusk	Freshwater bivalves	Mucket
Mollusk	Freshwater bivalves	Pimpleback
Mollusk	Freshwater bivalves	Pocketbook
Mollusk	Freshwater bivalves	Salamander mussel
Mollusk	Freshwater bivalves	Snuffbox
Mollusk	Freshwater gastropods	Spindle lymnaea
Mollusk	Freshwater gastropods	Watercress snail
Mollusk	Freshwater bivalves	Yellow sandshell

Lake Erie Table 12. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats to SGCN in the Lake Erie Basin. For details on threats, see Appendix: *Threats Characterization for Wildife and their Habitats*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Multiple [a]	35	92.1	13.2
Habitat loss- conversion to cultural	26	68.4	9.8
Contaminants, pesticides	19	50.0	7.2
Degradation of water quality	15	39.5	5.7
Human disturbance - illegal/unregulated harvest	15	39.5	5.7
Human disturbance - collisions	14	36.8	5.3
Disturbed predator/prey cycles	12	31.6	4.5
Competition for life support	11	28.9	4.2
Disease	10	26.3	3.8
Altered hydrology - loss of aquatic habitat quantity	10	26.3	3.8
Habitat fragmentation	8	21.1	3.0
Human disturbance - direct and indirect	7	18.4	2.6
Unsustainable agricultural/silvicultaral practices	7	18.4	2.6
Sedimentation/erosion	7	18.4	2.6
Active alteration of natural processes - fire, etc.	6	15.8	2.3
Habitat loss - natural succession - agricultural reversion; forestry	6	8.0	2.3
Competition from exotics - loosestrife, phragmites	5	8.0	1.9
Human disturbance - entanglement, entrainment	5	8.0	1.9
Loss of streamside buffers	4	8.0	1.5
Altered hydrology - loss of aquatic habitat quality	4	8.0	1.5
Detrimental hybridization	4	8.0	1.5
Unknown threats	4	8.0	1.5
Reduction of patch size, shape, area	3	8.0	1.1
Loss of connectivity	3	8.0	1.1
Susceptibility to stochastic events - weather, storm events	3	8.0	1.1
Susceptibility to stochastic events - isolated populations	3	7.9	1.1
Barriers (roads; development; curbs)	2	5.3	0.8
Terrestrial habitat composition altered by invasives/non-natives	2	5.3	0.8
Terrestrial habitat composition altered by overuse (deer browse, etc.)	2	5.3	0.8
Aquatic habitat altered by invasives or non-natives	2	5.3	0.8
Susceptibility to stochastic events - rare species	2	5.3	0.8
Climate change (sea level rise; temperature changes)	2	5.3	0.8
Pollution (acid rain; soil contamination)	1	2.6	0.4
Aguatic habitat altered by overuse (beaver, geese, swans, muskrats)	1	2.6	0.4
Human created abrupt edges	1	2.6	0.4
Loss of host species	1	2.6	0.4
Active alteration of natural processes - beaver activity, spring flooding	1	2.6	0.4
Climate change (range restriction; changes in distribution)	1	2.6	0.4
Erosion - silviculture; agriculture; stormwater	1	2.6	0.4

[a] Multiple = recommended action addresses multiple threats rather than one specific threat

Lake Erie Table 13. Existing management plans and agreements within the Lake Erie Basin.

Plan/Agreement Name	Involved Parties	Information
Lake Erie Gorges Biodiversity Inventory and Landscape Integrity Analysis October 2002	NYNHP	Integrity analyses; natural communities; conservation planning priorities
Lake Erie Lakewide Management Plan (LaMP) - April 2002	USEPA	State of the lake; guiding principles; goals and objectives - improve connectivity, restore ecosystems, prevent invasives, implement monitoring strategy
Fish Community Goals and Objectives for Lake Erie- Special Publication 30-02	Great Lakes Fishery Commission	Fish communities in Lake Erie
Effect of Water Levels and Flow Fluctuation on Aquatic and Terrestrial Habitat	New York Power Authority	Impacts of water on habitats

Description of the Basin

The Lower Hudson-Long Island Bays watershed covers 1.7 million acres of land and nearly 1 million acres of open water in the southeastern portion of New York State. The basin extends from the Bear Mountain Bridge across the Hudson River to the eastern end of Long Island. The coastal waters included in the basin are the New York waters of New York Harbor to an imaginary line drawn from Rockaway Point to Sandy Hook, N.J.; all of the bays on the south shore of Long Island to lines drawn across the ocean side of the inlets to those bays; and the New York waters of Long Island Sound and Block Island Sound to an imaginary line drawn from the intersection of the New York, Connecticut, and Rhode Island state lines east of Fisher's Island to Montauk Point. The oceanic portions of the state waters (>32 parts per thousand (ppt.) salinity) are included as part of the Atlantic Ocean Basin section of this strategy. These two basins are inextricably linked and conservation actions conducted in each should be well coordinated. The western boundary of the watershed extends to Greenwood Lake to include two sub-watersheds; the Raritan, that includes the New York state portions of the drainages of the Passaic and Ramapo Rivers, and Newark Bay that includes the New York state portion of the drainage of the Hackensack River. The New York state sections of the St. Johns basin, which drains to the Housatonic River, then to Long Island Sound, have been combined with this basin as well. See Lower Hudson-Long Island Bays Figure 1 for a graphic depiction of the estuarine waters included in the Lower Hudson-Long Island Bays Basin.

According to U.S. Environmental Protection Agency's (USEPA) Multi-Resolution Land Classification (MRLC), the dominant land cover types in the basin are "low intensity residential," "mixed forest," and "deciduous forest." The basin overall is 41.8% developed with structures and hardscape, with another 9.38% of developed green space, including parks, lawns, golf courses, pastures, hay fields, and row crops. The remaining 41.35% of land cover in the basin is forested, with deciduous forests dominating. A complete list of the land classification types and corresponding percentages are found in Lower Hudson-Long Island Bays Table 1.

Water is a significant feature in this basin. In addition to the lake and stream features found within land forms, the basin contains estuarine (0.5-18 ppt. salinity) waters within the lower Hudson River (downstream of Peekskill or Bear Mountain Bridge) and the many bays and harbors in the greater metropolitan region of the state. In addition to the lower Hudson River, significant bays and estuaries include New York Harbor, Long Island Sound, Great South Bay, and the Peconic Bays. This basin has 3 of only 28 Estuaries of National Significance included in the Federal National Estuary Program, Long Island Sound, New York-New Jersey Harbor, and Peconic Bay.

There are over 124,000 acres of state park lands in the basin and an additional 17,199 acres are owned and managed by New York State Department of Environmental Conservation (DEC). The names and acreage of these lands are listed in Lower Hudson-Long Island Bays Tables 4 & 5. There are also several federally owned and managed properties in the basin, including the units of the Long Island National Wildlife Refuge System, and the Gateway National Recreation Area.

The 2000 census recorded about 12.2 million residents in the basin making this basin the most heavily populated in the state, yet there are portions that are still very rural with low housing and road density. Population density ranges from 0 to more than 380,000 people per square mile with an average population density of 35,000 people per square mile. This basin contains over 4% of the entire population of the United States. Population growth projections for this portion of the state indicate that the population will grow by over 14% in the next 20 years (Demographia.com, 2005). Six of the top 11 ranked counties for population growth in New York are found in this basin.

Hudson River, Highlands and Western Units

In the northern portion of the basin, the Hudson River, its valley, and the surrounding highlands are dominant geographic features. The nearly 50 mile section of the river from the Bear Mountain Bridge in the north to the southern tip of Manhattan is part of a tidal estuary. The river becomes measurably salty near the Tappan Zee Bridge, but the extent of salt varies throughout the year depending on rainfall. To either side of the river near the Bear Mountain Bridge is the Hudson Highlands region of the state. These highlands are steep cliffs that cradle the sediment laden river as it winds toward the Atlantic Ocean. On the west side of the river sits Bear Mountain and Harriman State Parks. There are several New York City water supply reservoirs on the east side of the river, within the watershed. The entire Hudson Highlands area is of ecological significance for the great species diversity found there, though the majority of the Highlands physiographic region is outside of this basin and in the Upper Hudson and Delaware basins.

The eastern shore of the river is lined with rail road tracks that have created impoundments and sloughs. There is intense urban/suburban development along both shores of the river punctuated with stretches of waterfront parks, National Estuary Reserves, Camp Smith Army National Guard base, West Point Military Academy, numerous power plants including Indian Point Nuclear Power Plant, and several smaller inland state parks. The Appalachian Trail traverses this section of the lower Hudson valley from southwest to northeast. Development density increases and spreads further from the river toward New York City. Land cover in Westchester County is dominated by low intensity residential development. The western extension, or the sub-watershed with coastal plains uplands in Rockland and Orange Counties, has fish associations found more commonly in New Jersey.

The Hudson valley has diverse natural habitat ranging for high altitude barrens to coastal lowland marshes. This area includes the rare tidal fresh and brackish marsh communities which are among the most diverse wetlands in the state. The Hudson River serves as a migratory corridor for a number of marine and freshwater fish and avian species, including striped bass, eels, and many species of herring which all move up and down the river to and from spawning grounds. The lower section within this basin is a major transition point in the salinity of the Hudson River from the oceanic and estuarine environment of the New York Bight to the freshwater environment of the upper river and tributaries. This is also an important nursery area for juvenile diadromous fishes.

New York–New Jersey Harbor Estuary

The New York-New Jersey Harbor Estuary forms the confluence of several large coastal rivers and sits at the apex of the New York Bight, a major feature of the Atlantic coastline of the U.S. It includes the tidal waters from the Piermont Marsh on the Hudson River, to an imaginary line from Sandy Hook, N.J. to Rockaway Point, N.Y. The core area of the estuary includes the bi-state waters of the Hudson River, Upper and Lower Bay, Arthur Kill, Kill Van Kull, and Raritan Bay. In New York, it includes the East and Harlem Rivers and Jamaica Bay. Other waters are included on the New Jersey side of the harbor.

Over 20 million people live and work around the harbor, creating many stresses on the air, land and water environments and the species that live there. Over 75% of the region's historic wetlands and much of its forests and grasslands have disappeared over the past century. Although water quality has improved dramatically in the past several decades, portions of the harbor still do not meet water quality standards. In spite of all the pressures placed on the harbor by humans, it still supports a surprisingly diverse array of habitats and living species.

The Bight funnels migrating birds, fish, and insects into the Harbor. Species entering the harbor are further constrained by the expanse of land occupied by intense development, which makes the remaining green spaces in the city all the more important. In spite of the staggering human population density in New York City, more than 270 bird species have been documented in Central Park alone. Several islands in the harbor are regionally important breeding areas for the state's colonial waterbirds and wading birds and the surrounding wetlands provide important foraging areas. Staten Island is the least developed of the 5 New York City boroughs and is home to globally rare plant communities in its wetlands and woods.

Over 100 species of marine, estuarine, and diadromous fish have been recorded in the harbor and Raritan Bay continues to support a commercial hard clam fishery.

Long Island

Long Island extends northeast from the apex of the New York Bight and is composed of glacial till. There are two prominent depositional moraine features that extend the length of the island and form the distinctive north and south forks of the east end. The moraines divide the island into distinctive areas.

The north shore of Long Island is dominated by glacial features bordering the Long Island Sound estuary. The Sound is a 150 mile long tidal strait connected to New York Harbor on the western end through the East River, and connected to Block Island Sound on the east end. Long Island Sound is morphologically similar to a fjord, deep and narrow with sills that separate the Sound into three basins. The Sound is generally poorly flushed and proximity to the dense development of New York City and Nassau County make the western basin prone to hypoxia in the summer months. Historically, the Sound has been most important commercially for lobsters and oysters.

The shoreline area between the Harbor Hill glacial moraine and the Sound is dominated by secondary deciduous forest cover, low density residential development, and shallow bays. A string of parks can be found along the moraine ridge, extending from Staten Island to Nassau County. Beaches along the Sound range from coarse grained sand and gravel to cobble and several are designated as state, federal, or local parkland. The largest river on the north shore is the Nissequogue River in Smithtown, and it is bordered by three state parks, a Suffolk County park, and several smaller town parks.

The westernmost bays along the north shore are characterized by extensive mudflats and sparse fringing tidal marshes. There is generally more intensive industrial and commercial development in the western bays. Eastern north shore bays are more expansive and have fuller tidal marsh zonation. Development density generally decreases from west to east.

The north shoreline elevation peaks near Port Jefferson with nearly vertical sand bluffs. The bluffs decrease in height to the east. The easternmost portions of the north shore are still quite rural with extensive farmlands that have the highest market value production per acre in the state. However, eastern Suffolk County as a whole is under intense development pressure.

The south shore of Long Island is a glacial outwash plain that slopes down from the moraines to a series of lagoons enclosed by a barrier beach system. The south shore is more densely developed than the north shore. Much of the extensive salt marshes in the south shore bays have been negatively affected by dredging, mosquito ditching, marsh erosion, and filling for residential development, as well as inputs from upland development. The western barrier beaches have been intensively developed with high rise buildings and high density detached homes in Queens and Nassau Counties with some stretches of parkland at Breezy Point, Rockaway, and Jones Beach. The eastern barrier beaches are developed with lower density single-family homes punctuated by federal, state, county, and town parks (such as the Fire Island National Sea Shore and Jones Beach State Park) with limited development.

The south shore bays have traditionally been valuable for commercial and recreational hard clam fisheries, and recreational boating and fishing. The largest rivers on the south shore are the Connetquot and Carmens Rivers, but there are numerous tidal creeks and impoundments that drain to the bays. All of the south shore bays have been affected by dredging activity and nutrient enrichment due to human land use.

The east end of Long Island is home to the Peconic River and estuary, extensive pine barrens, and the largest remaining tracts of maritime heath, shrub, and grasslands in New York. The Peconic estuary is located between the north and south forks of Long Island, and consists of over 100 harbors, embayments and tributaries which span more than 128,000 acres of land and 158,000 acres of surface water. The estuary is relatively shallow and home to bay scallops, remnant beds of eelgrass, and many wintering waterfowl. The land side of the east end and Peconic area supports tiger salamanders, coastal ponds, and a high diversity of rare plant and animal species tracked by the New York Heritage Program.

Critical habitats of the basin and the species that use them

There are 229 species of greatest conservation need (SGCN) that currently occur in the basin and 44 species that historically occurred in the basin but are now believed to be extirpated. Lower Hudson-Long Island Bays Tables 4 and 5 list the current and historic species which are SGCN and associated with the Lower Hudson River-Long Island Bays Basin, respectively. Lower Hudson-Long Island Bays Table 5 also includes several species that were historically found in the basin, but whose current distributions and status are unknown, primarily moth and butterfly species. More information on specific distributions of these animals can be found in the insect taxa report in Appendix A. Lower Hudson-Long Island Bays Table 4 also includes information about the stability of the population of those animals currently within the basin. This basin has more of these SGCN than any other of all the basins in New York State, overall the basin contains 42.6% of all these species. The basin contains 75.4% of all the bird SGCN, 71.4% of the crustacea, 72.7% of the herpetofauna, 49% of the marine fish and 8% of the freshwater fish. Lower Hudson-Long Island Bays Table 6 contains further information regarding the species diversity of this basin.

Many of the marine fish and wildlife SGCN only occur in this basin or the Atlantic Ocean Basin statewide. Examples include all 25 marine fish species, the 5 species of sea turtles, and the seven species of salt marsh breeding birds. Long Island especially has increased plant and animal diversity due to its geographic location at the southern end of the geographic range of many northern species, and the northern end of the geographic range of many southern species. American lobster, winter flounder, and blue mussels are examples of northern species at the edge of their range on Long Island. This edge-of-range phenomenon is, in many cases, an added stressor to these species. It is thought that warmer water temperatures in Long Island Sound over the past few years have played a role in mass mortality events of lobsters there.

DEC staff members who compiled the SGCN information in the State Wildlife Grants database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger et al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers at DEC, e.g. "cold water - shallow".

Each of these systems and subsystems are further refined into a habitat category in the State Wildlife Grants database. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. The System-Subsystem classes that are listed as critical to species in

Lower Hudson River-Long Island Bays Basin are listed in Lower Hudson-Long Island Bays Table 7. These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather it is a subset of the habitats deemed critical to SGCN that occur in the basin.

There are excellent detailed discussions of the habitats of this basin found in the Comprehensive Conservation and Management Plans of the Long Island Sound Study, New York/New Jersey Harbor Estuary Program, and Peconic Estuary Program. The two state estuary programs, the South Shore Estuary Reserve Program and the Hudson River Estuary Program also have Comprehensive Management Plans that describe the habitats of those estuaries and the nearshore upland in detail. Another report produced by Cornell University and the DEC for the Hudson River Estuary Program (Penhollow et al., 2002) describes biodiversity “hot spots” within the estuary program boundaries in great detail. The Pine Barrens Reserve Management Plan and enacting legislation describe that habitat complex in detail. In addition, there are many OPRHP and DEC management area natural resource inventories, unit management plans, and park master plans that contain descriptions of the physical environment of those lands. Two federal publications, *Significant Habitats of the New York Bight* and *Northeast Coastal Areas Study*, both published by the U.S. Fish and Wildlife Service, have detailed ecological descriptions of this basin, the species that use it, and the primary threats to the species and their habitats. All of these publications were consulted in the process of drafting the descriptions and recommendations for this basin.

Open Upland Habitats

Terrestrial open uplands are the system-subsystem association critical to 57 SGCN, the most of any of the system-subsystem associations in the basin. This association includes grassland habitats that are critical to 53 of the species in the basin. An example of natural grassland habitats in the basin are the nearly extirpated Hempstead Plains grasslands that dominated Nassau County when European settlers first arrived on Long Island in the 17th century. The USDA has classified portions of central Suffolk County as “Grassland Wildlife Zones”. There are also maritime grasslands on the eastern end of the south fork of the island that are influenced by salt spray from the Atlantic Ocean.

The grasslands of the lower Hudson River valley are primarily active and abandoned agricultural fields. These grasslands support grassland breeding birds, raptor hunting, eastern hognose snake, and, in some areas, the New England cottontail rabbit. These grassland areas of the basin are classified by the USDA as areas of grassland related biodiversity.

This association also includes the extremely rare serpentine barrens community known only from Staten Island. This community is a distinctive grass-savannah community with mixed tree and shrub cover. Plant species here are strongly influenced by the chemical properties of serpentinite soils and extremely well-drained, sandy soil. These barrens are critical habitat for the Arogos skipper, a SGCN of critical importance in this basin.

Long Island contains open upland habitats influenced by the adjacent ocean and estuaries. Open habitats range from the historic prairie grasslands of the Hempstead Plains in Nassau County, east to the maritime grasslands of Montauk Peninsula where grassland patches are interspersed among low shrubby heathlands dominated by bearberry and beach heather, and maritime shrublands with native cherries and sumac. Six of only 13 known remaining natural populations of federally endangered sandplain gerardia, and 4 of the 7 new introduction sites, are found in the grasslands of Long Island.

Forested Habitats

Terrestrial forested habitats are also very important to SGCN in this basin. Forests are critical habitat for 52 SGCN in this basin. Most of Long Island's remaining forests are southern deciduous forests, but the eastern end of the island has an extensive area of pine barrens. The terrestrial barrens/woodland system-subsystem association in this basin provides critical habitat for 36 SGCN. Both the historic grasslands and pine barrens habitats on Long Island are fire-adapted communities, negatively affected by the suppression of fire in areas near human development. Long Island pine barrens contain interspersed coastal plain ponds and support eastern tiger salamander, eastern mud turtle, coastal barrens buckmoth, and banded sunfish among many other SGCN.

Montauk peninsula and the barrier beaches of southern Long Island contain the globally rare maritime oak-holly forest.

The lower Hudson valley forests are dominated by both mixed and deciduous forests. The entire Hudson Highlands region represents one of the few remaining large unfragmented landscape blocks in the entire state. This forest and wetland complex links the Mid-Atlantic States to New England. Dominant forest matrix community types in the Highlands include Appalachian oak-hickory forest, chestnut oak forest, and oak-tulip tree forest. The plant and wildlife communities in this region are among the most diverse in the state.

Wetland Habitats

Both freshwater and estuarine wetlands are used by large numbers of SGCN. The emergent marshes of both systems provide important nutrients, nesting habitat, and protective cover for many terrestrial and aquatic species.

There are a variety of freshwater wetland types in the basin ranging from forested wetlands like red maple swamps to emergent marshes with no woody vegetation to ephemeral wetlands like vernal pools. Freshwater wetlands of note in the basin include the string of wetlands associated with the unfragmented forested areas of the Highlands and the calcareous wet meadows found in the Harlem Valley. Freshwater wetlands in the Harlem Valley area provide excellent habitat for the federally threatened and state endangered bog turtle and the upland sandpiper. The interspersed wetland patches in the Hudson Highlands include inland white cedar swamps, rich graminoid fens, dwarf shrub bog, and highbush blueberry bog thicket.

Tidal wetlands in the basin range from fresh to brackish to estuarine. There are extensive marshes, sloughs, and flats all the way down the length of the Hudson River that cover the full range of salinities. Tidal fresh and brackish marshes in the Hudson River are among the most diverse in the world. Salt marshes have been severely compromised in the 5 boroughs of New York City, but in Queens, Staten Island, and the Bronx, important examples of these marshes remain, particularly those in Jamaica Bay and in Pelham Bay Park. Long Island tidal wetlands have also been diminished over time, but still remain a vital nursery and primary production area for coastal marine species in New York. The largest expanses of salt marsh on Long Island are found in Great South Bay. All estuarine intertidal habitats including salt marsh, mudflats, and sand flats provide critical habitat to 52 SGCN in the basin. Of these species, 31 use intertidal marshes and 15 use intertidal mudflats.

Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) beds in the estuarine and brackish waters of the basin provide critical habitat to many juvenile species of fish, crustacea and bay scallops. The plants themselves are indicators of good water quality and important transformers of nutrients in the water column. SAV also attenuates suspended sediments in the water, increasing clarity. The photosynthetic activity of the plants can enhance dissolved oxygen in the water column. Dominant vegetation types in the mixohaline waters are eelgrass and, less frequently, widgeon grass. Beds in the brackish portions of the Hudson River are dominated by native tape grass and exotic water chestnut.

All of the habitats within the estuarine shallow subtidal system-subsystem association in the basin collectively provide critical habitat to 40 SGCN. The unvegetated sand and mud bottom areas of estuaries are important to hard clams, winter flounder, and other species.

Calcareous Ridge and Ledge Habitats

Another important habitat in the terrestrial open uplands system-subsystem association are the calcareous ridges and ledges found in the Taconic Highlands adjacent to the Harlem Valley. This area contains 11 documented hibernacula for state threatened timber rattlesnakes.

Cliff and Cave Habitats

In the Palisades and Taconic Highlands areas of the lower Hudson River there are cliff and cave areas that provide critical habitat to Indiana bat and timber rattlesnakes in the basin.

Beaches

Beaches in the basin provide nesting habitat for horseshoe crabs, piping plovers and colonial waterbirds including least terns and common terns. The beaches also provide important foraging area for transient shorebirds and other migratory birds in the spring. Many of these birds feed on the eggs laid by horseshoe crabs. The beach strand habitat at Orient Point has high quality nesting habitat for least tern, a most critical SGCN in this basin.

Island Habitats

Islands in this basin provide an important refuge for colonial-nesting herons and beach and island ground-nesting birds. The islands limit access to the birds’ eggs and young by nestling and egg predators such as raccoons, foxes, and domestic and feral cats. Great Gull Island hosts common tern and roseate tern colonies of national significance. The islands in New York Harbor host regionally significant colonies of colonial nesting water birds.

Open Water Habitats

Some of the open water habitats of note in the basin include lacustrine coastal plain ponds, estuarine shallow and deep water habitats, coastal streams and inland streams. There are three freshwater fish SGCN in the basin that are most critical. The banded sunfish and swamp darter are both found in isolated ponds near the Peconic River on the east end of Long Island. Some of these ponds are not connected to any other waters and their isolation historically protected them from predators and competitors. Additional examples of these open water habitats at higher elevations are found in Rockland County, which previously contained two sunfish species (now extirpated there), banded sunfish and mud sunfish. Mud sunfish is identified as extirpated in Lower Hudson-Long Island Bays Table 5, though its status is poorly understood. Given the lack of certainty about this species, the protection of its habitat is a most critical priority. Dams have isolated these ponds and may have protected remnant populations from competitors. Studies about reintroduction into this segment are needed.

Open water habitats are utilized by as foraging habitat by a host of bird species including waterfowl (e.g. greater scaup, red breasted merganser and surf scoter), osprey, bald eagle, loons, terns, wading birds (e.g. snowy egret and great blue heron), and cormorants. Mammals such as river otter, harbor seal and harp seal forage in open water habitats. Turtles utilize both fresh water (e.g. painted turtle, snapping turtle, and eastern mud turtle) and marine water (e.g. diamondback terrapins, green sea turtles) habitats. Open water habitats are also used as foraging habitat by larval odonates. Significant populations of wintering waterfowl utilize open water habitat.

The shallow estuarine waters of the basin provide critical habitat to marine fish, mollusks and crustacean species. The lagoons of the south shore of Long Island once held abundant hard clam populations, and still provides important nursery habitat for many fish species. The Peconic estuary is critical habitat to juvenile sea turtles and scallops. The Hudson estuary is critical for spawning sturgeon. Deeper estuarine waters like Long Island Sound are critical for lobster and oyster toadfish.

Coastal streams provide a vital link to migratory fish species like American eel and rainbow smelt. Both of these species were once abundant in the marine district of New York. American eel is in decline coast-wide, and coastal stocks of smelt that once supported commercial fisheries have declined sharply in the past half century.

Overall Trends in the Basin

There were several Native American nations living in the basin at the time of European settlement in the 17th century. The Native Americans used the rich natural resources of the Hudson River valley and what is now New York City and Long Island. In the time since European settlement, the basin landscape has undergone dramatic changes. All New York City and Long Island forests were cleared at one time for firewood and shipbuilding. The locust tree was introduced to Long Island specifically for use in shipbuilding. The waste generated by the burgeoning population in the greater metropolitan area was channeled into the waters surrounding the settlements. Cholera outbreaks in the late 19th and early 20th centuries were traced to sewage in the waters around New York City, eventually resulting in the creation of the Interstate Shellfish Sanitation Commission. The problem still persists in the form of combined sewer outfalls (CSO). There are some 460 CSOs within the confines of the five boroughs of New York City. CSOs normally collect rainwater runoff and convey it to estuarine waters in order to avoid flooding. When it rains too intensely sewage treatment plants cannot handle the excess and they discharge treated and untreated sewage in to the same conduits that send rainwater runoff, hence, combined sewage outfalls. The average discharge of untreated sewage over the last several years is estimated at 27 billion gallons annually, while 75% of the wet weather flow is treated. While the New York City discharges are the most significant source of untreated sewage in the basin, an additional 6 million gallons of untreated sewage is discharged annually by the Westchester County-Yonkers Joint Treatment Plant into the Hudson River. Untreated sewage poses a health threat to humans and aquatic organisms.

Land use in the basin changed dramatically over the course of the 20th century. In 1900 about 45% of land in the basin was used for agriculture. Most of this farming took place outside the 5 boroughs of New York City, but even portions of Queens, Brooklyn, and Staten Island were still very rural. By the 1990s, residential and forested land accounted for 78% of total land use in the basin, while agriculture had dropped to 5%.

New York City

The urban and suburban development of the entire New York metropolitan area resulted in significant losses of natural habitats as well. In Bronx County alone, U.S. Fish and Wildlife Service studies indicate that 90% of large tidal wetland complexes were lost in the 10 year period between 1954 and 1964. These losses were due to dredging and filling activities associated with development. Comparisons between historic and modern geographic survey maps of the metropolitan region show similar losses of tidal wetlands throughout the 5 boroughs. Jamaica Bay, Flushing Meadows, and College Point all experienced significant fill activity throughout the 20th century.

There were an estimated 224,000 acres of freshwater wetlands in New York City prior to the Revolutionary War. Only a fraction of those wetlands remain today. Of those that have survived, many suffer significant impairments. In the decade between 1980 and 1990 there was virtually no net loss of freshwater wetlands in the basin. During this period, the acreage of shrub wetlands decreased and forested wetlands increased by 1,500 acres.

Long Island

Habitats on Long Island were also dramatically altered by human development. Most of Long Island was probably thickly forested at the time of European settlement, but likely contained embedded areas of pine barrens and grassland. Between 22% and 33% of Nassau County was covered by the Hempstead Plains grasslands, a native warm-season grass prairie. The Hempstead Plains were first altered by potato farming and other forms of agriculture, and then transformed into the first suburban neighborhoods in the country. In the years following World War II, returning servicemen and a booming U.S. economy fueled a great expansion of residential development onto Long Island. This was further enabled by the building of the New York State Parkway System by Robert Moses.

Prior to the adoption of the tidal wetlands laws and regulations in 1972, wetlands were subject to intense development pressure and were dredged, filled, and bulkheaded. In addition, during the 1930's, as part of the New Deal programs of the federal government, many of Long Island's salt marshes were ditched to control mosquito breeding. At the time, ditching was thought to control populations of mosquitoes by eliminating the standing water in upper marsh areas where mosquitoes breed. In Suffolk County, greater than 90% of the County's 11,000 acres of extant tidal wetlands have been ditched.

Threats

DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate threats to SGCN and their habitats. During the analysis for the basin, a listing of threats for each species occurring in the Lower Hudson-Long Island Bays Basin was extracted from the database. The threats and summary figures compiled here are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and other rationales. The information provided does not quantify the magnitude of a particular threat. The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the database. The purpose of this information is not to compare the severity of one threat against another.

There are 39 individual threats to SGCN listed in this basin, and all of the species are suffering the effects of multiple threats at once (Lower Hudson-Long Island Bays Table 8.). Almost all of the threats to SGCN in this basin can be traced back, directly or indirectly, to the density and extent of human development in the basin. The most frequently mentioned single threat to these species is the loss of habitat to human alteration. Other than actual loss of green space to structures and paving, there is much degradation of remaining habitat due to contamination by toxic substances, nutrients, and the spread of invasive species. These threats are the indirect results of many human activities on the land and water. Most of the threats to SGCN are complex and interrelated. For example, habitat loss generally increases fragmentation of habitat and negative edge effects in the remaining habitat patches. Some of the most prominent threats to SGCN in the basin are discussed in further detail below. A discussion of the threats to all the species can be found in Appendix A.

Habitat Loss and Fragmentation, and Edge Effects

The basin description and critical habitats section above describes much of the changes in the 400 years since European colonization of the basin. Habitat loss due to human development affects 71% of the species groups found in this basin. Many habitats, especially grasslands and tidal wetlands have been radically altered and reduced from historic levels. As discussed above, nearly half of the basin has been developed with structures that provide virtually no habitat to SGCN. The remaining green spaces in the basin are often filled with exotic or invasive species tolerant of pollution and disturbance. The remaining habitat patches, particularly in the New York City and Long Island portions of the basin, are often too small and isolated. This limits their ability to effectively support healthy populations of SGCN.

Lands under water in this basin have been drastically altered as well. The entire marine district of the state has been dredged and modified to accommodate shipping for more than a century and extensive sand mining has occurred in New York Harbor and Long Island Bays. Dredging continues today, consisting of maintenance dredging of channels and dredging in marinas. The oyster bars of the New York Harbor have been removed. Much of the marine district shoreline has been bulkheaded, creating a bathtub-like effect on the water side habitat with abrupt and less productive edges. Two notable areas where human development has created a viable and important habitat for wildlife species are Shooter's Island in the Arthur Kill and the pile fields and pier areas of Manhattan. Shooter's Island is a man-made island that is part of the Harbor Herons nesting complex. The island was formed from dredge spoil. The pile fields and defunct piers on the west side of Manhattan provide important overwintering habitat for fish and crabs, including several SGCN.

The placement of shoreline structures like bulkheads, groins, and jetties can seriously alter the coastal habitat by modifying biological resources and habitat structure, causing cumulative ecological effects and changing physical and ecological processes such as the distribution of sand on beaches. Wave action and reflection off bulkheads causes sand scour immediately seaward of the structure. Over time, the intertidal portion of the remaining beach may disappear entirely. When the shoreline is hardened, habitats do not cease to exist but shift from one type to another which may have dramatic effects on species composition. Groins and jetties interrupt longshore currents and trap sand. Undeveloped beach immediately down-current from the structures becomes more prone to erosive forces. Placement of structures in the dunes and on the upper beach cause immediate loss of habitat for nesting and transient birds. Shoreline engineering, such as jetties, bulkheads and repeated beach nourishment are short-term strategies that weaken the barrier islands. These elements as well as construction in the beach and dune areas affects the ability of the system to respond naturally to human induced threats as well as storm events and sea level rise and therefore threatens the viability of all species who utilize the area throughout their lifecycle.

Barriers: Dams, Weirs, Culverts, Bridges

This basin is the point of entry for many diadromous fish species. Human development in this basin in the past 400 years has included building dams to provide power, control flooding, and create drinking water reservoirs. Dams are found in most tributaries on the Hudson River and rivers around Long Island. These structures block spawning and nursery areas and, in combination with over harvesting, pollution and interspecies competition, have adversely affected SGCN especially diadromous fish.

In the case of freshwater mussels, their gametes and larvae may need to disperse past these barriers to reach suitable habitat. Culverts under roads may also impede passage of fish species. On the Hudson River, railroad bridges may almost entirely block off side channels and small bays in the river shoreline.

Contaminants

Contaminants in this basin take many forms. There are heavy metals, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), dioxin, and pesticides that persist in the sediments of estuaries and upland lakes, ponds, and stream beds. Frequently these compounds are associated with organic sediments. The highest concentrations of these compounds in the estuary are found in the New York/New Jersey Harbor, especially in the East River, according to the sampling conducted by the National Status and Trends Program. In fact, the sediment and mussel samples taken from the area ranked highest among all the estuaries sampled by that program. Other areas of high contaminant concentration within the New York portion of the New York/New Jersey Harbor are the western portion of Raritan Bay and the Arthur Kill.

Primary sources of these contaminants in New York Harbor include, but are not limited to, industrial discharges, sewage treatment plant discharges, combined sewer overflows, storm water runoff and other nonpoint source discharges, atmospheric deposition of mercury, and chemical and oil spills. Many of these contaminants are from historic sources and remain in the sediments and can be remobilized.

A number of wildlife species have been affected by contaminants. Examples of these are PCB effects on wading bird reproduction in New York Harbor, lead poisoning in geese, and PCB contamination in nearly all fish species in the Hudson River and some species in New York Harbor.

Atmospheric Deposition

Atmospheric deposition of acidifying pollutants, in particular nitrogen and sulfur (also known as acid rain), and mercury has pervasive, severe and large scale effects on many habitats and species, both aquatic and terrestrial. Forest dependent species suffer when forest health is reduced. Mercury is a neurotoxin that accumulates in the food chain, and is particularly damaging to higher-level consumers, such as loons and larger fish. Even smaller fish lower in the food chain may suffer reduced reproductive success. Although atmospheric deposition is known to be a severe threat in the Adirondacks and Tug Hill areas of New York, we have little information on the severity of this threat to Lower Hudson and Long Island habitats and species. Acidification does not seem to be a problem with lakes on Long Island due to better buffering than the waters in the Adirondacks, though the rain and snowfall on Long Island is acidified and there has been some acidification of Long Island's ground water. This is clearly a major research and information need.

Atmospheric deposition is likely a primary source of nitrogen to all of Long Island's estuaries. For example, an estimated 60% of the nitrogen loading to the Peconic Estuary is from atmospheric deposition. Predominant sources of nitrogen in atmospheric deposition include nitrogen oxides (from car exhaust, industrial emissions, etc) and ammonium (from livestock waste and fertilizer applications).

Degraded Water Quality

The quality of estuarine and fresh waters in the basin is compromised by low dissolved oxygen, eutrophication, toxic contaminants, and sedimentation. All of these factors are interrelated. Low dissolved oxygen is exacerbated by high temperatures and low mixing of surface waters. Increased nutrients can cause nuisance algae blooms that create decaying organic matter that further robs the water of oxygen. Low dissolved oxygen can result in death or reduced growth in many aquatic animals, especially those unable to move to areas of better water quality. Sedimentation caused by surface runoff carries contaminants, nutrients, and can cause suffocation and/or burial in sensitive aquatic species. In many areas of the basin, rain that falls onto land cleared of vegetation is not absorbed into the ground, but travels over the surface picking up dirt and contaminants until it reaches the nearest body of water. In urban and suburban areas of the basin, storm water may be directed into pipes and recharge basins, but it is still common to have runoff directed into the nearest natural waterway. For example, chlordane, an environmentally persistent pesticide that was banned 20 years ago, is still found in fish from fresh water lakes, though the incidence is decreasing. Deep rooted vegetation like forest trees, shrubs, and wetlands can absorb the greatest amount of rainfall and discharge it slowly to surface and ground water. In the case of emergent wetlands, the plants absorb and sequester many contaminants, discharging cleaner water.

Climate Change

This threat affects many species through direct thermal stress. Winter flounder and American lobster in New York are at the southern limit of the species range. Warmer water temperatures appear to be causing stress to these animals and affecting their reproductive capability and susceptibility to disease. American lobsters have experienced a major die off in Long Island Sound. Increased water temperature has been implicated as a major cause of the die off, in conjunction with other factors.

Indirect effects of climate change include more frequent and more severe weather events, and rising sea levels. The rising sea level coupled with other factors is thought to play a significant role in decline in salt marshes in the basin. Hardened shorelines offer no place for natural marsh retreat, resulting in complete submergence. The amount of habitat available for beach dependent species will also be negatively affected by sea level rise as beach lands submerge. The effects of climate change also include changes in the timing of natural processes and the frequency of natural disturbances. For example, in fish and other species which breed or migrate according to temperature cues, their breeding seasons may become altered by changed annual average temperatures.

Collisions

Habitats fragmented by roads result in increased wildlife mortality due to collisions with vehicles. This is a severe problem in areas where roads have skirted protected wetlands. Many amphibian species forage in upland forested habitat and return to ponds to breed. During breeding season, roads directly adjacent to breeding ponds may be covered by salamanders during spring nights. Other species like turtles move between upland and pond habitats, too, and may suffer the same fate.

Other structures like cell phone towers, wind turbines, and large buildings can pose a serious threat to birds and bats. There is preliminary research that suggests that careful geographical placement and appropriate altitudes can reduce the negative effects of these structures on wildlife. Ongoing SWG funded research is investigating the migratory pathways of birds and bats in New York. Persistent coastal breezes make this basin an attractive area for placement of wind farms. The density of people in this area creates pressure for more communications towers of all kinds.

An emerging potential threat to aquatic SGCN is the placement of turbines powered by tidal flow into the estuarine waters of the basin. These structures are currently being tested as a new source of clean energy in a proposed six turbine array demonstration project in New York Harbor. Effects to aquatic species have not yet been determined, but resource managers have expressed concern about potential mechanical stress or death to organisms that pass through the active turbines. Full power generation projects would consist of several hundred turbines permanently deployed in a confined area.

Entrainment

Power plants in this basin often use the Hudson River and other estuarine waters as a source of cooling water for their turbines. The older plants use once-through cooling systems that result in the intake and mortality of many types of marine life at various life stages. During reproductive seasons of some fish or bivalves, millions of larvae are pulled into power plants and killed by mechanical interaction or thermal stress from the turbines. While DEC has been working with the power generators and other regulatory authorities to minimize these effects, they are still significant. In the case of SGCN, small parent populations can ill afford to lose large quantities of larvae and juveniles to this type of mortality.

Entanglement

Another direct disturbance to SGCN in this basin is unintentional entanglement and bycatch of animals during fishing activities. This is most common in commercial fisheries using nets. The National Marine Fisheries Service (NMFS) has gear regulations on various fisheries to decrease the interactions of fishing gear with marine mammals and sea turtles. These non-targeted species are called bycatch. The stress of the netting process may result in mortality of the bycatch. In the New England area various gear modifications on the type of line and breaking strength were instituted by NMFS to decrease the bycatch mortality of right, humpback, minke, and fin whales in lobster and gillnet gear. Area closures were implemented as part of this same effort and further amendments related to pot, trap, and gillnet fisheries are pending. There are NMFS has also instituted gear modifications to sea scallop dredges in the middle Atlantic to decrease the capture of sea turtles in the gear.

Illegal or Unregulated Harvest

Humans harvest animals from the wild for food and the pet trade. There are many species of herpetofauna that are popular in the pet trade such as turtles, salamanders, snakes, and lizards. Commercial fisheries target finfish, mollusks, and crustaceans for human food and bait. Traditional fisheries management of these species may be ineffective due to confounding factors of disease, predator populations, and loss of habitat. Often fisheries and other types of wildlife collecting develop in advance of the state's regulatory authority to limit or manage that collection. Many of the bait species are not covered under fishery management plans. Some of the fisheries for these bait species do not require permit or reporting on the species and number harvested, which makes it difficult to estimate population effects. Some of the conservation actions in this strategy simply recommend regulation of harvest and fishery dependent monitoring of these animals.

Disturbed Predator-Prey Cycles

The health of populations of predatory SGCN in this basin depends, in part, on the availability of prey items at an abundance that can sustain them. In the case of prey SGCN, the prey populations must be able to withstand the predation rate, or no amount of habitat improvement will help them. In the case of estuarine forage species of fish, their role as prey items for larger fish is not well enough understood. Predatory fish stocks are on the rebound (e.g. striped bass) while it is thought that forage species are in decline. This can have a cascading effect throughout the estuarine food web.

Predatory species like osprey may suffer from the decline of prey species. In the case of zooplankton, increased primary production has not resulted in increased production at higher trophic levels. Some researchers suspect that domination of the zooplankton in Long Island Sound by gelatinous species (i.e. jellyfish) results in increased predation on larval fish species in the zooplankton community. This may be exacerbated by increasing average winter temperatures that lengthen the activity period of the predatory zooplankton during the year. A better understanding of all these species interaction is integral to managing their survival.

Imbalanced populations of species such as raccoons, fox, opossums, and feral and free ranging domestic cats throughout Long Island have had negative effects on several SGCN, including birds and snakes. Populations of raccoons, opossum, fox, and cats are not kept in check by predation or disease, resulting in a disproportionate rate of predation on SGCN and other wildlife.

Interspecific Competition for Resources

In the face of shrinking habitat available for all species due to habitat loss and fragmentation, interspecific competition for habitat and food is heightened. It is comparable to a game of musical chairs, as humans and other threats take away more and more viable pieces of habitat, fewer species can be supported by the remaining patches. Species most effective at finding and defending those resources will survive. An example is the golden-winged warbler and its competitor, the blue-winged warbler. Both of these birds use the same types of habitat and have overlapping ranges. The blue-winged warblers are more effective at attracting mates of both species, and reproduce in greater numbers than golden-winged warblers.

Invasive Species

Invasive species are second only to outright habitat destruction as a threat to the ecological health of our ecosystems and species. Invasive plants that spread into natural habitats often out compete and eliminate native plants, and change habitat structure, to the detriment of the native insects, birds and animals that depend on native plants for food and shelter. Invasive plants also may change fundamental ecosystem processes such as nutrient cycling, decomposition rates, soil chemistry, hydrology, frequency of wildfires, vegetation structure, natural succession, and rate of soil erosion. Invasive, non-native species are a major cause, or contributing factor, in the decline of 49% of the U.S. species federally listed as threatened or endangered.

Invasive marsh plants like common reed and purple loosestrife can reduce the quality of nesting habitat for salt marsh breeding birds. Many of the estuarine and brackish salt marshes in the basin have become dominated by common reed. Common reed's woody nature is thought to make it less valuable for detritus production than other salt marsh grasses. However, it does sequester nutrients more effectively than salt marsh cordgrass, a potential benefit in nutrient-enriched estuaries.

In portions of the Hudson River estuary, water chestnut, an invasive aquatic plant, has nearly eliminated light penetration in the bays where it occurs. This in turn kills the native aquatic beds that provide critical habitat to crabs and juvenile fish. Research also shows that dense water chestnut beds can reduce dissolved oxygen levels in the water column in the immediate vicinity.

There are invasive animals in this basin, and a huge potential for further introductions due to the heavy international shipping in this basin. Ships use water as ballast during their journey. The ballast water may be taken into the tanks in one part of the world then the tanks are emptied in the destination port as cargo is loaded. This is how zebra and quagga mussels are thought to have been introduced into the Great Lakes. Through competition for space and habitat they have decimated native mussel populations, and their predation on plankton has dramatically affected freshwater ecosystems.

There are also many live animal markets in the New York metropolitan region where exotic animals are sold as food. Many of these food animals have the potential to escape and wreak havoc on the basin's ecosystems. On the west coast of the U.S., Chinese mitten crabs escaped into the wild and have caused ecological as well as severe economic damage. There have been some near misses with Chinese mitten crabs in New York already, with shipments of live crabs intercepted at airports. Recent discovery of snakehead fish in Queens could have devastating ecological effects on pond communities if not isolated and eliminated. Vigilance regarding invasive species in this basin is essential to prevent potentially severe consequences.

In some areas of the basin, like Shooters Island, habitats altered by invasive species like tree-of-heaven and Japanese honeysuckle provide vital nesting habitat for SGCN. In this case, colonial-nesting herons use these trees for nesting. Free ranging cats are having significant effects on SGCN through predation.

Priority Issues

There are several existing management programs in the basin that have identified priority issues. They are listed below.

Hudson River Estuary Program

- Restoration of signature fisheries
- Contaminants in biota
- Restoration of habitat
- Conservation of biodiversity
- Water quality
- Monitoring and increased knowledge

Hudson River Estuarine Research Reserve

Research related to:

- Freshwater to brackish conditions along the Hudson River estuary
- Changes in the river's shoreline land use from north to south and the effect on the estuary
- Hydrological exchange between the marshes and the Hudson River through restricted openings in railroad embankments
- Describing the movement of particles through the system using natural and anthropogenic tracers.

New York - New Jersey Harbor Estuary Program

- Habitat loss and degradation
- Toxic contamination
- Pathogen contamination
- Floatable debris
- Nutrient and organic enrichment

Long Island Sound Study

- Hypoxia and nitrogen management
- Toxics
- Floatable debris
- Living resources and habitat management
- Development and land use

South Shore Estuary Reserve Program

- Nonpoint source pollution
- Coastal habitat protection and restoration
- Living resources
- Development and land use
- Monitoring and increased knowledge
- Public use
- Economic viability of the estuary
- Brown tide

Peconic Estuary Program

- Brown tide
- Nutrients
- Habitat and living resources
- Pathogens
- Toxics
- Critical lands protection

Central Pine Barrens Management Plan

- Ground water and habitat protection
- Nitrate management
- Pesticide management
- Fire management
- Invasive species management plan in development

The Nature Conservancy (Ecoregional Planning)

- Management for sustainable use of essential resources and their habitats (bay scallop; hard clam; eelgrass; salt marsh)
- Protection and restoration of natural shoreline, buffers and beach dependent species
- Barrier island natural processes
- Water quality
- Incompatible land use
- Fire management
- Reducing the threat of invasive species
- Global warming/sea level rise
- Atmospheric deposition
- Research, monitoring and stewardship to reinforce all initiatives

Vision, Goals and Objectives for the Basin

Vision

The Lower Hudson River-Long Island Bays Basin will have healthy and sustainable populations of all SGCN that currently occur here. Conservation partners will work together to reintroduce extirpated species to the basin where appropriate.

Existing conservation partnerships among federal, state, and local government partners, not-for-profit organizations, and other citizens groups will be strengthened. New and innovative partnerships will be formed.

Conservation partners in the basin will work together to collect, share, and analyze information on SGCN and their habitats in the basin. Information will be used to constructively manage species and habitats for the greatest benefit to biodiversity preservation while balancing human needs for use of the resources.

Members of the public will understand the value of healthy habitats and the species that they support.

Goals and Objectives

- Coordinate existing resource management structures in this basin like the National Estuary Programs, state estuary programs, Pine Barrens Commission, fisheries commissions, and others to improve monitoring, management, and protection of SGCN and their habitat basin-wide.
- Use the State Wildlife Grants program staff within DEC to strengthen partner agencies' and management structures' involvement in research, management, and restoration of SGCN and their habitats.
- Preserve and restore key representative habitats that support the basin's biodiversity.
- Ensure that no at-risk species becomes extirpated from the basin by better understanding the current distribution abundance and most immediate threats of these species and responding appropriately. Share this information with local governments in a way that helps inform their decision making related to local land use.
- Improve the health of remaining habitats for SGCN by reducing the limiting factors on them. On public lands this should include better monitoring and management of habitat health and balancing human recreational and other uses of viable habitat. On private lands this should include data sharing and incentive programs that assist landowners in habitat improvements.
- Town and Villages play a key role in protecting SGCN which can be improved by strengthening land use and zoning codes. Federal, State and County policies should also be strengthened.
- Develop a "stepped down", more targeted plan for the basin that expands upon the recommendations made here. This plan may focus on goals within the basin for specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented on the ground.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection, Monitoring, and Analysis Recommendations for Critical Habitats

SALT MARSHES

❖ Salt marshes and their internal creeks and pools are critical habitat for 31 SGCN. There is evidence from New York and other locations on the eastern seaboard that salt marshes are in severe decline. Nearly all marshes have been ditched as part of mosquito control activities and many are sprayed with a variety of mosquito control pesticides. Because this habitat is a foundation of the health of the entire marine district of the state, establishment of a comprehensive salt marsh monitoring program is of critical importance. Reference locations in each major estuary should be selected for investigation as outlined in the Long Island Sound Study Tidal Wetland Workshop Findings Report. Key components of the program are measurements of overall acreage and health of marshes, evaluation of faunal community, development of a marsh health index trends analysis and buffer need assessment and recommendations for regulatory reform for more effective protection of salt marshes and their fauna. Priority species to monitor as part of this activity include: salt marsh breeding birds- especially saltmarsh sharp-tailed sparrow and sea side sparrow, fiddler crabs, horseshoe crabs, ribbed mussels, diamondback terrapins, and estuarine forage fish species.

❖ Comprehensive salt marsh monitoring programs should be designed with the required pre-monitoring of open marsh water management in mind, in case such a project is warranted to improve the health and functioning of the marsh in the future.

OPEN WATER HABITATS

❖ Open Water habitats are important forage areas for many SGCN. Recommend continuation and expansion of the benthic mapping and infauna index currently being done in select embayments. Map all major habitat types (including shallow water habitats) to establish baseline and use this as a basis for trends analysis. This work is important for winter flounder, northern puffers, bay scallops, hard clams and oyster toadfish.

❖ Study the use of oyster shell hash and reef structures by forage fish and invertebrate species, and juvenile stages of critically important marine finfish species including winter flounder and oyster toadfish.

SUBMERGED AQUATIC VEGETATION

Submerged Aquatic Vegetation beds provide critical habitat for SGCN and are an indicator of high water quality. Abundance of eelgrass declined sharply in the 1930s due a disease event throughout the eastern seaboard and has yet to rebound. Monitoring of SAV beds and their faunal community is critical to the health of estuaries in NY. Specific monitoring parameters should include:

- ❖ Select eelgrass bed reference sites and document their use by fauna, especially estuarine associates of SAV, winter flounder, oyster toadfish, northern puffer, estuarine forage species, bay scallops, and blue crabs.

- ❖ Map areal extent of eelgrass beds in all major estuaries of the state and analysis of trends in their health.

- ❖ Examination of habitat value of non-eelgrass forms of aquatic vegetation such as *Codium fragile*.

- ❖ Conduct research to identify and mitigate threats to seagrass recovery and improve restoration techniques. Conduct research to understand why eelgrass is not recolonizing and why restoration efforts to date have not succeeded in enhancing existing eelgrass populations.

- ❖ Investigations and long term inventories of the macroalgal biomass (including species and location) in each estuary should be conducted. Macroalgae may be affecting eelgrass abundance and distribution, may serve as a predominant nitrogen sink in the entire system, and may serve as an important alternate habitat to shellfish species affected by the dramatic loss of eelgrass beds.

FRESHWATER WETLAND HABITATS

- ❖ Vernal pool and upland buffer habitats are critical habitats for several species of amphibians. Mapping of vernal pools and upland buffer and monitoring their use by amphibian species of concern is necessary to protect vernal pool salamanders, especially tiger salamanders, and eastern spadefoot toads. Collect information on their productivity in vernal pools.

- ❖ Freshwater marshes are critical for many species of freshwater marsh nesting birds, Eastern box turtle and other herpetofauna, and odonates. Monitoring of these habitats should be conducted and specific parameters should include examination of the necessary adjoining upland habitat for these species.

OPEN UPLAND HABITATS

Grasslands and heathlands are important habitat areas for a number of birds and other SGCN. The agricultural lands in the upper portions of the basin east of the Hudson are a good area for biodiversity assessment. Specific activities should include:

- ❖ Map the historic and current distribution of grassland habitats.

- ❖ Monitor the distribution, abundance, and productivity of grassland birds and other SGCN.

- ❖ Map and monitor beach and island habitat availability especially the area above mean high water. This is important habitat for colonial nesting herons, piping plover, common and least terns, and horseshoe crabs.

FORESTED HABITATS

- The Central Pine Barrens Complex supports a large number of SGCN, including several most critical species such as tiger salamander, marbled salamander, blue-spotted salamander, pine barrens bluet, and eastern hognose snake. Pine barrens are also historic habitat for American burying beetle and the coastal barrens buck moth. The full range of habitats found in association with the pine barrens, including coastal plain ponds and grassy openings should be monitored for use by SGCN. Those monitoring data should be used to shape specific management and protection recommendations to the state, Central Pine Barrens Commission, and other conservation organizations. Forest habitat monitoring protocols developed for the USFWS, Upton Ecological Research Reserve, Brookhaven National Laboratory, Upton, NY have been used in forests of the Long Island Pine Barrens Core Preserve in the summer of 2005. Baseline data obtained in 2005 and data to be gathered in 2006 may be used to characterize and evaluate habitat quality for SGCN.

GENERAL HABITAT ASSESSMENT RECOMMENDATIONS

- Survey the recent Jamesport State Park acquisition for the presence of SGCN and their habitats in support of drafting the park's master plan.

- Identify key conservation areas for species or suites of species in order to strategize where limited funds should be directed. TNC's ecoregional assessments, Significant Habitat designations, NY Natural Heritage, NOAA habitat mapping, Long Island Sound Stewardship Program sites, Peconic Estuary Critical Land's Program sites, and others can assist with the effort.

- Identify and fill information gaps and research needs especially for overarching threats such as climate change, atmospheric deposition, invasive species, and estuarine ecology.

Data Collection, Monitoring and Analysis Recommendations for SGCN

There are several species in this basin that are poorly understood and mitigation of the threats to them is difficult or impossible without better understanding of their life history, habitat requirements, and reaction to specific threats in the environment. Implementation of the CWCS should complement and enhance existing data collection efforts for SGCN in the basin, as well as institute new data collection.

Early successional forest/shrubland birds

- Monitor trends of early successional species, in particular those that are not currently adequately monitored.
- Complete an inventory and analysis for high priority focus species (woodcock and grasshopper sparrow) that identifies core habitats (highest abundance) and geographic areas (where appropriate).
- Monitor the effects of West Nile Virus on these bird populations.

Wintering waterfowl

- Periodically monitor the levels of contaminants in wintering waterfowl and freshwater marsh-nesting birds and their eggs to assess trends and determine the effects of contaminants on reproductive success, eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. The most critical species in this group are Greater scaup, American bittern, king rail, and pied-billed grebe.
- Monitor ongoing restoration projects of critical SGCN, such as those for beach and island ground-nesting birds, for evaluating the effectiveness of techniques.

Forest breeding birds

- Survey forest habitats for nesting long-eared owl, red-shouldered hawk and whip-poor-will.
- Track productivity of long-eared owl, red-shouldered hawk and whip-poor-will nesting pairs.
- Monitor the effects of West Nile Virus on these bird populations.

Butterflies, Moths and Odonates

- Develop standardized survey protocol to obtain repeatable, relative abundance estimates for barrens buckmoth, odonates (e.g. yellow-sided slider, Needham's skimmer, pine barrens bluet) and butterflies (Hessel's hairstreak, Arogos skipper).
- Survey populations to understand population status, trends and distribution.

Herpetofauna

- Investigate the life history of Eastern box turtle, diamondback terrapin, and hognose snake including sex ratio of Lower Hudson-Long Island Bays population, predator-prey relationships, and habitat use.

FRESHWATER FISH

- Monitor waters in Rockland and Suffolk Counties that are suited to banded sunfish and mud sunfish to better understand their population dynamics and their habitat needs.

MARINE FISH

- Sample bycatch in the commercial fisheries of the Atlantic Ocean to determine numbers and sizes of Atlantic sturgeon affected by commercial fishery activities in New York waters.

- Use telemetry techniques to tag and monitor adult and juvenile Atlantic sturgeon. Use telemetry data to identify specific spawning and nursery habitat use within the basin. Supplement this investigation with archival tags to gain information on the timing and location of seasonal movements of adult fish.

- Continue monitoring the distribution, abundance, and habitat use of Atlantic sturgeon in the basin.

- Sample tributaries in all estuaries for the presence of American eels, alewives, and other diadromous species, especially at the base of dams in historic streams.

- Document habitat use by alewife in estuarine waters of the state, including remnant spawning runs in coastal streams and lower Hudson River tributaries. Develop basic life history and stock profiles of estuarine New York alewife populations including fecundity, age at maturity, population age structure, and lifespan

- Develop and/or expand fishery-independent surveys for marine species of critical importance including: American eel, American lobster, winter flounder, oyster toadfish, estuarine forage species, horseshoe crab and rainbow smelt. Define the preferred habitat for varying life stages of these species. Link these preferred habitats with detailed benthic maps when possible and appropriate.

- Monitor diseases, pathogens, and pesticide effects on crustaceans in the basin, specifically American lobster. Specific parameters to investigate include evaluation of any lobster or other crustacean die-off for disease, pathogen, or pesticide contamination and lobster shell disease. Wherever possible, these parameters should be correlated and coordinated with ongoing overall water quality monitoring.

- Monitor horseshoe crabs to better understand their population dynamics and their significance to shorebirds migrating through NY, especially the red knot. These investigations need to be coordinated with similar research in other mid-Atlantic states. Specific research parameters include:
  - Investigate the existence of a terminal molt for adult horseshoe crabs to better understand the age structure of the population. Also develop reliable field methods for aging horseshoe crabs.
  - Conduct directed fishery-independent spawning and abundance surveys, including tagging of individuals to examine uniqueness of NY stock.

- Identify key spawning beaches for horseshoe crabs and their use by migrating shorebirds.
- Monitor the distribution, abundance, and habitat use of egg stage, larval, and juvenile horseshoe crabs, particularly on marshes and mud flats.

MARINE BIVALVES

❖ Increase monitoring for diseases, pathogens, and contaminant loads in marine bivalves used for human consumption. Specific parameters to investigate include the hard clam disease QPX; paralytic shellfish poisoning; vibrio; oyster diseases MSX, juvenile oyster disease, and Dermo; the suite of contaminants measured in the USEPA Mussel Watch study; and pesticides. Wherever possible, these parameters should be correlated and coordinated with ongoing overall water quality monitoring.

❖ Identify historic and current eastern oyster abundance and establish a list of potential oyster habitat restoration sites based on current water quality parameters necessary to support viable oyster populations.

❖ Determine optimal size for bed and reef areas, and optimal planting densities of seed and adult oysters in restoration areas.

BEACH AND ISLAND GROUND-NESTING BIRDS

❖ Continue annual surveys to collect nesting data including, but not limited to, number of nesting pairs, productivity, and number of active breeding sites.

TRANSIENT SHORE BIRDS

❖ Initiate annual shorebird monitoring program, using established protocols at 5-10 locations in New York State.

❖ Conduct field studies to document ecology of transient shorebirds, including important food items, habitat use and time/activity budgets.

Planning Recommendations

- Prepare a response plan for mass mortality events involving shellfish, finfish, and crustacean/meristomata, especially horseshoe crab, American lobster, and estuarine forage species. This will provide valuable management information in determining causes of these events.

- Develop species management plans that incorporate fisheries and habitat needs for eastern oyster, hard clam, bay scallops, northern puffer, oyster toad fish, and estuarine forage species.

- Update species management plans for American eel, American lobster, horseshoe crab, and winter flounder in coordination with the Atlantic States Marine Fisheries Commission which New York is an active member (Table 9).

- Expand fishery-independent surveys for marine fish and crustacean species and develop new survey protocols for non-fishery targeted species. Update existing sampling protocols to better record forage fish species encountered.

- Work collaboratively with the Long Island Sound Study Management Conference and its partners to implement the recommendations in the Long Island Sound Stewardship Initiative, where those recommendations meet the needs of SGCN.

- Develop a grassland management and restoration plan specific to this basin that incorporates the needs of all grassland dependent species, including grassland birds, barn owl, woodland/grassland snakes, and game species of concern.

- Explore the feasibility of fire as a habitat management and restoration tool in the appropriate habitats in the basin. Some fire management plans already exist for habitats on Long Island.

- Develop a management plan that provides guidance on maintaining, enhancing and restoring early successional forest/shrub bird species.

- Develop habitat management guidelines for early successional forest breeding birds in this basin. This is especially critical for golden-winged warbler where ongoing research in Sterling Forest can be used to guide habitat management that favors golden-winged over blue-winged warblers.

- Update management plans on state and other public beach lands to incorporate the needs of beach and island ground-nesting birds, transient shorebirds in seasonal site use and development, especially for common tern, least tern, piping plover, marbled godwit, purple sandpiper, red knot, and short-tailed dowitcher, and horseshoe crabs.

- Develop a management plan for terrestrial invertebrates in the basin.

- Develop population targets for Eastern box turtle and hognose snake on protected land parcels in this basin.

- Incorporate management and restoration recommendations for all SGCN into land management planning actions, including the creation of new Unit Management Plans (UMP) and UMP revisions.

- Prioritize all existing habitat restoration lists prepared by management programs in the basin for terrestrial and estuarine habitats in the basin for their benefits to SGCN. Coordinate implementation of their recommendations and seek to leverage additional funding from sources other than SWG.

- Develop a management plan to stop/reduce the introduction of aquatic nuisance species (ANS) into the waters of New York State. A number of plant, mollusk, and bird ANS have already been introduced into the waters of New York with varying effects on native wildlife. Marine species are probably under-represented, because marine ANS have not been studied as much in New York as freshwater ANS.

- Develop a management plan to stop/reduce the introduction of new terrestrial invasive species and mitigate effects from previous introductions in coordination with future recommendations of the Governor's Invasive Species Task Force.

Land Protection Recommendations

The second most commonly listed threat to SGCN in this basin is the loss of habitat. Acquisition and cooperative management of critical lands are an effective way to slow the trend of habitat loss and fragmentation in this densely populated basin.

EXISTING OPEN SPACE PLAN RECOMMENDATIONS

The 2002 edition of the New York State Open Space Conservation Plan (OSP) lists priority sites for protection. Many of these sites are valuable habitat for SGCN and are listed here as priority land protection areas for the basin.

- All of the Pine Barrens Core area recommendations have potential benefit to SGCN dependant on pine barrens habitat.

- Peconic Pinelands Maritime Reserve Projects, Tuckahoe Woods, Gardiner's Island, Cow Neck/Sebonac, Accobonac Harbor, Long Pond Greenbelt, Montauk Peninsula, Great Hill, Noyack Hills, and Stony Hill parcels all harbor important habitat for SGCN. Specifically there are several types of deciduous forest, tidal wetlands, freshwater wetlands, grasslands, and documented habitat for state threatened odonates.

- Within the Western Suffolk/Nassau Special Groundwater Protection Area the Pulling Estate and Held Property are documented habitat for tiger salamanders and several turtle species. The sites contain grassland, early successional forest habitats, and freshwater wetlands.

- Within the Long Island South Shore Estuary Reserve recommendations the Shinnecock Bay, Beaverdam Creek, and Barrier Island acquisition recommendations have potential benefits for protecting SGCN. The sites contain tidal and freshwater wetlands, and nesting habitat for critically important beach and island ground-nesting birds.

- Within the Long Island Sound Coastal Area recommendations, the Key Span - Shoreham site is a tidal wetland and shoreline habitat that benefits many coastal SGCN.

- All of the individual sites within the Harbor Herons Wildlife Complex include freshwater and/or tidal wetlands, and some forested areas.

- Within the Jamaica Bay Protection Area recommendations, the Hook Creek, Sea Girt Avenue Wetlands, and Spring Creek/Fresh Creek sites have freshwater and tidal wetlands to further benefit SGCN adjacent to the Gateway National Recreation areas in the Bay.

- All of the sites in the Long Pond/Butler Woods, Northeastern Queens Shoreline, Staten Island Greenbelt, and Staten Island Wet Woods contain many important natural habitats for SGCN, including vernal pools, other freshwater and tidal wetlands, and forested areas.

- The Rockland County Highlands Priority Project contains important habitat for SGCN including freshwater wetland areas.

- Acquisitions expanding the Sterling Forest State Park holdings that provide habitat for golden-winged warblers.

- The expansion of the Cranberry Lake Wildlife Management Area to protect the lake and surrounding forests.

- Expansion of the Piermont Marshes National Estuarine Research Reserve property in the Hudson River to protect SGCN that use brackish and freshwater tidal wetlands.

GENERAL LAND PROTECTION RECOMMENDATIONS

- Acquire and/or cooperatively manage emergent marsh habitat, lands that buffer marsh habitat, and lands adjacent to existing protected land through fee title or easement. Emergent habitat parcels support certain marsh bird species such as bitterns and rails. Other species which benefit from contiguous wetland habitat include various herons, waterfowl and shorebirds and sub-tidal animals that are sensitive to contaminants, nutrients, and sediments.

- Upland forest habitats within 1,000 feet of wetlands known to host breeding populations of herptile SGCN (mud turtle, tiger salamander, and bog turtle) should be acquired or managed to protect these species.

- The Peconic Estuary Critical Lands Protection Strategy created a prioritized list of properties for public acquisition within the estuary watershed, many of which are valuable habitat for SGCN. Protection of these parcels should be high priority for acquisition funds.

Management and Restoration Recommendations

- Conduct controlled habitat manipulations to determine effective habitat management parameters to benefit freshwater marsh-nesting birds. The most critical species in this group are American bittern, king rail, and pied-billed grebe.

- Expand and coordinate seasonal protection of beach and island ground-nesting birds and transient shorebirds. This should include fencing of key nesting areas, development of ideal nesting conditions on beaches with less recreational use pressure, selective removal of predators, and enhanced stewardship of nesting beaches.

- Restore and manage nesting islands for colonial waterbirds.

- Protect and restore grassland habitats in the basin.

- Support and expand use of fire as a habitat management tool in the Central Pine Barrens and grassland habitats on Long Island.

- Develop appropriate management measures to protect estuarine forage species of marine fish, including compliance monitoring of vessels trip reporting, and assessment of bait fish harvest.

- Develop multi-species modeling approaches for New York's Estuaries similar to the ongoing work in Chesapeake and Delaware Bays.

- Implement and monitor marine shellfish spawner sanctuaries.

- Conduct feasibility studies for re-introducing SGCN for restoration purposes (such as oyster, scallop, and rainbow smelt restoration).

- Restore diadromous fish runs in appropriate tributaries.

- On a case by case basis, evaluate the use of Open Water Marsh Management (OMWM) to restore wetlands. Develop OMWM guidance based upon the Suffolk County Vector Control Environmental Impact Statement.

- Implement the habitat restoration plans for all the estuary programs where those recommended sites provide critical habitat for SGCN.

- Protect and restore vernal pool habitats in the basin.

- Incorporate the construction of vernal/ephemeral wetlands into large civil works projects (e.g. beach nourishment, wetland restoration) to provide foraging habitat for shorebirds (piping plover, red knots) and breeding habitat for amphibians and odonates.

- Consistent with species recovery plans, support and implement the reintroduction or translocation of SGCN into suitable habitats.

- Restore salt marsh habitat.

- ❖ Create and monitor eelgrass sanctuaries in cooperation with local and federal government agencies.
- ❖ Support cooperative and coordinated interagency invasive species management and control.
- ❖ Establish a cooperative, interagency Lower Hudson invasive species management area similar to the Long Island Weed Management Area (LIWMA).
- ❖ Establish “weed prevention areas” in which native species are still dominant, invasive species infestations are still small, and the focus can be on the most cost-effective strategies, namely prevention and early detection/rapid response. These areas should be examined in conjunction with the selection of exemplary and representative habitats within the basin.
- ❖ Seek management and restoration opportunities that aim to restore natural shorelines in the basin.
- ❖ Where possible, reestablish high quality intertidal forage habitats by allowing overwash fans and other like formations to build naturally.

Regulatory and Legislative Recommendations

GENERAL

- Coordinate permit reviews for existing and new ground water wells on Long Island to avoid excessive drawdown and ensure that ponds providing habitat for vernal pool salamanders, odonates of coastal plain lakes/ponds, swamp darter, and banded sunfish remain viable.

- Pursue protection of wetlands less than 12.4 acres in size in this basin that provide habitat for SGCN under the 'unusual local significance' provisions of Article 24 of the ECL. Establish upland buffer protections for those wetlands that reflect actual usage by herptile species.

- Consider regulation on smelt harvest in the marine district of New York appropriate to the reduced populations of rainbow smelt found here.

- Collaborate with other state agencies and local governments to examine the need for and utility of regulations to reduce shoreline hardening, including docks, in aquatic habitats.

- Work with local governments to develop policies that discourage shoreline hardening structures.

- Assist local governments with strengthening zoning and planning regulations to be more wildlife friendly, including clustering, tree clearing, buffers, and native landscape plantings.

- Maximize open space protection funding to state Environmental Protection Fund, federal funds, and support of acquisition programs by local governments.

- Review existing regulatory framework for eelgrass protection and underwater habitats for SGCN >6 feet below low tide and enhance as necessary.

- Implement the regulatory recommendations of the Regional Greenhouse Gas Initiative and Acid Deposition Reduction Program.

- Examine the need for a moratorium on all harvest of SGCN herpetofauna to allow time for population assessments of these species. Examine the need for terrapin excluder devices on trap fishing devices.

- Enhance permit review of pesticide applications in or near documented habitat for herpetofauna SGCN.

HABITAT LOSS AND DEGRADATION

- Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN in the basin.

- Protection and restoration of salt marsh (management and restoration plan; modify codes and policies to encourage and guide restoration, buffer protection and address sea level rise)

- Coordinate with State efforts to respond to Pew Commission and U.S. Oceans Policy reports.
- Coordinate efforts with overlapping recommendations of Atlantic Ocean Watershed.
- Ensure that all management activities include an element for well trained enforcement entities in sufficient numbers to protect SGCN in the basin.
- Support enhanced implementation and enforcement of existing water quality protections under ECL §608, including stream buffers and other best management practices.

Incentives

- Work with private landowners and the agricultural community in the basin to identify people willing to participate in wildlife habitat and water quality improvement programs. Collaborate with the farm community and other land owners to refine existing programs to better meet their needs.

- Explore an amendment of §480a of the Real Property Tax Law that may provide for wide-ranging holistic stewardship on eligible tracts of private property. Consider the establishment of a Habitat Reserve component to encourage land owners to voluntarily conserve and manage significant habitats for wildlife and fish located on their lands through Real Property Tax exemptions.

- Support proposals to provide financial incentives to private property owners to preserve open space.

- Support pending state Community Preservation Fund legislation that would support local land acquisition programs.

- Work with local governments to develop tax and other incentive programs to shape new development to reduce negative effects on SGCN. Specific issues to address include:
    - Ground water withdrawal & negative effects on SGCN.
    - Nonpoint source pollution - especially in areas critical to SGCN.
    - Curbing the use of invasive plant species in landscaping.
    - Curbing the use of pesticides in landscaping and mosquito control.
    - Natural and soft alternatives to bulkheads.
    - Removal of existing bulkheads with native vegetation restoration.
    - Establish/expand natural buffer zones between developed areas and waterways and wetlands.

Information Dissemination Recommendations

- ❖ Develop targeted recommendations for the management of remaining farmlands on Long Island and in the Hudson Valley to assist farmers in wildlife friendly farming practices.

- ❖ Create basin-specific information for landowners, landscapers, and nursery retailers regarding wildlife-friendly landscaping, creation of wildlife habitat, alternatives to invasive plant species, and alternatives to pesticide use such as integrated pest management.

- ❖ Create public education information about invasive plant species that degrade wildlife habitat.

- ❖ Create consolidated summary of all marine fisheries research and catch data related to SGCN.

- ❖ Information about most SGCN is maintained in DEC's Master Habitat Databank. It is critical that the availability of this information be made known to land managers and decision makers. The Natural Heritage Program should have the capacity to maintain current data and to disseminate such data in a timely manner so that it is readily useable. In addition, NHP should continue to develop interpreted data products, such as maps and conservation guides, for use by decision makers so they can accommodate the conservation needs of SGCN early in project design.

- ❖ Educate and inform landowners of the importance of reducing development and associated impacts on barrier beaches.

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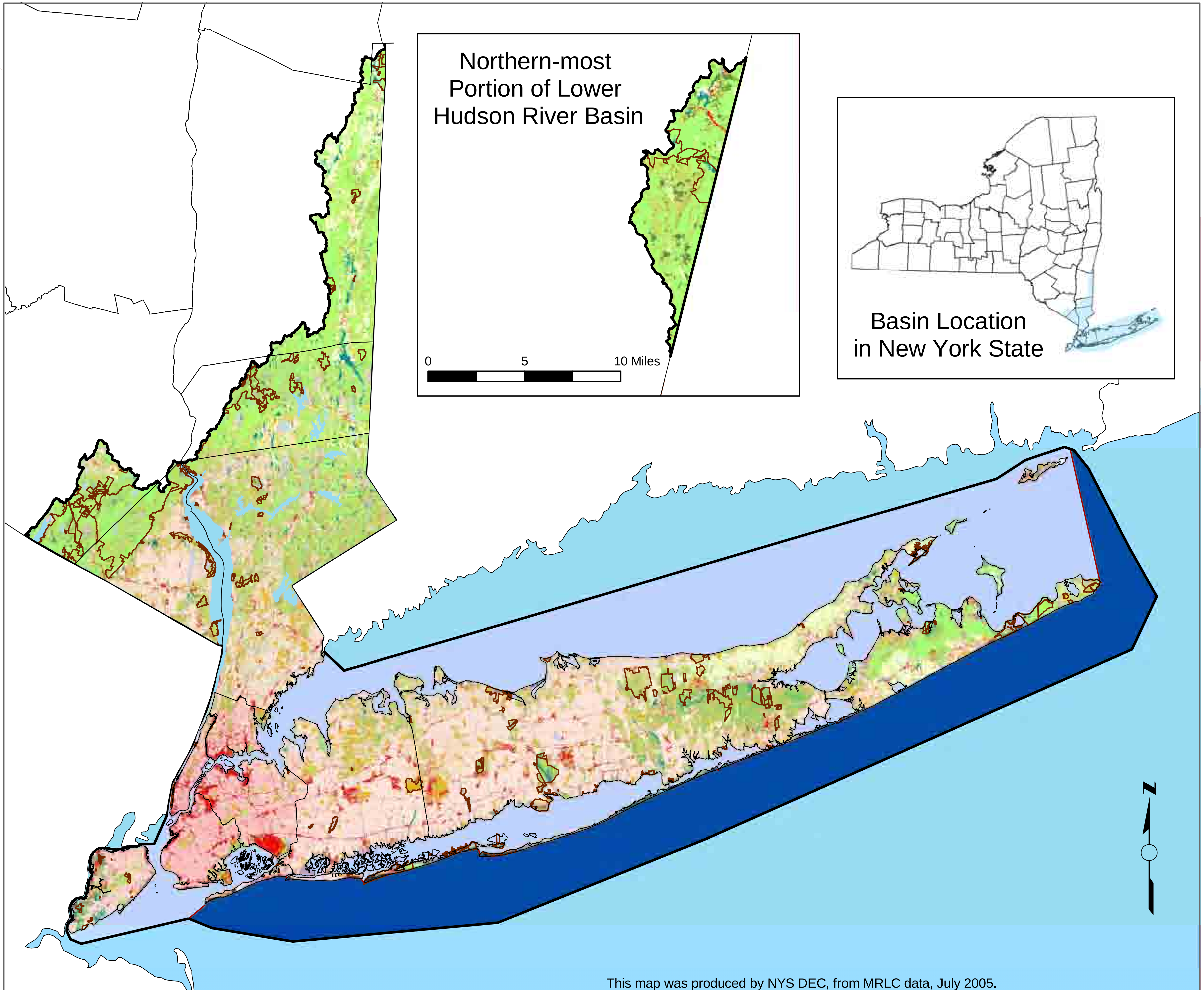
Tables and Figures

Tables

Figures



Lower Hudson Figure 1.

LOWER HUDSON BASIN

Multi-Resolution
Land Cover Map

LEGEND

Long Island Bays
Atlantic Ocean Waters of New York

Major Waterbody
County Border
DEC Lands and NYS Parks

Landuse/Land Cover Values

Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional

0 5 10 Miles

Lower Hudson-Long Island Bays Table 1. Multi Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Lower Hudson - Long Island Bays Basin.

Classification	% Cover
Low Intensity Residential	27.33
Mixed Forest	19.97
Deciduous Forest	15.55
High Intensity Residential	9.68
Evergreen Forest	5.83
High Intensity Commercial/Industrial	4.79
Water	4.38*
Pasture/Hay	3.56
Parks, Lawns, Golf Courses	2.99
Row Crops	2.83
Woody Wetlands	1.53
Emergent Wetlands	0.75
Barren: Bare Rock and Sand	0.55
Barren: Quarries, Strip Mines, Gravel Pits	0.19
Uncoded	0.08

* This data set only includes water areas contained within the landforms of the Basin, e.g. lakes and streams, not open bays.

Lower Hudson-Long Island Bays Table 2. State parks in the Lower Hudson - Long Island Bays Basin and their acreage.

Park Name	Total Acreage
Alfred E. Smith/Sunken Meadow	1,157
Bayard Cutting Arboretum	679
Bayswater	20
Bear Mountain	4,787
Belmont Lake	487
Bethpage	1,438
Blauvelt	572
Brookhaven	1,646
Caleb Smith	530
Camp Hero	399
Captree	502
Clarence Fahnestock	12,516
Clay Pit Ponds	249
Cold Spring Harbor	45
Connetquot River	3,446
East River	8
Empire-Fulton Ferry	8
Franklin Delano Roosevelt	835
Gantry Plaza	3
Gilgo	1,063
Graniteville Quarry	5
Harriman	46,725
Harts Brook Nature Preserve	120
Haverstraw Beach	36
Heckscher	1,564
Hempstead Lake	516
High Tor	628
Hither Hills	1,722
Hither Woods	1,431
Hook Mountain	792
Hudson Highlands	5,031
Hudson River Park	338
Iona Island	134
Jones Beach	2,536
Montauk Downs	186
Montauk Point	809
Napeague	1,482
Nissequogue River	134
Nyack Beach	141
Orient Beach	348
Palisades	20
Peter Jay	20
Riverbank	29
Robert Moses	923
Roberto Clemente	32
Rockefeller Preserve	718
Rockland Lake	956
Rockwood Hall	118
Sag Harbor	121
Sanctuary	337
Shadmoor	101
Sterling Forest	17,590
Taconic	5,664
Tallman Mountain	680
Valley Stream	65
Wildwood	788
Wonder Lake	829
	124,058

Lower Hudson-Long Island Bays Table 3. NYSDEC land units within the Lower Hudson - Long Island Bays Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
BEEBE HILL STATE FOREST	2,830	
BIG BUCK MUA	151	
BLOESSERS POND	4	
BOG BROOK UNIQUE AREA	131	wetlands
BRONX RIVER TRAIL	0	riparian trails
CALIFORNIA HILL MUA	886	
CRANBERRY MOUNTAIN WMA	450	
CROTON GORGE UNIQUE AREA	1,337	
DAVID A SARNOFF	2,310	pine barrens
GOETHALS POND	2	tidal wetlands
HARBOR HERONS	40	tidal wetlands, heron rookery
HARVEY MOUNTAIN STATE FOREST	150	
HAWK WATCH TRAILWAY	5	
KAUFMAN CAMP	77	
KINGS PARK	65	
LEMBO	2	
LEMON CREEK	43	
LONG BEACH	422	
LONG ISLAND	1,269	pine barrens
MINISCEONGO MARSH	20	
MONTROSE POINT STATE FOREST	52	
MT. LORETTO	150	
NAPEAGUE HARBOR	24	tidal wetlands
NIMHAM MOUNTAIN MUA	1,024	
NORTH HAVEN	202	
OAK BRUSH PLAINS	731	
OAKWOOD BEACH	1	
OTIS PIKE	2,963	pine barrens
PIERMONT MARSH	68	brackish wetlands
QUOGUE	304	freshwater wetlands, forests
RICHMOND COUNTRY CLUB	124	
ROCKY POINT	5,171	
SAWMILL CREEK	7	
SLADE	2	
TITUS MILL	5	
TURKEY MOUNTAIN	287	
UDALLS PRESERVE	42	
WASSAIC MUA	501	
WEST MOUNTAIN STATE FOREST	822	
WHITE POND MUA	287	
WILPON	25	
	17,199	

Lower Hudson - Long Island Bays Table 4. Species of Greatest Conservation Need currently occurring in the Lower Hudson - Long Island Bays Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Barn owl	Barn owl	Unknown
Bird	Beach and Island ground-nesting birds	American oystercatcher	Increasing
Bird	Beach and Island ground-nesting birds	Black skimmer	Stable
Bird	Beach and Island ground-nesting birds	Common tern	Decreasing
Bird	Beach and Island ground-nesting birds	Least tern	Decreasing
Bird	Beach and Island ground-nesting birds	Piping plover	Increasing
Bird	Beach and Island ground-nesting birds	Roseate tern	Decreasing
Bird	Breeding waterfowl	American black duck	Unknown
Bird	Breeding waterfowl	Ruddy duck	Unknown
Bird	Colonial-nesting herons	Black-crowned night-heron	Stable
Bird	Colonial-nesting herons	Cattle egret	Decreasing
Bird	Colonial-nesting herons	Glossy ibis	Decreasing
Bird	Colonial-nesting herons	Great egret	Increasing
Bird	Colonial-nesting herons	Little blue heron	Decreasing
Bird	Colonial-nesting herons	Snowy egret	Decreasing
Bird	Colonial-nesting herons	Tricolored heron	Stable
Bird	Colonial-nesting herons	Yellow-crowned night-heron	Decreasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Kentucky warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Deciduous/mixed forest breeding birds	Worm-eating warbler	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Northern bobwhite	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	King rail	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Freshwater marsh nesting birds	Yellow rail	Unknown
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Osprey	Osprey	Stable
Bird	Peregrine falcon	Peregrine falcon	Increasing
Bird	Salt marsh breeding birds	Black rail	Unknown
Bird	Salt marsh breeding birds	Forster's tern	Increasing
Bird	Salt marsh breeding birds	Gull-billed tern	Stable
Bird	Salt marsh breeding birds	Laughing gull	Decreasing
Bird	Salt marsh breeding birds	Saltmarsh sharp-tailed sparrow	Decreasing
Bird	Salt marsh breeding birds	Seaside sparrow	Decreasing
Bird	Salt marsh breeding birds	Willet	Increasing
Bird	Transient shorebirds	American golden-plover	Unknown
Bird	Transient shorebirds	Black-bellied plover	Unknown

Lower Hudson - Long Island Bays Table 4 (continued)

Taxa Group	Species Group	Species	Stability
Bird	Transient shorebirds	Buff-breasted sandpiper	Unknown
Bird	Transient shorebirds	Dunlin	Unknown
Bird	Transient shorebirds	Hudsonian godwit	Stable
Bird	Transient shorebirds	Marbled godwit	Unknown
Bird	Transient shorebirds	Purple sandpiper	Unknown
Bird	Transient shorebirds	Red knot	Decreasing
Bird	Transient shorebirds	Ruddy turnstone	Unknown
Bird	Transient shorebirds	Sanderling	Unknown
Bird	Transient shorebirds	Semipalmated sandpiper	Unknown
Bird	Transient shorebirds	Short-billed dowitcher	Unknown
Bird	Transient shorebirds	Whimbrel	Unknown
Bird	Wintering waterbirds	Atlantic brant	Stable
Bird	Wintering waterbirds	Black scoter	Unknown
Bird	Wintering waterbirds	Greater scaup	Decreasing
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Lesser scaup	Stable
Bird	Wintering waterbirds	Long-tailed duck	Unknown
Bird	Wintering waterbirds	Northern pintail	Unknown
Bird	Wintering waterbirds	Red-necked phalarope	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Bird	Wintering waterbirds	Surf scoter	Unknown
Bird	Wintering waterbirds	White-winged scoter	Unknown
Crustacea/Meristomata	American lobster	American lobster	Decreasing
Crustacea/Meristomata	Blue crab	Blue crab	Unknown
Crustacea/Meristomata	Fiddler crab	fiddler crab	Unknown
Crustacea/Meristomata	Horseshoe crab	Horseshoe crab	Unknown
Crustacea/Meristomata	Zooplankton	Marine zooplankton	Unknown
Freshwater fish	Banded sunfish	Banded sunfish	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Swamp darter	Swamp darter	Unknown
Herpetofauna	Box Turtle	Eastern box turtle	Decreasing
Herpetofauna	Diamond-backed Terrapin	Northern diamondback terrapin	Unknown
Herpetofauna	Eastern Spadefoot Toad	Eastern spadefoot	Unknown
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Fowler's toad	Unknown
Herpetofauna	Freshwater wetland amphibians	Northern cricket frog	Decreasing
Herpetofauna	Freshwater wetland amphibians	Southern leopard frog	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Decreasing
Herpetofauna	Lizards	Fence lizard	Decreasing
Herpetofauna	Sea turtles	Green turtle	Unknown
Herpetofauna	Sea turtles	Hawksbill	Unknown
Herpetofauna	Sea turtles	Kemp's or Atlantic ridley	Unknown
Herpetofauna	Sea turtles	Leatherback	Unknown
Herpetofauna	Sea turtles	Loggerhead	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Stream salamanders	Northern red salamander	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Bog turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Eastern mud turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Vernal pool salamanders	Marbled salamander	Decreasing
Herpetofauna	Vernal pool salamanders	Tiger salamander	Decreasing
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Eastern hognose snake	Decreasing
Herpetofauna	Woodland/grassland snakes	Northern black racer	Unknown
Herpetofauna	Woodland/grassland snakes	Northern copperhead	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Worm snake	Decreasing
Insect	Barrens buck moth	Barrens buck moth	Unknown
Insect	Odonates of bogs/fens/ponds	Southern sprite	Unknown
Insect	Odonates of bogs/fens/ponds	Yellow-sided skimmer	Unknown
Insect	Odonates of brackish marshes/lakes/ponds	Needham's skimmer	Unknown
Insect	Odonates of brackish marshes/lakes/ponds	Rambur's forktail	Unknown
Insect	Odonates of coastal plain lakes/ponds	Little bluet	Unknown
Insect	Odonates of coastal plain lakes/ponds	Pine barrens bluet	Unknown
Insect	Odonates of coastal plain lakes/ponds	Scarlet bluet	Unknown
Insect	Odonates of lakes/ponds	Comet darner	Unknown
Insect	Odonates of lakes/ponds	Mantled baskettail	Unknown

Lower Hudson - Long Island Bays Table 4 (continued)

Taxa Group	Species Group	Species	Stability
Insect	Odonates of lakes/ponds	New England bluet	Unknown
Insect	Odonates of lakes/ponds	Spatterdock darner	Unknown
Insect	Odonates of rivers/streams	Spine-crowned clubtail	Unknown
Insect	Odonates of seeps/rivulets	Arrowhead spiketail	Unknown
Insect	Odonates of seeps/rivulets	Gray petaltail	Unknown
Insect	Odonates of seeps/rivulets	Tiger spiketail	Unknown
Insect	Odonates of small forest streams	Mocha emerald	Unknown
Insect	Odonates of small forest streams	Sable clubtail	Unknown
Insect	Other butterflies	Arogos skipper	Decreasing
Insect	Other butterflies	Brazilian skipper	Unknown
Insect	Other butterflies	Checkered white	Decreasing
Insect	Other butterflies	Frosted elfin	Decreasing
Insect	Other butterflies	Henry's elfin	Unknown
Insect	Other butterflies	Hessel's hairstreak	Decreasing
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Northern oak hairstreak	Stable
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Regal fritillary	Unknown
Insect	Other butterflies	Southern grizzled skipper	Unknown
Insect	Other moths	*Nemoria bifilata*	Unknown
Insect	Other moths	*Semiothisa banksianae*	Unknown
Insect	Other moths	*Datana ranaeceps*	Decreasing
Insect	Other moths	*Lepipolys perscripta*	Unknown
Insect	Other moths	*Abagrotis barnesi*	Decreasing
Insect	Other moths	*Amphipoea erepta ryensis*	Unknown
Insect	Other moths	*Chaetaglaea cerata*	Unknown
Insect	Other moths	*Chytonix sensilis*	Unknown
Insect	Other moths	*Eucoptocnemis fimbriaris*	Decreasing
Insect	Other moths	*Euxoa pleuritica*	Decreasing
Insect	Other moths	*Heterocampa varia*	Unknown
Insect	Other moths	*Phoberia orthosioides*	Unknown
Insect	Other moths	*Richia acclivis*	Decreasing
Insect	Other moths	*Schinia bifascia*	Decreasing
Insect	Other moths	Acadian swordgrass moth	Unknown
Insect	Other moths	*Catocala sp 3*	Unknown
Insect	Other moths	Barrens itame	Unknown
Insect	Other moths	Barrens metarranthis moth	Decreasing
Insect	Other moths	Black-bordered lemon moth	Unknown
Insect	Other moths	Broad-lined catopyrrha	Unknown
Insect	Other moths	Brown-bordered geometer	Unknown
Insect	Other moths	Buchholz's gray	Unknown
Insect	Other moths	Chain fern borer moth	Unknown
Insect	Other moths	Coastal barrens buckmoth	Unknown
Insect	Other moths	Coastal heathland cutworm	Unknown
Insect	Other moths	Dimorphic gray	Unknown
Insect	Other moths	Gordian sphinx	Unknown
Insect	Other moths	Gray woodgrain	Decreasing
Insect	Other moths	Herodias underwing	Unknown
Insect	Other moths	Jersey jair underwing	Unknown
Insect	Other moths	Ostrich fern borer moth	Unknown
Insect	Other moths	Pink sallow	Unknown
Insect	Other moths	Woolly gray	Unknown
Mammal	Allegheny Woodrat	Allegheny woodrat	Decreasing
Mammal	Furbearers	River otter	Unknown
Mammal	Game species of concern	New England cottontail	Decreasing
Mammal	Indiana Bat	Indiana bat	Increasing
Mammal	Marine mammals	Harbor porpoise	Unknown
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	Alewife - marine district population	Alewife	Unknown
Marine fish	American eel	American eel	Unknown
Marine fish	American shad	American shad	Stable
Marine fish	Atlantic sturgeon	Atlantic sturgeon	Unknown
Marine fish	Blueback herring	Blueback herring	Unknown
Marine fish	Estuarine associates of SAV	Common pipefish	Unknown
Marine fish	Estuarine associates of SAV	Fourspine stickleback	Unknown
Marine fish	Estuarine associates of SAV	Lined seahorse	Unknown
Marine fish	Estuarine associates of SAV	N. American ninespine stickleback	Unknown
Marine fish	Estuarine associates of SAV	Threespine stickleback	Unknown
Marine fish	Estuarine forage species	Atlantic silverside	Unknown
Marine fish	Estuarine forage species	Inland silverside	Unknown
Marine fish	Estuarine forage species	Mummichog	Unknown

Lower Hudson - Long Island Bays Table 4. (continued)

Taxa Group	Species Group	Species	Stability
Marine fish	Estuarine forage species	Spotfin killifish	Unknown
Marine fish	Estuarine forage species	Striped killifish	Unknown
Marine fish	Estuarine migratory pelagic	Bay anchovy	Unknown
Marine fish	Estuarine migratory pelagic	Menhaden	Unknown
Marine fish	Labrids	Cunner	Unknown
Marine fish	Labrids	Tautog	Unknown
Marine fish	Northern puffer	Northern puffer	Unknown
Marine fish	Oyster toadfish	Oyster toadfish	Decreasing
Marine fish	Rainbow smelt	Rainbow smelt	Decreasing
Marine fish	Shortnose sturgeon	Shortnose sturgeon	Stable
Marine fish	Tomcod	Atlantic tomcod	Unknown
Marine fish	Winter flounder	Winter flounder	Decreasing
Mollusk	Bay scallop	Bay scallop	Decreasing
Mollusk	Blue mussel	Mytilus edulis	Unknown
Mollusk	Eastern oyster	Oyster	Decreasing
Mollusk	Freshwater bivalves	Eastern pearlshell	Unknown
Mollusk	Hard clam	Hard clam	Decreasing
Mollusk	Ribbed mussel	Ribbed mussel	Unknown

Lower Hudson - Long Island Bays Table 5. SGCN that historically occurred in Lower Hudson - Long Island Bays Basin, but are now believed to be extirpated from the basin.

Taxa Group	Species Group	Species
Bird	Breeding waterfowl	Blue-winged teal
Bird	Grassland birds	Sedge wren
Bird	Loggerhead Shrike	Loggerhead shrike
Bird	Transient shorebirds	Greater yellowlegs
Crustacea/Meristomata	Freshwater crustacea	Piedmont groundwater amphipod
Freshwater fish	Comely shiner	Comely shiner
Freshwater fish	Extirpated Fishes	Mud sunfish
Freshwater fish	Ironcolor shiner	Ironcolor shiner
Herpetofauna	Lake/river reptiles	Queen snake
Insect	American burying beetle	American burying beetle
Insect	Beach tiger beetles	Northeastern beach tiger beetle
Insect	Karner blue butterfly	Karner blue
Insect	Odonates of rivers/streams	Appalachian jewelwing
Insect	Odonates of rivers/streams	Brook snaketail
Insect	Odonates of rivers/streams	Common sanddragon
Insect	Odonates of rivers/streams	Russet-tipped clubtail
Insect	Odonates of rivers/streams	Sparkling jewelwing
Insect	Other butterflies	Northern metalmark
Insect	Other moths	*Orgyia detrita*
Insect	Other moths	Barrens dagger moth
Insect	Other moths	Bay underwing
Insect	Other moths	Culvers root borer
Insect	Other moths	Doll's merolonche
Insect	Other moths	Jair underwing
Insect	Other moths	Melsheimer's sack bearer
Insect	Other moths	Pale green pinion moth
Insect	Other moths	Regal moth
Insect	Other moths	The consort underwing
Insect	Other moths	Toothed apharetra
Insect	Pine barrens tiger beetles	*Cicindela abdominalis*
Insect	Pine barrens tiger beetles	*Cicindela patruela*
Insect	Pine barrens tiger beetles	*Cicindela unipunctata*
Insect	Stoneflies/Mayflies of uncertain habitat	*Procloeon simile*
Insect	Sylvan hygrotus diving beetle	Sylvan hygrotus diving beetle
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mammal	Tree bats	Silver-haired bat
Mollusk	Freshwater bivalves	Black sandshell
Mollusk	Freshwater bivalves	Tidewater mucket
Mollusk	Freshwater gastropods	Lance aplexa

Lower Hudson - Long Island Bays Table 6. Lower Hudson - Long Island Bays current species diversity relative to the total number of SGCN statewide

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**16**	**89**	**118**	**75.4**
Bald Eagle		1		
Barn Owl		1		
Beach and Island Ground Nesting Birds		6	7	85.7
Breeding Waterfowl		2	4	50.0
Colonial-Nesting Herons		8	8	100.0
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		7	9	77.8
Early Successional Forest/Shrubland Birds		12	12	100.0
Forest Breeding Raptors		5	6	83.3
Freshwater Marsh Nesting Birds		5	6	83.3
Grassland Birds		8	11	72.7
Osprey		1		
Peregrine Falcon		1		
Salt Marsh Breeding Birds		7	7	100.0
Transient Shorebirds		13	14	92.9
Wintering Waterbirds		11	19	57.9
CRUSTACEA	**5**	**5**	**7**	**71.4**
American Lobster		1		
Blue Crab		1		
Fiddler Crab		1		
Horseshoe Crab		1		
Zooplankton		1		
FRESHWATER FISH	**3**	**3**	**40**	**7.5**
Banded Sunfish		1		
Heritage-Strain Brook Trout		1		
Swamp Darter		1		
HERPETOFAUNA	**12**	**32**	**44**	**72.7**
Box Turtle		1		
Diamond-Backed Terrapin		1		
Eastern Spadefoot Toad		1		
Freshwater Wetland Amphibians		4	5	80.0
Lake-River Reptiles		2	5	40.0
Lizards		1	3	33.3
Sea Turtles		5	5	100.0
Snapping Turtle		1		
Stream Salamanders		1	2	50.0
Uncommon Turtles of Wetlands		4	5	80.0
Vernal Pool Salamanders		4	4	100.0
Woodland/Grassland Snakes		7	8	87.5
INSECT	**10**	**62**	**197**	**31.5**
Barrens Buckmoth		1		
Odonates of Bogs/Fens/Ponds		2	10	20.0
Odonates of Brackish Marshes/Lakes/Ponds		2	2	100.0
Odonates of Coastal Plain Lakes/Ponds		3	3	100.0
Odonates of Lakes/Ponds		4	5	80.0
Odonates of Rivers/Streams		1	19	5.3
Odonates of Seeps/Rivulets		3	4	75.0
Odonates of Small Forest Streams		2	3	66.7
Other Butterflies		11	18	61.1
Other Moths		33	92	35.9
MAMMAL	**6**	**7**	**21**	**33.3**
Allegheny Woodrat		1		

Lower Hudson - Long Island Bays Table 6. (continued)

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
MAMMAL (continued)				
Furbearers		1	2	50.0
Game Species of Concern		1		
Indiana Bat		1		
Marine Mammals		1	7	14.3
Tree Bats		2	3	66.7
MARINE FISH	**15**	**25**	**51**	**49.0**
Alewife		1		
American Eel		1		
American Shad		1		
Atlantic Sturgeon		1		
Blueback Herring		1		
Estuarine Associates of SAV		5	5	100.0
Estuarine Forage Species		5	5	100.0
Estuarine Migratory Pelagic		2	2	100.0
Labrids		2	2	100.0
Northern Puffer		1		
Oyster Toadfish		1		
Rainbow Smelt		1		
Shortnose Sturgeon		1		
Tomcod		1		
Winter Flounder		1		
MOLLUSK	**6**	**6**	**59**	**10.2**
Bay Scallop		1		
Blue Mussel		1		
Eastern oyster		1		
Freshwater bivalves		1	39	2.6
Hard clam		1		
Ribbed mussel		1		
TOTAL	**73**	**229**	**537**	**42.6**
% of all spp groups statewide	**57.0%**			

Lower Hudson-Long Island Bays Table 7. Habitats listed as critical to SGCN found in the Atlantic Ocean Basin, described by habitat system and subsystem as adapted from Edinger *et al* (2002). The number of SGCN that use each system-subsystem association is also indicated.

System	Subsystem	# of Species
Terrestrial	open upland	57
Terrestrial	forested	53
Estuarine	intertidal	52
Palustrine	mineral soil wetland	46
Terrestrial	barrens/woodlands	45
Estuarine	shallow subtidal	40
Marine	deep subtidal	32
Riverine	coldwater stream	29
Terrestrial	coastal	24
Estuarine	deep subtidal	23
Marine	shallow subtidal	17
Lacustrine	warm water shallow	15
Terrestrial	maritime	15
Unknown	unknown	14
Lacustrine	cold water shallow	13
Riverine	unknown	13
Marine	intertidal	11
Riverine	warmwater stream	11
Palustrine	peatlands	10
Riverine	coastal plain stream	10
Lacustrine	coastal plain	8
Lacustrine	cold water deep	8
Lacustrine	unknown	7
Riverine	deepwater river	7
Estuarine	cultural	5
Estuarine	unknown	5
Lacustrine	warm water deep	4
Marine	unknown	4
Subterranean	natural	2
Terrestrial	unknown	2
Marine	cultural	1
Palustrine	unknown	1
Subterranean	cultural	1

Lower Hudson-Long Island Bays Table 8. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the Lower Hudson-Long Island Bays Basin. For details on threats, see Appendix C: Threats Characterization for Wildlife and Their Habitats.

Threats	# of Species Groups Affected	% of All Threats in Basin
Multiple [a]	73	15.6
Habitat Loss - cultural	52	11.1
Contaminants	35	7.5
Degradation of water quality	34	7.3
Human Disturbance - illegal/unregulated harvest	29	6.2
Disturbed Predator/Prey Cycles	22	4.7
Human Disturbance - collisions	21	4.5
Barriers - dams, weirs, culverts, bridges	19	4.1
Interspecific Competition for Resources	18	3.8
Disease	14	3.0
Fragmentation of Habitat Types	11	2.4
Habitat Loss - natural	11	2.4
Sedimentation/Erosion	11	2.4
Competition from Invasives/Exotics	10	2.1
Human Disturbance - entanglement/entrainment	10	2.1
Climate change (aquatic)	10	2.1
Active Alteration of Natural Processes	8	1.7
Human Disturbance - general	7	1.5
Unsustainable Agricultural/Silvicultural Practices	7	1.5
Susceptibility to Stochastic Events - isloated pop'ns	7	1.5
Susceptibility to Stochastic Events - weather events	6	1.3
Altered Hydrology - water level mgmt/extraction	5	1.1
Habitat Patch Size Reduction	5	1.1
Loss of Habitat Connectivity	5	1.1
Loss of Streamside Buffers	4	0.9
Habitat Composition Altered by Invasive Species (terrestrial)	4	0.9
Altered Hydrology - natural processes	4	0.9
Habitat Composition Altered by Invasive Species (aquatic)	3	0.6
Detrimental Hybridization	3	0.6
Climate change (terrestrial)	3	0.6
Barriers - roads, development	2	0.4
Pollution - acid rain, soil contamination (terrestrial)	2	0.4
Habitat Composition Altered by Overuse - deer browse	2	0.4
Loss of Host Species	2	0.4
Parasites	2	0.4
Susceptibility to Stochastic Events - rare species	2	0.4
Unknown	2	0.4
Interspecific Competition - general	1	0.2
Habitat Composition Altered by Overuse - geese, swans	1	0.2
Negative Edge Effects	1	0.2

Lower Hudson-Long Island Bays Table 9. SGCN in the Lower Hudson - Long Island Bays Basin for which the Atlantic States Marine Fisheries Commission has management jurisdiction. Year of completion of the Fishery Management Plan (FMP) and most recent update is indicated.

Species	FMP Completion Date	Most Recent Update
American Eel	1999	N/A
American Lobster	1997	2005
Atlantic Menhaden	1981	2004
Atlantic Sturgeon	1990	2001
Horseshoe Crab	1998	2004
Shad and River Herring	1985	2002
Tautog	1996	2002
Winter Flounder	1992	1998

Source: www.asmfc.org, list of Fishery Management Reports. Downloaded 5/9/05.

Description of the Basin

The Northeast Lake Ontario-St. Lawrence River (NELO-SLR) Basin is the second largest in New York State (NYS) in terms of land area, covering all or part of 9 counties and about 4.9 million acres (7,600 square miles), including all of St. Lawrence County, most of Franklin County, large portions of northern Jefferson, Lewis, Herkimer and Hamilton counties, and small parts of Essex and Clinton counties. The NELO-SLR Basin is bordered to the west by a north-south line in Lake Ontario, passing through Kingston, Ontario and along the shore as far south as Stony Point, and to the north by the St. Lawrence River. The basin covers three major watersheds (St. Lawrence River, Black River, and the northeastern portion of Lake Ontario and its tributaries) and seven sub-watersheds (St. Lawrence mainstem, Black Lake/Indian River, Grasse River, Oswegatchie River, Saint Regis River, Raquette River, and English-Chateaugay-Salmon Rivers). There are more than 14,000 miles of mapped rivers and streams in the Basin (USGS Watershed Index) and more than 1,000 lakes (DEC Division of Water, 2002). Some of the major lake systems in the Basin include the Stillwater Reservoir, the Fulton chain of lakes (Herkimer County), Raquette Lake, Blue Mountain Lake, Little Tupper Lake, Long Lake, and Round Lake (Hamilton County) in the southern part of the Basin, Perch Lake (Jefferson County), Cranberry Lake, Carry Falls Reservoir (St. Lawrence County), and Tupper Lake (Franklin County) in the central part of the Basin, and Black Lake (St. Lawrence County) and Upper Chateaugay Lake (Clinton County) in the northern part of the Basin.

The St. Lawrence River is one of the most significant waterways in North America. Extending 760 miles from Lake Ontario to the Gulf of St. Lawrence, the St. Lawrence River is the gateway between the North Atlantic and the Great Lakes. At its most downstream point in the United States (near Cornwall, Ontario), the St. Lawrence drains an area of nearly 300,000 square miles (DEC, Division of Water, 2002). The upper St. Lawrence River can be divided into three sections: the Thousand Islands section, the middle corridor section, and Lake St. Lawrence. The Thousand Islands section (northwestern Jefferson County and southwestern St. Lawrence County) includes a complex of islands, numerous shoals, and channels. The middle corridor (St. Lawrence County) is relatively narrow with few islands and is more riverine in nature. Lake St. Lawrence (northeastern St. Lawrence County) is a 30-mile long impounded section created by the Moses-Saunders Power Dam. The river section downstream of Moses-Saunders Dam extends 7 mi. to the Quebec border and has unique habitats of backwaters, tributary mouths, and a powerful tailwater turbulent zone. The most downstream segment and adjoining lands are governed by the St. Regis Mohawk Tribe of American Indians. Because of the benefits provided by the St. Lawrence River in the form of transportation, fishing, hunting, and fertile soils, the river has been used by humans for at least 10,000 years. Despite the heavy use that has occurred since, (Thompson, et al., 2002), including international commercial transport, hydroelectric power generation, and industrial and residential development, the river continues to support a diverse array of fish and wildlife.

Lake Ontario has a total surface area of more than 7,500 square miles and a maximum depth of more than 800 feet. The eastern basin portion of the Lake in the NELO-SLR watershed is about 800 square miles and is relatively shallow, with a maximum depth of less than 200 feet. This eastern part of Lake Ontario extends from Stony Point, northward to the outlet of the St. Lawrence River (Tibbetts Point, New York - Wolfe Island, Ontario). The area contains a series of rocky points, islands, and shoals. Several are found here which include Henderson Bay, Black River Bay, Chaumont Bay, and Guffin Bay. Wetlands occupy the more protected areas of the bays. The bays are considered mesotrophic and open lake areas are oligotrophic. As with the St. Lawrence River, Lake Ontario in general, and the bays of northeastern Lake Ontario in particular, have been providing consumptive and non-consumptive benefits to people for thousands of years. The region continues to help support New York State's economy by sustaining a robust recreational fishery, by serving as a commercial transportation link, and by providing high-value residential and commercial development. Chaumont Bay was formerly the center of a robust commercial fishery for brown bullhead, yellow perch, and other pan fish. There are only 4 active license holders in that fishery today. Northeastern Lake Ontario and its tributaries have provided recreational benefits in the form of fishing, hunting, trapping, boating, and wildlife viewing, and provide crucial fish and wildlife habitat, such as nursery and spawning grounds for a diverse array of fish species, islands that support a significant breeding population of colonial waterbirds; a migratory corridor for passerine birds, raptors, and waterfowl, and marshes that support amphibians, invertebrates, and other species of conservation concern.

Several major rivers carry water from the northern slope of the Adirondacks and converge near Massena, where they join the St. Lawrence. The Salmon, St. Regis, Raquette and Grasse rivers each have headwater and midsection areas as trout fisheries. Their lower sections are in the St. Lawrence Plain as sandy-low gradient habitat suited to fishes of the St. Lawrence, like sturgeon, muskellunge and Iowa darters. The Oswegatchie River joins the St. Lawrence farther to the west, at Ogdensburg, and the watershed has west-slope Adirondack areas which are more severely affected by poor neutralizing capacity to the acid rainfall. There are portions of 20 rivers in the basin that have been designated under DEC’s Wild, Scenic, and Recreational Rivers Program. Some of these include the Grasse, Salmon, Oswegatchie, Raquette, and St. Regis.

The Black River and smaller tributaries of the Northeast Lake Ontario shoreline drain about 2,500 square miles in north-central NYS. This area includes portions of the western Adirondacks, the Tug Hill Plateau, and lowlands along the Lake Ontario shore. The Black River itself drains 1,900 mi encompassing much of Lewis County, large parts of Jefferson and Herkimer counties, and smaller portions of Hamilton and Oneida counties. The Black River is a large, warm water river, with a bedrock substrate (in free-flowing sections). The river has been dammed at many upstream and downstream locations for generation of hydroelectric power. Similar to the other river systems described above, the Black River watershed is sparsely populated. Human uses of the area are primarily silviculture and recreation/tourism in the heavily forested Adirondacks, agriculture and silviculture (paper manufacturing) in the valley between the Tug Hill Plateau and the Adirondack Mountains, and agriculture and recreation (e.g., hunting, fishing, trapping) in the East Ontario Plain (lowlands along Lake Ontario in west-central Jefferson County). Conservation efforts to mitigate the effects of hydroelectric dams on this waterway have increased the accessibility of the river to Lake Ontario salmonids in the lower 10 miles, and today the fishery at the river mouth attracts visitors from throughout New York State and beyond.

From a terrestrial perspective, the NELO-SLR Basin is comprised of two ecoregions (as defined by The Nature Conservancy). Roughly half of the watershed is classified as northern Appalachian boreal forest. This area is made up primarily of the Adirondack Mountains and the northeastern fringe of the Tug Hill Plateau (southwestern Lewis County), and is heavily forested. This plan will focus on the Adirondacks, as the vast majority of the Tug Hill Plateau falls within the Southeast Lake Ontario Basin. The St. Lawrence/Champlain Valley ecoregion defines the remaining half of the area and extends from northern Clinton County, along the St. Lawrence River, southwest through Jefferson County, terminating at the East Ontario Plain. This expanse is often referred to as the St. Lawrence Valley and was formed 12,000 years ago as the glaciers receded. The land is primarily flat as a result of the underlying bedrock, the weight of ancient glaciers, and the shifting levels of the water that filled the valley at the end of the last glacial period (Thompson, et al., 2002). The St. Lawrence/Champlain Valley ecoregion also includes the Black River Valley in Lewis County, which separates the Tug Hill Plateau from the Adirondacks. Both the St. Lawrence Valley and the Black River Valley are largely outside of the Adirondack Park boundary and are comprised of relatively open habitats.

Despite the NELO-SLR Basin's large size, it is among the least populated in the state with about 350,000 people. In fact, this Basin has the lowest population density in the state with only 45 people per square mile (U.S. Census Bureau, 2002). The human population of the Basin is mostly rural, with small population centers located along the St. Lawrence River and its larger tributaries. They include Massena (population 13,121, St. Lawrence County), Ogdensburg (population 12,364, St. Lawrence County), Potsdam (population 15,957, St. Lawrence County), and Malone (population 14,981, Franklin County; U.S. Census Bureau, 2002). The City of Watertown near the mouth of the Black River is the largest urban population center in the Basin (population 26,705, Jefferson County; U.S. Census Bureau, 2002). Fort Drum, a 107,000-acre (168 sq. mi.) military reservation, lies just outside the city. The majority of the human population in this Basin is condensed within the St. Lawrence Valley and the eastern shore of Lake Ontario, and as a result, many of the threats to wildlife and their habitats also occur there. However, despite these stresses, the NELO-SLR Basin retains a large percentage of natural and semi-natural habitats.

The Basin is comprised of a diverse array of habitats, from the extensive hardwood and boreal forest and wetland systems of the Adirondacks, to the agricultural and grass and marsh habitats of the lowland areas associated with the St. Lawrence and Black River valleys and the East Ontario Plain. The predominant habitat type within the watershed is forest (about 70%), including deciduous, coniferous, and mixed forest habitats (Figure 1, Northeast Lake Ontario-St. Lawrence Table 1). Anthropogenic uses dominate about 18% of the Basin (Figure 1, Northeast Lake Ontario-St. Lawrence Table 1). This includes agriculture (row crops 10%, pasture/hay land 6%); residential and commercial/industrial development (1%); barren areas (quarries, strip mines, gravel pits < 1%), and lawns and golf courses (<1%). More than 11% of the NELO-SLV Basin is classified as aquatic habitat (Figure 1, Northeast Lake Ontario-St. Lawrence Table 1). About 8% of this is classified as wetlands, the majority of which are wooded wetlands. The remaining 3% classified as "water" encompasses thousands of lakes and ponds, miles of rivers and streams, and roughly one-third of the NYS share of the coast of Lake Ontario (Figure 1, Northeast Lake Ontario-St. Lawrence Table 1).

These habitats accommodate 110 Species of Greatest Conservation Need (SGCN; Northeast Lake Ontario-St. Lawrence Table 2). This is about 21% of the 537 species designated as SGCN in New York State (Northeast Lake Ontario-St. Lawrence Table 3) and includes 61 bird species, 15 insect species, 15 amphibian and reptile species, 9 freshwater fish species, 5 mammal species, 4 mollusk species, and 1 species of marine fish. There are 35 species that historically occurred in the Basin, but are now believed to be extirpated (Northeast Lake Ontario-St. Lawrence Table 4).

Critical Habitats of the Basin and the Species That Use Them

SGCN within the NELO-SLR Basin occupy a landscape mosaic of interconnected terrestrial and aquatic habitats shaped by natural and human processes. Overall, the landscape of the Basin ranges from the high-elevation alpine forests and lowland boreal marshes of the Adirondacks, to the wooded and emergent marshes and rich agricultural lands in the St. Lawrence Valley. These habitats are bordered by Lake Ontario and the St. Lawrence River, which is part of the largest aquatic system in the nation. This diversity and interspersion of habitat types allows this region to support both common and rare species of fish and wildlife.

Forested Habitats

Forested habitats dominate the NELO-SLR Basin and range from lowland deciduous, evergreen, and mixed forests to the boreal forests of the higher elevations of the Adirondacks. For the purposes of this document, the forested habitats will be divided into two general regions: the Adirondack Mountains and the St. Lawrence Valley (including the Black River Valley in Lewis County and the East Ontario Plain in Jefferson County).

The 6-million acre matrix of public and private lands of the Adirondack Park is comprised of some of the largest, intact stretches of forest (including some first growth) in the state including alpine/boreal forest communities. State-owned lands within the Adirondack Forest Preserve have special regulations covering their use. Logging and prescribed fires are not permitted. Within the Adirondacks, more than 3.2 million acres of Forest Preserve lands will remain forever wild. Predominant vegetation types in this region are beech-maple forest, hemlock-northern hardwood forest, and spruce-fir forests. These habitats support wide-ranging mammals, such as marten and fisher; early successional birds, such as Canada warbler, ruffed grouse, and American woodcock; raptors, such as long-eared owl, and forest interior birds, such as wood warblers and various thrushes. Abandoned mines and natural caves provide bat habitat and support listed species such as the Indiana bat. Alpine tundra ecosystems exist on several of the Basin's highest mountain peaks, such as Seward Mountain (4,300 feet, Franklin County). These areas are characterized by shrubs, herbs, mosses, and lichens. Plant communities of the alpine zone have survived in these isolated and exposed habitats since the end of the last glacial period.

Critical habitat types of the Adirondacks include, mature forests, early successional forests, high elevation regenerating conifer stands, and the lowland boreal system. The lowland boreal system is an area of moderately low diversity in which the plants and animals are adapted to short summers and deep snow and in which songbirds, insects, and evergreens are common (Jenkins, in review). The Adirondacks are technically south of the true Boreal Zone but still have extensive tracts of habitat characteristic of the southern edge of the true boreal, where northern animals and plants are subject to boreal processes (Jenkins, in review). Common forest vegetation types of the lowland boreal include conifer swamps and low bog forests. The largest corridors of boreal habitat are found in the northwest Adirondacks, a large portion of which is within this Basin and contain significant populations of northern plants, such as black spruce, white spruce, dwarf cranberry, bog aster, and various sedges, and northern animals, such as spruce grouse and bay-breasted warbler (Jenkins, in review).

High elevation forests provide critical habitat for Bicknell's thrush. It is found primarily above 2800 feet in dense fir or spruce thickets, in particular regenerating fir waves. This species has a very limited global population and breeding range, and NYS has a substantial portion of the global population.

Early successional habitats are critical for a host of early successional birds. The vast majority of these species are in widespread and often steep declines. Habitat for these species in the forest preserve is dependent on natural disturbances since the state constitution prohibits management practices that would create and/or maintain them. Therefore, private lands are essential to maintain these habitats and NYS easements on working forests will allow them to remain as working forests and benefit this habitat.

Mature hardwood and mixed forests are also important, as they provide habitat for a wide variety of forest-nesting species, including Neotropical forest birds and amphibians. Most of the bird species that rely on this habitat are doing well, and the large amount of Forest Preserve lands will help to ensure this for the future.

The transitional lowland forests of the St. Lawrence Valley lie between the boreal forests and the broadleaf deciduous zone. Soils in the St. Lawrence Valley are made up primarily of marine clays that resulted from an influx of seawater at the end of the glacial period and have influenced the composition of forested habitats. Forests in this region of the basin are dominated by conifers, such as hemlock and pine, and deciduous species, such as birch, beech, maple, and oak. Due largely to anthropogenic causes, forested habitats are more fragmented in the St. Lawrence Valley than in the Adirondacks. The rich agricultural lowlands in the St. Lawrence Valley comprise the matrix within which these maple-beech-birch northern hardwood forests are embedded. Despite this fragmentation, forest tracts are sizeable enough to support species that require large, intact stretches of forest. Early successional habitats that have taken hold from more recently abandoned agricultural endeavors can be found spread throughout the Valley and support species such as Canada warbler and golden-winged warbler. Examples of this critical habitat type can be observed at Ashland Wildlife Management Area (2,000 acres, Jefferson County).

Wetland and Other Aquatic Habitats

There are about 400,000 acres of wetlands in the NELO-SLR Basin (MRLC Data, 2005), roughly 250,000 of which are outside the Adirondack Park (DEC, 2003). Wetlands in the Basin can be characterized in three ways:

(1) Wetlands embedded in a forest matrix (primarily the Adirondacks, the fraction of Tug Hill that is in this Basin, and some wooded wetlands of the central St. Lawrence Valley). Wetland types include bogs (characterized by peat and sphagnum mosses), wooded swamp/bottomland forest (mature trees including cedar, red maple, silver maple, and black ash), shrub swamp (woody shrubs such as speckled alder and various species of willow and dogwoods), and vernal pools (seasonal/temporary ponds or wetlands often associated with wooded habitats).

(2) Wetlands embedded in a grassland matrix (primarily the St. Lawrence Valley). Wetland types here are often characterized as "pothole" or "sheetwater" wetlands and include emergent marsh (frequently or continually flooded wetlands with plants such as cattails and rushes) and wet meadows (seasonal wetlands with grasses and sedges).

(3) Coastal marshes and embayments (shores of eastern Lake Ontario and the St. Lawrence River). Wetland types include open embayments, protected embayments, barrier-beaches, and drowned river mouths.

Based on these three broad categories the following descriptions attempt to provide a general feel for the wetlands in the watershed.

The proportion of wooded wetlands in this Basin is among the highest in the state and includes the extensive lowland boreal wetlands of the Adirondacks. New York State's wetlands are found in the Adirondacks, and wetland types include spruce-fir swamp, shallow emergent marsh, sedge meadow, boreal wetlands, and vernal pools dotted across the landscape. These habitats support wetland birds such as American bittern, least bittern, and pied-billed grebe. Marsh and vernal pool habitats also support herpetofauna such as blue-spotted and Jefferson salamanders. As discussed above, wetlands of the lowland boreal system found in the Adirondacks are a significant habitat feature and contain significant populations of wetland-dependent northern plants and animals. Common vegetation types of the lowland boreal include conifer swamps, low-bog forests, open sphagnum bogs, tall-shrub swamps, and shrub-sedge meadows. Some wooded wetland types and plant communities in the Basin are uncommon. Bogs, fens, alpine peatlands, cedar swamps, and black gum swamps are all examples of rare wetland plant communities. An example of a rare wetland ecotype within this Basin is the boreal peatland complex near Lake Clear in Franklin County. Spring Pond Bog Preserve, a 4,200-acre parcel acquired by The Nature Conservancy, contains the second-largest expanse of peatland in New York State.

Wooded wetlands are not restricted to the Adirondacks. Patches of wooded wetlands are spread throughout the St. Lawrence Valley, with concentrations in the central (North-central St. Lawrence County) and eastern (northern Clinton County) parts of the Valley. An excellent example of wooded wetlands can be seen at Upper and Lower Lakes Wildlife Management Area (8,600 acres; St. Lawrence County). Species of interest, found here include black tern, pied-billed grebe, least bittern, osprey, and common loon.

The St. Lawrence Valley contains extensive agricultural grasslands interspersed with abundant freshwater wetlands and tributaries. When compared with other areas in the northeastern United States, the mix of grasslands (400,000 acres) and wetlands (150,000 acres) found in the St. Lawrence Valley provide critical habitat for SGCN (USFWS, 2000). Unlike other agricultural regions, climate and poor drainage conditions favor the establishment of freshwater wetlands and promote late season harvesting of grass, which enhances the value of the region to wildlife (Pashley, et al., 2000). For example, the interspersion of agricultural lands, shrublands and wetlands (forested and marsh) creates habitat conditions that favor, and are of critical importance to several species of migratory birds that are rare and declining elsewhere in the Northeast (USFWS, 2000). These species include the American woodcock and the golden-winged warbler. Furthermore, the

St. Lawrence Valley is one of the most important areas for waterfowl production in NYS. Waterfowl and other water-dependent species rely on the numerous freshwater wetlands scattered throughout the Valley for resting, feeding and staging areas during spring and fall migration. The shallow wetlands characteristic of the Valley provide a greater variety of nutrients for feeding and more abundant cover for nesting and hiding than do many of the deep lakes or fast-moving rivers of the region. Species using these habitats include, waterbirds (e.g., American bitterns, least bitterns, black tern), waterfowl (e.g., blue-winged teal), and herpetofauna (e.g., western chorus frog). An example of wetland habitat embedded in an agricultural landscape can be seen at Perch River Wildlife Management Area (7,800 acres; Jefferson County).

The coastal wetlands along eastern Lake Ontario and the St. Lawrence River can be characterized by four geomorphic types: open embayment, protected embayment, barrier-beach, and drowned river mouth. These critical habitats extend from the lake to the border with Quebec, near St. Regis, New York. There are 28 areas within the Basin designated as Significant Coastal Fish and Wildlife Habitat (SCFWH) by the Department of State in consultation with DEC (Northeast Lake Ontario-St. Lawrence Table 5). These areas encompass more than 37,000 acres and are primarily concerned with marshes and tributaries of Lake Ontario and the St. Lawrence River. Critical coastal wetland habitats designated as SCFWH include Goose Bay and Cranberry Creek (2,035 acres, Jefferson County), Crooked Creek Marsh (1,198 acres, Jefferson County), and Dexter Marsh and the Black River (2,526 acres, Jefferson County). Goose Bay and Cranberry Creek comprise a large, shallow, riverine bay and wetland ecosystem on the St. Lawrence River and is subject to minimal disturbance. It is one of the major concentration areas for migratory birds, including waterfowl, in the St. Lawrence Plains ecological region and has an important reproduction area for northern pike and littoral fishes. SGCN found here include Blanding's turtles, northern harriers, and least bitterns. Crooked Creek Marsh is one of the four largest, undeveloped, coastal streamside wetlands on the St. Lawrence River and has been subject to minimal habitat disturbance. The area supports pugnose shiners, nesting northern harriers and least bitterns, and foraging common terns. Dexter Marsh and Black River comprise an extensive, relatively undisturbed, bay-head complex, unusual in the Great Lakes Plain. Habitats include a 2,000-acre wetland complex located at the confluence of the Black River, Perch River, and Muskalonge Creek. The area supports concentrations of salmonids, lake sturgeon, marsh-nesting birds such as black tern, and migrant waterfowl. Another important coastal marsh is the Eastern Lake Ontario Barrier Beaches/Wetland Complex, designated as an Important Bird Area by Audubon New York. The area covers about 24,000 acres in Oswego and Jefferson counties, extends from the Salmon River north to the Black River, and contains remnants of one of the largest inland dune systems in the eastern Great Lakes, and some of the highest-quality freshwater marshes in NYS. The area supports species such as pied-billed grebes, American bitterns, least bitterns, northern harriers, common terns, black terns, blackchin shiner and Iowa darter. Chaumont Bay, 9,000 acres on the northern edge of this complex, is sufficiently enclosed or protected from waves that it provides vast habitats with submerged aquatic vegetation and open water. Shoreline habitats also support an array of shorebirds during migration, and forest and shrub habitats along and near shorelines of Lake Ontario also provide critical habitats to migrating songbirds and raptors.

Other important aquatic habitats found in the NELO-SLR Basin include the more than 14,000 miles of rivers and streams and more than 1,000 lakes, ponds, and reservoirs. The Adirondack Region alone contains an estimated 2,800 ponds and lakes (both within and outside the Basin), miles of pristine headwater streams, and several large river systems. The ponds and lakes in the Adirondacks provide habitat for rare fish species such as round whitefish, reptiles such as the wood turtle, and foraging sites for raptors such as osprey, and are the stronghold for nesting common loons in the state. Significant lake habitats in the Adirondacks include Stillwater Reservoir, Blue Mountain Lake, and Fulton chain lakes, Raquette Lake, Long Lake, Cranberry Lake, Tupper Lake, North Carry Falls Reservoir, and Upper Chateaugay Lake. Important lake habitats in the northwest part of the basin include Perch Lake, several smaller Indian River lakes and Black Lake. Unique species in Black Lake include mooneye and lake sturgeon.

The most significant lake habitat in the basin is Lake Ontario. Nearshore habitats have water depths of less than 50 feet that provide critical habitat for nearly all Lake Ontario fish in the eggs, fry, and juvenile stages. Most fish depend on these habitats during some stage of their life cycle (Stewart, et al., 1999). Offshore habitats have water depths greater than 50 feet and are inhabited by both benthic and pelagic organisms. Species found here include alewives, lake trout, and deepwater sculpin. An important spawning shoal for lake trout is found at Stony Point.

As mentioned above, the St. Lawrence River is often characterized by four distinct segments: the Thousand Islands, the Middle Corridor, Lake St. Lawrence, and Lake St. Francis downstream of Moses-Saunders Dam. The Thousand Islands section includes a complex of 1,768 islands, numerous shoals, channels with moderate water currents, deep channels with strong currents, large shallow bays, and emergent wetlands (LaPan, et al., 2002). The middle corridor (St. Lawrence County) is relatively narrow, with few islands, and is more riverine in nature, with limited shallow water and relatively rapid currents (LaPan, et al., 2002). Lake St. Lawrence (northeastern St. Lawrence County) is a 30-mile-long reservoir created by the Moses-Saunders Power Dam. Unlike the other two sections, this section of the river is subject to significant water level fluctuations. A stabilization of water level by the Moses-Saunders Dam has also caused degradation of wetlands in areas upstream as far as Rochester, and this is currently under study. Average water depth is about 25 feet, with a maximum depth of about 100 feet. Lake St. Lawrence has relatively strong water currents and contains a number of islands and shoals; however, the flooding and dredging associated with power projects along this section of the river have altered its character (LaPan, et al., 2002). The 7-mile river segment downstream of the Moses-Saunders Dam has a tailwater important to lake sturgeon spawning, is part of Lake St. Francis, and has productive shallow areas on the St. Regis Mohawk Reservation. Variation in depth, water current, and the presence/absence of shoals and islands in these different parts of the river support a diverse and productive warm-water fishery, migratory stopover sites for waterfowl and other birds, and breeding and foraging habitat for many species of greatest conservation need. Lake Ontario supplies nearly all of the water to the upper St. Lawrence River. The amount of water available is dependent upon precipitation and evaporation rates in the Great Lakes, in conjunction with the amount of water released from Lake Ontario by control structures on the river.

Some other important aquatic habitats within the Basin, designated as Significant Coastal Fish and Wildlife Habitat by the Department of State (Northeast Lake Ontario-St. Lawrence Table 5), include bays, river systems, and unique island habitats. Examples include Chippewa Bay (2,457 acres, St. Lawrence County), Moses-Saunders Tailwater (467 acres, St. Lawrence County), Grasse River (1,197 acres, St. Lawrence County), and Little Galloo Island (43 acres, Jefferson County). Chippewa Bay is the largest shallow, open-water bay with a substantial littoral zone in St. Lawrence County. This bay is the only habitat type of its kind in the St. Lawrence Plains ecological region and one of the only two examples of this ecosystem type in New York State. This site supports a muskellunge nursery habitat; essential habitat for pugnose shiner; a migratory staging area for waterfowl, shorebirds, and passerines; nesting habitat for common terns and common loons; and is used as a feeding area by bald eagles prior to ice cover. The Moses-Saunders Tailwater is a relatively large, deep, open-water section of the St. Lawrence River extending about 2 miles from the base of Moses-Saunders Power Dam to the St. Lawrence Seaway navigation channel. It encompasses a relatively deep (up to approximately 50 feet), wide, open-water area below the dam and a narrow waterway which connects the two main channels of the river. It is the best known spawning area for lake sturgeon. Additional quality habitat is in the next 5 miles to the border with Quebec. Bald eagle wintering and feeding and lake sturgeon occur here and it is a major concentration area for migrant and wintering gulls and waterfowl in the St. Lawrence Valley. The Grasse River is one of only three major tributaries in the St. Lawrence Plains ecological region and is in relatively undisturbed condition in areas upstream of Massena. The river corridor is largely forested and supports muskellunge and lake sturgeon. Little Galloo Island is an isolated and undeveloped island subject to minimal human disturbance, with an extensive shoal area. The island sustains one of the largest ring-billed gull colonies in North America and one of the few Caspian tern nesting locations in New York State. Shoals around the island support a recreational fishery of state importance for smallmouth bass.

Grassland Habitats

Several public and private natural resource conservation organizations have identified the St. Lawrence Valley (central Jefferson County through northern Clinton County) as one of the largest and most important grassland areas in the northeastern United States. This area now represents some of the best farmland in the Northeast. Dairy farming and associated agricultural land uses represent a major economic activity in the St. Lawrence Valley, and many grassland bird species and waterfowl that nest here are dependent upon the pastures, hayfields and agricultural grasslands maintained by landowners. Furthermore, areas with significant amounts of more intensive agricultural operations (e.g., large row crop monocultures) provide habitat for grassland-dependent species, although agricultural practices incompatible with wildlife have reduced the value of these habitats.

The vast "agricultural grassland" of the St. Lawrence Valley supports some of the largest populations of grassland and other early successional bird species in North America (Pashley, et al., 2000). A much higher percentage of bird species that rely on grassland and shrubland/early successional forest are in long-term and widespread decline more so than any other landbird group. Many species that are declining elsewhere are breeding successfully and maintaining stable populations in the St. Lawrence Valley, including the bobolink, eastern meadowlark, short-eared owl, upland sandpiper, Henslow's sparrow, savannah sparrow, grasshopper sparrow, sedge wren, and the northern harrier (USFWS, 2000). An estimated 17% of the world's bobolink population breeds in the St. Lawrence Valley, and exceptionally high relative abundances of savannah sparrows have been recorded (Rosenberg, 2000).These birds, and many other wildlife species, rely upon the extensive grasslands of the St. Lawrence Valley. An example of a critical grassland habitat in this Basin is the Point Peninsula Wildlife Management Area. The area encompasses about 1,046 acres (967 acres of which is TNC property under a management agreement with DEC) of a 2000-acre mosaic of active farmland, old field, and some woodlots and conifer plantations. The most significant concentration of wintering raptors in New York State has been observed here, including the northern harrier and the short-eared owl.

An example of a unique grassland type in this Basin is alvars. Alvars are grasslands and shrublands that develop on shallow soils with limestone geology and support rare plant communities. They are a habitat type unique not only to this Basin, but on a state and global level as well. Most alvars are concentrated in Jefferson County and are a high priority for conservation. The Nature Conservancy has protected almost 4,000 acres of alvars, including Chaumont Barrens and Three-Mile Creek Barrens. Multiple threats to alvar ecosystems include quarrying of limestone, ATV use, residential development, and invasive plants like swallow-wort, buckthorn, and shrubby honeysuckle.

The extensive mixture of reverting farmlands and shrub and forested wetlands provide critical habitat for shrubland and early successional forest species in lowland areas. This area remains the stronghold for the golden-winged warbler in NYS. Golden-winged warblers favor shrublands with herbaceous ground cover and with trees or near forest edges, in particular in or near wetlands. Also, American woodcock thrive in areas that have a mixture of grasslands, shrub, and forested wetlands. Many other species, such as the Canada warbler and whip-poor-will, rely on these dwindling habitats.

Publicly Held or Designated Lands - Opportunities to Develop Conservation Partnerships

Many of the critical habitats in the Basin have unique ecological (wildlife and plant communities, geological formations) or cultural (recreational, historical value) characteristics, and thus have been designated with some protective status by state agencies such as Office of Parks, Recreation and Historic Preservation (OPRHP) and DEC. These areas include state parks, state forests (also wilderness area, wild forest, primitive area, and unique area), wildlife management areas (WMAs), and bird conservation areas (BCAs), and total about 1,500,000 acres distributed throughout the NELO-SLR Basin. The majority of protected land is in large forest tracts (primarily state forests, wilderness areas, wild forests, and primitive areas) located in the Adirondack Park.

Lists of public land holdings have been provided here (Northeast Lake Ontario-St. Lawrence Tables 6-9) to offer a spatial context (i.e., location, size) for these large pieces of habitat and to recognize their importance in the implementation of the conservation recommendations that follow. The species and habitats found on these parcels provide an excellent opportunity for research, survey, and inventory efforts. Finally, these properties give public and private natural resource managers the chance to partner with the agency that administers the land to help deliver habitat and population management actions designed to benefit SGCN.

These lists are not meant to be a comprehensive catalogue of all publicly held or designated lands in the NELO-SLR Basin. Many parcels owned by local governments provide benefits to SGCN (e.g., town parks, green belts), and many privately held parcels have been designated as protected through perpetual conservation easements and fee acquisitions, and other methods (Audubon's Important Bird Area program also identifies many of the most important bird habitats in NY, and although it doesn't protect them, it does provide the opportunity to enhance conservation efforts). These private lands are usually acquired because of their unique biological character and/or highly imperiled status and should not be overlooked during more targeted conservation planning efforts. Local land trusts, such as the Adirondack Land Trust, and private groups, such as The Nature Conservancy that own and/or administer these lands are important partners in the conservation of fish and wildlife species of concern.

Species of Greatest Conservation Need and their Critical Habitats

DEC staff members who compiled the SGCN information in the State Wildlife Grants (SWG) database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and sub-system levels were extracted from the database (Northeast Lake Ontario-St. Lawrence Tables 10 and 11). The habitat classifications in the database were adapted from the New York Natural Heritage Program's Ecological Communities of New York State, Second Edition. In most cases, the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the Lacustrine and Riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers in DEC (e.g., cold water-shallow). These critical habitats do not comprise a comprehensive listing of all habitat associations found in the basin; rather they are a subset of the habitats deemed critical to SGCN that occur in the basin.

Each of these systems and subsystems are further refined into a habitat category in the SWG species database and can be viewed in the taxa reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can also be found in the appendix.

Overall Trends in the Basin

Biodiversity Trends

From the alpine forests and boreal wetlands of the Adirondacks, to the agricultural grasslands and emergent marshes of the St. Lawrence Valley, and the coastal marshes, bays, and tributaries of Lake Ontario and the St. Lawrence River, both natural and anthropogenic forces have shaped the landscape and biodiversity of the NELO-SLR Basin. New York Natural Heritage Program (NYNHP) element occurrence records, the Breeding Bird Atlas, Breeding Bird Survey, Partners in Flight's ranking system, and the North American Bird Conservation Initiatives planning efforts all indicate that this Basin is of critical importance to bird diversity in New York State. More than half of all bird species of greatest conservation need are found within this Basin (Northeast Lake Ontario-St. Lawrence Table 3) occupying the diverse range of habitat types, including boreal forests, deciduous forests, early successional forest/shrublands, grasslands, wooded and emergent marshes, and island and coastal habitats. In addition, NYNHP data indicate that the coastal and inland emergent wetlands of the St. Lawrence Valley are of vital importance to rare amphibians and reptiles, and the region's extensive rivers and tributaries support rare fish like sturgeon, rare mollusks such as yellow lamp mussel, and rare invertebrates such as the odonate, extra-striped snaketail. The highest diversity of fish is found in Lake Ontario and the St. Lawrence River, but river mouths of the Black, Oswegatchie, Raquette, St. Regis and Salmon Rivers also contain high-quality habitat. Six of the fish SGCN are found here, and all of the extirpated fish SGCN are historic to these two larger waters.

While this Basin tends to be high in species richness, trends and changes in land use, as well as many other environmental and social changes that are incompatible with some wildlife have taken their toll on populations of SGCN. Of the 111 SGCN in this Basin, 35% are declining (Northeast Lake Ontario-St. Lawrence Table 2). The majority (80%) of these are birds, with early successional forest/shrubland birds (29%) and grassland birds (23%) making up the largest shares of declining avifauna. Ten percent of the insects designated as SGCN are declining, and all of these are butterflies. Populations of some rare, threatened, and endangered animal species and rare natural communities in the NELO-SLR Basin are declining as a result of habitat alteration/conversion, habitat degradation, invasions of non-native species, and other factors. Many of these declining species specialize in a few select habitats or foraging guilds, and in so doing, inhibit their ability to adapt to declining habitat quantity and quality.

More troublesome still is the 45% of SGCN whose status we do not know (Northeast Lake Ontario-St. Lawrence Table 2). About one-third of these are birds, one-quarter of which are boreal forest birds. Reptiles and amphibian species of concern make up about 25% of species of unknown status, and the majority (31%) is lake/river reptiles. About 20% of insect species of greatest conservation need have an unknown status, and all of these are odonates. Anecdotal evidence and preliminary data suggest that these species may be rare and/or declining, but without sufficient data on their distribution and abundance, it is exceedingly difficult to assess the need for or try to combat threats to their populations and habitats.

Changing Human Population, Land Use, and Habitat Quality

As described above in the description of the Basin, this region has the second largest land area and the lowest population density of any basin in the state. From 1990-2000, population growth in the six counties that make up the heart of the Basin (Jefferson, St. Lawrence, Franklin, Lewis, Herkimer, and Hamilton) ranged from -2% in Herkimer County to 10% in Franklin County (U.S. Census Bureau, 2002); however, Franklin County is the outlier in this group, as the remaining five counties experienced little or no growth during this period. Similarly, it is estimated that between 2000 and 2015, the increase in human population will be in Franklin County, but the other counties in the Basin are expected to have negligible increases (St. Lawrence County) or population reductions (Jefferson, Hamilton, Lewis, Herkimer counties; New York Statistical Information System, Cornell Institute for Social and Economic Research, 2002). Growth in Fort Drum and the supporting area is going to be substantial. Current plans already call for a disruption of 120 acres of Fort Drum property. Fort Drum contains many unique habitats with significant bird diversity which may be affected by this base expansion.

Despite the relatively small human population compared to other watersheds, human population growth and the development (e.g., residential, industrial, roads) that accompanies it are still a problem for some areas within the NELO-SLR Basin. Pendall (2003) concludes that, as land consumption has outpaced population growth, upstate New York has urbanized hundreds of thousands of acres of farm and forest land since 1980. While development may bring economic prosperity to a region, development without growth can actually be economically detrimental (Pendall, 2003). Furthermore, it is important that any development that occurs be sustainable and compatible with wildlife. Sprawl that has occurred in the NELO-SLR Basin has fragmented sensitive habitats and threatens the rare species that depend upon them.

The NELO-SLR Basin has a complex natural and human history. Land use in the Basin over the last several centuries resembles that of New York State; forest followed by intense agriculture (primarily the St. Lawrence Valley) and silviculture (throughout the Basin, but particularly in the Adirondacks), and now a return to forested land (Stanton and Bills, 1996). Records indicate that in 1910, on average, more than 50% of the NELO-SLR Basin was classified as farmland (i.e., row crops, pasture, hay land)(Stanton and Bills, 1996). By the 1990's this trend had completely reversed itself, and today more than 70% of the watershed is classified as forest (Stanton and Bills, 1996; MRLC data, 2005).

Forest composition and trends in the Adirondacks have been shaped by humans through commercial timber harvest and production, resulting initially in removal of dominant white pine, hemlock, and old-growth spruce, and then a gradual shift to a greater proportion of the forest comprised of northern hardwoods as softwoods continued to be preferentially harvested. Although the total acreage of Adirondack forests has increased steadily since 1900, harvest and removal of timber has also increased by nearly 90% since 1968 (Pashley et al., 2000). Still, Forest Preserve lands exceed 3.2 million acres in the Adirondacks, and over time these areas will become natural forest communities as no logging is allowed. Silvicultural harvest on private lands today is too often by means of poorly planned selective cutting (called high grading), that negatively influences forest health and tree species composition. High grading is not considered to be sustainable forestry, and should be avoided. Sustainable silvicultural methods (both even-aged and uneven-aged) provide critical habitat for many species of early successional forest birds.

Twelve-thousand years ago, the receding glaciers and flood waters that followed shaped the St. Lawrence Valley. In recent centuries, European settlers cleared the forests and drained many of the wetlands of the St. Lawrence Valley. Agriculture took hold in the more fertile soils here, and by the mid-Nineteenth Century 75% of the land in the Valley had been cleared for row crops and pasture. As settlers abandoned the less productive portions of this land in search of more productive soils, forest regrowth has been repeatedly harvested, such that the forests present today are commonly third or fourth successions of growth (Thompson et al., 2002). Furthermore, selective cutting of maple, hickory, basswood, and butternut have reduced tree-species diversity in the remaining forest fragments of the St. Lawrence Valley.

The nature of the remaining agricultural land of the basin has changed as well. Cropland diversity has decreased, and smaller farms have been consolidated into larger units. The number of farms dropped dramatically between 1910 and 1992, but the average farm sizes more than doubled (Stanton and Bills, 1996). These larger farms also began to implement more intensive agricultural practices. Fields are mowed and planted earlier and more often, which precludes successful nesting and greatly limits productivity of grassland species. Further, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. These combined losses of habitat were a critical factor in the declines of grassland birds, and may also have played a role in the decline of migratory species, such as Neotropical migratory birds that breed in the Basin, as well as negatively affecting resident wildlife communities. There may also be advantages to the larger field sizes resulting from removal of hedgerows. Several grassland species of birds are area sensitive, preferring larger field sizes. If the larger fields are put into set-asides, they have the potential for providing prime habitat for these species.

Similar to the rest of NYS, wetland habitats declined dramatically in the Basin from 1900 until the 1970s. During this time, it was common practice to drain marshes for agriculture and other land-use practices. The Freshwater Wetlands Act protected many of these habitats, and wetland losses have been slowed dramatically since 1975. With the exception of the Adirondack Park, only wetlands larger than 12.4 acres, or certain wetlands of unusual local significance, are regulated. In addition, draining wetlands for agriculture is exempted from the law and still occurs. In the Adirondack Park, all wetlands larger than one acre, and any wetland adjacent to a water body are protected. From the 1980 through the 1990, the Adirondacks experienced a small net gain in wetlands. Today wetlands are incrementally destroyed and wetland complexes fragmented by smaller, more numerous projects. Many remaining wetland communities, particularly in the St. Lawrence Valley and along the coast of the St. Lawrence River and eastern Lake Ontario, have been reduced to small, isolated fragments whose quality is threatened by siltation, runoff from agriculture and development, and introduction of invasive species.

Overall water quality in the NELO-SLR Basin is good, and significant improvements have been made over the past few decades, but there are still issues that need to be addressed. DEC has engaged in extensive surveys of macroinvertebrate communities in rivers and streams in the state in an effort to assess 30-year trends in water quality. Within the NELO-SLR Basin, about 45% of the streams and rivers sampled were classified as non-impacted (very good water quality). About 37% were classified as slightly impacted (good water quality). Many of the slightly impacted sites were associated with the Black River. Contaminants included non-point nutrient input, industrial runoff, wastewater treatment facility discharge, and toxics such as polycyclic aromatic hydrocarbons (PAHs). An industrial complex centering on aluminum production and located in Massena is the source of several slightly impacted sites on both the Grasse and St. Lawrence rivers. The U.S. Environmental Protection Agency identified the St. Lawrence River at Massena as an "Area of Concern" and developed a Remedial Action Plan (RAP) in 1995. Since that time, the RAP has worked to assess and improve conditions here for both people and wildlife. The remaining 18% of macroinvertebrate sample sites in the basin were classified as moderately impacted (poor water quality). This was due to agricultural runoff and toxics, such as polychlorinated biphenyls (PCBs) and PAHs, in tributaries of the Black River such as Kelsey Creek and Mill Creek and some sites on the St. Lawrence River.

Significant changes have occurred in the Lake Ontario ecosystem over the last century due to the effects of toxic pollution and habitat loss resulting from the rapid development of the Lake Ontario Basin (Lakewide Advisory Network, 1998). Steady progress has been made toward cleaning up the waters of Lake Ontario. Efforts to restore the health of the Lake, such as the Great Lakes Water Quality Agreement, have resulted in the reduction of contaminants and the rebounding of many species of wildlife, such as colonial waterbirds, affected by contaminants. Treatment facilities on Lake have been regionalized, thus significantly reducing the number of discharges into the Lake (DEC Division of Water, 2002). Phosphorus reductions in the Lake have resulted in a far less productive and oligotrophic status.

Dramatic changes in the Lake Ontario fish community have been underway for several decades, and several species are extirpated or extinct. The predator fish community has been supplemented with major programs stocking salmonids, but these species have also been depleted by cormorants. Fish communities are being altered by invasive species and habitat degradation. The number of fish-eating gulls and cormorants in Lake Ontario has increased dramatically in the last 20 years. This is likely related to the banning of DDT and the reduction of other toxics entering the Lake. The rebound of these species, especially cormorants, can cause competition with SGCN for habitat and food resources.

Human effects on stream and riparian habitat have been intense and wide ranging. Water-level fluctuations are a natural phenomenon in the Great Lakes due to natural climatic variability. Wetland plant communities, which provide habitat for a multitude of invertebrates, amphibians, reptiles, fish, birds, and mammals, have evolved to adapt to, and depend on, water-level changes. However, humans have altered the flow of streams and rivers for flood control, bridges and roads, power generation (dams), agriculture, and development. This has resulted in loss of floodplains and riparian buffers; increased river channel instability; altered hydrology (decreased water storage, conveyance); decreased water quality (including increased sedimentation); and reduced and fragmented fish and wildlife habitat. Since 1960, water levels and flows of Lake Ontario and the St. Lawrence River have been regulated at the Moses-Saunders Power Dam (St. Lawrence County). In the winter of 2000, the International Joint Commission (IJC) launched a five-year bi-national study to review the current criteria in the Orders of Approval for regulation of Lake Ontario-St. Lawrence River levels and flows. The study will recommend changes to the 1956 criteria currently in use for Lake Ontario-St. Lawrence River regulation. The study will assess how water-level fluctuations affect interests within the basin, including fish, wildlife, and their habitats, while also looking at how lake levels affect recreation, economic, and other social concerns

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While water quality has improved in many parts of the Basin thanks to the efforts of government and private agencies, some of the more alarming trends related to water quality, such as atmospheric deposition (acid rain, mercury) and invasive species (plants and animals) have effected almost every water body. In the Black River watershed 90% of the lake impairment, 30% of the river impairment and all of the Great Lake's shoreline impairment is attributed to atmospheric deposition (DEC, Division of Water, 2002). In the St. Lawrence watershed, atmospheric deposition has been documented in more than 150 lakes, and it is assumed to affect many more lakes that have not been monitored (DEC, Division of Water, 2002).

Invasive species have been degrading aquatic and terrestrial habitats for more than 100 years (e.g., common carp in the late 19th Century), with significant increases in the last few decades. In the scientific literature complied by the International Association for Great Lakes Research, it is reported that more than 160 non-native invasive species are found in the Great Lakes, with 12 species appearing to have entered since 1990 alone. Even more problematic for Adirondack ponds is the spread of native species like yellow perch and smallmouth bass to higher elevations.

Threats

DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate threats to SGCN and their habitats. During the analysis for the Basin, a listing of threats for each species occurring in the NELO-SLR Basin was extracted from the database. The threats and summary figures compiled here (Northeast Lake Ontario-St. Lawrence Table 12) are not listed in order of importance. The magnitude of a threat is measured by several variables, including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and others. The information provided does not quantify the magnitude of a particular threat. It is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat was assigned, and the frequency with which a particular threat was mentioned in the database. For example, climate change, causing a change in species range, distribution, or migration, was identified as a threat for 9% of the SGCN species groups in the Basin. However, it is likely that climate change affects (or will affect in the future) all species and their habitats. Furthermore, the purpose of this information is not to compare the severity of one threat against another.

Rather than go through each of the 38 threats listed in Northeast Lake Ontario-St. Lawrence Table 12, some of the more prominent threats to species of greatest conservation need in the NELO-SLR Basin have been combined into a few broad categories and summarized here. The most significant threats were determined by reviewing information from the CWCS database, scientific literature, and conservation plans for the Basin.

Habitat Loss and Fragmentation

Anthropogenic changes like development (residential and commercial, roads, power lines), dredging, and wetland draining, and natural changes such as succession reduce not only habitat quantity, but the quality of habitat as well by disrupting the function of remaining habitat patches. Examples of the loss of habitat function include loss of connectivity to patches of similar habitat (or different, yet complementary habitats), loss of metapopulation dynamics in small, isolated patches ("sink" habitats), increased negative edge effects (increased susceptibility to predation), and reduction in the types of species the patch can support ("area-sensitive" species).

Almost 18% of the NELO-SLR Basin is comprised of habitats that have been significantly altered by humans [residential and commercial development, agriculture (row crops, haylands), parks and golf courses, and barren habitats (quarries, strip mines, gravel pits)]. Many of these habitats are maintained by suppressing ecological processes such as vegetative succession and fire; however, the reverse is also true. Late and early successional forest habitats may suffer because of a reluctance of the public to engage in the active management of these habitats. The result is large, homogenous forest tracts with lower structural, vegetative, and species diversity than would be encountered in forests with both natural disturbances (e.g., fire, wind throws) and active management (variable cutting regimes). A goal for the heavily forested sections (greater than 70 % forested) of this Basin would be to incorporate more structural and vegetative species diversity into forests and shrub habitats. It is generally agreed upon by those that study wildlife-habitat relationships that sustainable silviculture practices executed in areas of high percent forest cover do not generally result in the type of fragmentation being portrayed here. For example, recent studies indicate that forest interior birds will utilize cut-over areas extensively for portions of their life cycle (Audubon New York, 2004). While this is true, it is also important to increase the size and connectedness of habitat patches where feasible. This concept also applies to grassland habitats. The St. Lawrence Plain and Lake Ontario Plain represent one of the most important agricultural grasslands in the northeastern United States. It is important that extensive grassland habitats remain unfragmented, and that small patches of remnant grassland be evaluated to determine whether they are sink habitats to help guide further management actions. Further, there is a critical need to counter the detrimental effect of more intensive agriculture on grassland-nesting species.

Early successional forest and shrubland habitats are also in serious decline throughout the watershed. Land development is reducing habitat, natural succession is turning many of these habitats into forests, and shrublands are sometimes converted into agricultural fields. The rate of farmland abandonment has also slowed, further reducing the potential for new habitats to form. There is a critical need to increase active management for these habitats and the species that rely on them. A serious threat to these habitats and the species that rely on them is the lack of adequate management due to misconceptions about the benefits of sustainable forestry practices for wildlife. A variety of silvicultural techniques should be used to increase habitat and structural diversity across the landscape. Habitat management methods should include both even-aged and uneven-aged (at various levels of intensity) silvicultural techniques. Proper management of utility right of ways can also add to the diversity of shrubland habitats. Silvicultural methods need to be properly planned and implemented using sustainable forestry.

Degraded Water Quality, Atmospheric Deposition, and Altered Hydrology

Many of the SGCN in this Basin rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites). Research by DEC staff has identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality includes siltation, nutrient runoff, temperature increases, toxics (e.g., pesticides, heavy metals), lowered dissolved oxygen, and altered hydrology (dams, water withdrawal, ground water extraction). In addition, contaminants enter aquatic and terrestrial systems through atmospheric deposition and affect both habitat and population levels.

Water quality problems in Lake Ontario tributaries and nearshore waters are related to eutrophication and siltation caused by excess nutrients and runoff from agricultural operations and on-site disposal systems. Levels of toxic contaminants in the Lake Ontario ecosystem have decreased significantly, and wildlife such as colonial waterbirds have overcome most of the contaminant-induced effects of the 1970s and 80s; however, bioaccumulative toxics persist in sediment, water, and biota at levels of concern for some fish species such as lake trout and salmon, and for predators such as bald eagles, snapping turtles, mink, otters, and humans (Lakewide Advisory Network, 1998).

Another significant water quality issue in this basin is PCBs in the St. Lawrence River and Lake Ontario. The source of contamination for much of the St. Lawrence is attributed to priority organics (primarily PCBs) from Lake Ontario sediments (DEC, Division of Water, 2002). PCB contamination negatively affects reproduction and survival of mammals such as river otter and raptors such as bald eagles. Ongoing remediation activities described in the Remedial Action Plan for the St. Lawrence River/Massena are expected to reduce some of these effects.

Mercury contamination is thought to be a result of atmospheric deposition. Mercury is released from anthropogenic sources (coal burning plants, etc.) and is carried via wind currents from sources in the Midwest and deposited onto terrestrial and aquatic habitats through rain, snow, or dust. If mercury is converted to methylmercury, it can be consumed by organisms, move up the food chain, and increase in concentration as it does so (Evers, 2005). Traditionally, high levels of mercury were correlated with decreased productivity and survivorship of common loons (Schoch and Evers, 2002), but recent findings suggest that mercury contamination is a much larger threat to human and ecological health. A recent report by Evers (2005), compiling data from 21 peer-reviewed journal articles, shows elevated mercury levels in almost every taxa including fish (e.g., brook trout, yellow perch), crayfish, salamanders, waterbirds (e.g., common loon), forest songbirds (e.g., Bicknell's thrush), and furbearers (mink and otter). The report goes on to state that not only does mercury pose a threat to fish and the humans consuming them, but also to wildlife living in habitats as diverse as mountain tops and small headwater streams. Particularly high mercury levels were observed in the Adirondack Mountains. Mercury can have adverse effects on individual animals living in this region, as well as population-level effects through changes in behavior, reproduction, and body chemistry (Evers, 2005).

Another significant threat in the NELO-SLR Basin that has negative consequences for wildlife is the declining pH of Adirondack water bodies due to acid deposition. Utility-plant pollution laden with nitric and sulfuric acid from industrial sites in the Midwestern United States (Ohio, Illinois, Indiana, and Pennsylvania) is carried northeast via wind currents, and deposited in the form of precipitation onto the Adirondack Mountains. Thin, acidic soils and nutrient-poor water bodies in these areas make them particularly susceptible to acidification. Despite reductions in emissions that have resulted from the Clean Air Act, the Adirondacks are now more sensitive to acid deposition due to the accumulation of acids and the loss of buffering capacity in the soil (Schoch, 2002). The effects of acid deposition can be seen in the damaged spruce-fir forests of the high peaks of the Adirondacks, reduced fish numbers and reproductive success in ponds with a pH of <5, and decreased foraging and reproductive success of nesting common loons (Environmental Protection Agency, 2004; Schoch, 2002; Simonin, et al., 2005). Acid deposition also affects waters in the St. Lawrence and Black River watersheds. Acid deposition has been documented in more than 300 lakes and ponds in these two watersheds, while episodic acidification of smaller headwater streams has also been documented during periods of snowmelt/runoff (DEC, Division of Water, 2002).

Altering the flow of riparian habitats with dams and bridges, and for flood control, agriculture, and development (roads, residential, commercial) can directly and indirectly affect fish and wildlife. Movement of populations of aquatic species such as fish and freshwater bivalves is inhibited, and habitat for all species dependent on lotic systems is lost outright or degraded through decreased conveyance and increased sedimentation. Changes in water levels and flows resulting from the construction and operation of the Moses-Saunders Power Dam are implicated in the impairment of critical fish habitats in the St. Lawrence River. Flooding of fast-water river stretches impairs spawning habitat for species such as lake sturgeon (LaPan, et al., 2002). In addition, maintenance of Lake Ontario water levels results in substantial water level changes, discouraging the establishment of wetlands and submerged aquatic vegetation in the nearshore zone (LaPan, et al., 2002). Throughout the Basin, wetlands and tributaries that are flooded by dams have diminished value as spawning and nursery habitats for warm water fish.

Stream and road bank erosion, erosion of coastal soils, and erosion from agricultural fields are significant sources of sand/sediment. Once in lotic habitats, sediment fills in gravel spawning beds, decreasing salmonid spawning success, limiting macroinvertebrate production, and increasing winter mortality of fish and invertebrates such as mussels. Excessive sand and sediment loads also contribute to the formation of significant sedimentation deltas at the mouths of many tributary segments. Such deltas can restrict fish migration into the tributaries and present opportunities for the establishment of non-native aquatic vegetation.

Invasive Species

Invasive exotic and invasive native plants and animals diminish the quality of upland and aquatic habitats throughout the Basin. In wetlands and other aquatic habitats, species like purple loosestrife, Eurasian water milfoil, and common reed with little value to wildlife, displace native plant species and disrupt ecological processes. Purple loosestrife thrives on moist, disturbed soils and often invades following construction activity. It can form dense, impenetrable stands that are unsuitable as cover, food, or nesting sites for a wide range of wildlife. It also outcompetes many rare wetland plants. Eurasian water milfoil occupies an extensive range throughout the Great Lakes and tributaries. This species forms dense mats of vegetation that degrade the structure and function of aquatic habitats.

Invasive aquatic animals degrade habitat quality and/or directly affect fish and other aquatic species. Zebra mussel densities have increased dramatically since their discovery in the Great Lakes in 1988. Zebra mussels have affected water supplies, crowded out native mussels species, and reduced the biomass of other benthic animals in many areas. Since 1999, a severe outbreak of type E botulism has been documented along the shores of Lake Erie, and more recently, Lake Ontario. The severity of type E botulism-caused mortality documented during the current outbreak along Lake Erie and Lake Ontario could threaten, or eliminate, sub-populations of common loon with fidelity to these water bodies for migration. It is suspected that invasive exotic zebra and quagga mussels are ingesting *Clostridium botulinum* bacteria and then, in turn, are being eaten by an exotic fish species, the round goby. Common loon and lake sturgeon feed on round gobies, thereby becoming infected with botulism. Many other invasive species exist in Lake Ontario, including the spiny water flea (*Bythotrephes cederstroemi*) and fish hook water flea (*Cercopagis pengoi*), Rusty crayfish (*Orconectes rusticus*), common carp, and alewives (Manninen, 2005).

In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. For example, exotic insects like viburnum leaf beetle lack any natural predators and threaten to alter the composition of young forest stands. Several forest pathogens and insect pests may affect forested habitats. Some of these pests have yet to reach the NELO-SLR Basin from southern NYS (e.g., hemlock wooly adelgid, Japanese long-horned beetle), but northward movement of the distribution of these species has been observed.

Invasive native species present in locations or numbers not historically found can be detrimental to some SGCN. These invasive native species can out compete the species of concern for forage or nest sites, can pose a predation threat (e.g., perch preying upon round whitefish or heritage strain brook trout), or can reduce habitat quality by altering vegetative composition and structure. This type of range expansion by native species should be of issue only if it does not represent a natural range expansion and is due to anthropogenic causes. A case in point is double-crested cormorants on Lake Ontario and other waterbodies in the region. This species was first documented breeding in New York State in 1945 on Gull Island in eastern Lake Ontario. During the 1960' cormorant populations in the Great Lakes were devastated by the effects of chemical contaminants (primarily pesticides) on reproduction. Pollution control, in addition to the protective status granted by the Migratory Bird Treaty Act, has allowed populations of cormorants to soar to historic highs. Cormorant populations have increased in abundance to the point where they are affecting other colonial-nesting waterbirds by taking over nest sites or by destroying woody vegetation needed for nesting. Affected species include common terns and black-crowned night herons. In addition, DEC and Cornell University have conducted long-term studies linking cormorants to declines in smallmouth bass in eastern Lake Ontario. In response to concerns about conflicts with other colonial-nesting birds, DEC initiated cormorant control measures at several locations during the 1990s. As part of the Final Environmental Impact Statement on Double-crested Cormorant Management in the United States (2003) prepared by the USFWS, and the management of double-crested cormorants to protect public resources in New York: Statement of Findings (2004) prepared by DEC, cooperating agencies are working to evaluate the effect of cormorant control measures and to monitor the status of island-nesting colonial waterbirds and native fish species relative to the abundance and distribution of double-crested cormorants.

Incompatible Silvicultural and Agricultural Practices

Agricultural and silvicultural products are both important to the economy of the NELO-SLR Basin and have historically provided good habitat for many species, but they have also degraded habitat for many species. Unfortunately, agricultural and silvicultural practices may lack ecologically based objectives and thus may be detrimental to wildlife.

Trends in modern farm operations toward more intensive use (increased field size, loss of edge habitats, erosion due to conventional tillage, intensive grazing, earlier and more frequent mowing/haying of fields) can have negative consequences for wildlife and their habitats in regions where agriculture (e.g., row crops, pasture/hay land) makes up a significant portion of the landscape as seen in the St. Lawrence Valley, Black River Valley, and East Ontario Plain. In addition, runoff from agricultural operations can increase contaminant, nutrient, and sediment loads in adjacent aquatic habitats negatively affecting the SGCN that reside there. In the forested landscapes that predominate the Adirondacks, forestry operations that do not comply with best management practices (BMPs) or that are poorly planned and executed can damage habitat function and reduce habitat quality for SGCN that reside there. It is important to develop and implement farm and forestry practices that are both ecologically and economically sustainable.

Human-Wildlife Interaction

A variety of threats to SGCN in the Basin derive from direct interactions with humans. These include vehicle and structure collisions and illegal and unregulated harvest. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Fragmentation of habitats by structures, such as power lines and roads, can be a significant source of mortality. Some wildlife is sensitive to any human disturbance, particularly during critical nesting periods. Examples include common loons and common terns.

Anecdotal evidence and preliminary data gathering efforts have suggested that wildlife collisions with human-created structures like wind turbines, communications towers, buildings, and power lines can have significant population-level effects depending on their height and location. The U.S. Fish and Wildlife Service (USFWS) and others are currently investigating the effects of these types of structures on wildlife populations (specifically, migratory birds), but as human populations within the Basin continue to increase, these structures have the potential to become a more significant hazard to SGCN.

Many of the amphibian and reptile species of conservation concern have no protected status, though protective state legislation is pending. Killing, collection/translocation, and the (illegal) sale of herpetofauna in the pet trade pose a significant threat to rare and declining reptile and amphibian species. Furthermore, public misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals. Pending state legislation will provide protections to many species of amphibians and reptiles, including SGCN.

Climate Change

Climate changes the threat with the greatest potential to affect fish and wildlife on a scale much larger than just this basin. Large quantities of carbon released into the atmosphere by human activities have increased the amount of carbon dioxide in the air and trapped the sun's heat. This has resulted in an increase in the global temperature at a rate faster than anything that has been observed for at least 10,000 years (Millennium Ecosystem Assessment Board, 2005). Habitats in the Adirondacks, such as the lowland boreal, may be particularly susceptible to climate change. The total warming in the Adirondacks during the past 100 years has been about 4° F, and the rate of warming since 1970 has been 13° F/century (Jenkins, in review). Warming trends may affect the distribution patterns of plants and animals that inhabit boreal habitats and may extirpate some plants and animals that cannot adapt or move to more suitable areas.

The stressors described above vary in their significance across different regions within the Basin. For the purposes of summarizing threats, the prominent hazards for three different regions within the Basin are listed here (not in order of significance):

Many SGCN within the NELO-SLR Basin are in decline, and some of the species that once occurred in the Basin have been extirpated. Many critical habitats of the Basin have been fragmented, and the quality of the remaining patches of isolated habitat have been compromised by altered or suppressed habitat processes, barriers to movement (e.g., dams, roads), and invasions of exotic species. Aquatic habitats have been compromised by point and non-point source pollution, water extraction, and sedimentation. Ensuring the sustainability of the ecological systems of this Basin will be a challenge and will require cooperation among a diverse group of stakeholders, comprehensive land-use planning that incorporates ecologically based objectives, and proactive management to protect systems in good health and restore systems that have been degraded.

Priority Issues in the Basin

Adirondack Mountains
Atmospheric deposition
Habitat loss and fragmentation
Incompatible forestry practices
Invasive species
Human disturbance (collection, recreation)
Climate Change*

St. Lawrence Valley/Black River Valley/E. Ontario Plain
Habitat loss and fragmentation
Degraded water quality and altered hydrology
Incompatible agricultural practices
Invasive species

St. Lawrence River/E. Lake Ontario Coastal Habitats
Habitat loss and fragmentation
Degraded water quality and altered hydrology
Incompatible agricultural practices
Invasive species
Human disturbance (recreation)

***Climate change is listed here only for the Adirondacks, but will likely affect all areas.**

Vision, Goals and Objectives for the Basin

Vision

The Northeast Lake Ontario - St. Lawrence River Basin will be part of a healthy and sustainable ecosystem.

Traditional and non-traditional public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on species of greatest conservation need (SGCN) within the basin in a format that can easily be shared among natural resource managers and disseminated to the public to raise awareness of the issues facing species of concern and their habitats.

These conservation partners will also work in a coordinated manner to manage populations and habitats over a large spatial and temporal scale. This will be done through comprehensive planning, land conservation, adaptive management, and rigorous evaluation.

The result of these efforts will be healthier and secure animal populations, habitats, and communities. Loss of SGCN to extinction will be slowed or halted. Species that currently are common will remain common, and populations of threatened/endangered/special concern species will improve to the point where they can eventually be de-listed.

Goals and Objectives

- Establish a conservation framework within the NELO-SLR Basin through which public and private stakeholders interested in wildlife conservation can work cooperatively toward the management, enhancement, and protection of the basin's at-risk biodiversity.

- Ensure that no at-risk (threatened/endangered) species becomes extirpated from the Basin.

- Manage animals, habitats, and land use practices to produce sustainable benefits for species of conservation concern.

- Maintain knowledge of species and their habitats in sufficient detail to recognize long-term population shifts.

- Fill "data gaps" for those species where population status, distribution, and habitat needs are unknown.

- Identify, manage, protect, maintain, and restore habitat/natural communities over as broad a spatial scale as possible. Work to keep large forest, wetland, and grassland complexes unfragmented, and to restore fragmented habitats where feasible to increase patch size and connectivity.

- Work with land managers to incorporate wildlife-based objectives into traditional land-management activities such as forestry and agriculture that still allow these activities to be economically sustainable.

- ❖ Develop a "stepped down," more targeted plan for the basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented "on the ground."

Priority Strategies and Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Some of the following recommendations refer to work that has already been initiated under the first two rounds of State Wildlife Grant funding (State Fiscal Years 2003 and 2004, Northeast Lake Ontario-St. Lawrence Table 13). Those interested in implementing one of the actions below should be sure to consult the data generated by these studies before engaging in their own conservation endeavors.

Data Collection Recommendations for Critical Species

Data collection (research, surveys, and inventories) is a crucial first step for the majority of SGCN in the NELO-SLR Basin. Many of the conservation actions in the following categories (e.g., planning, land acquisition, etc.) should not or can not be done until critical data gaps are addressed for particular species and their habitats. Once we know more about a species' abundance, distribution, life history, and habitat needs, we can begin to decide where, when, and how conservation actions can be implemented.

A number of priority species and groups need population, habitat, and life history research to address critical data gaps. This information will help more clearly identify threats and establish baseline information for these species. This type of data collection will address multiple threats to many species, which are listed below by species group.

BEACH AND ISLAND GROUND-NESTING BIRDS

- ❖ Conduct annual surveys for common terns to track population status at known breeding locations. Breeding Bird Atlas (BBA, 2000-04) records indicate that, along with Long Island, the coastal portions of western Jefferson and St. Lawrence counties are a stronghold for breeding populations of this species in New York State. Information from this effort should be incorporated into the conservation plan for common terns being developed under the 2003 State Wildlife Grant.
- ❖ Monitor the status of NYS's only known Caspian tern colony on Lake Ontario Islands WMA (Little Galloo Island, Jefferson County).

BOREAL-FOREST BIRDS

- ❖ Develop a long-term monitoring program to determine population and habitat trends of boreal forest birds and to determine threats to these species. The highest priority species in the group are the New York State endangered spruce grouse and the declining olive-sided flycatcher and bay-breasted warbler. The status of the following species is unknown: Cape May warbler, rusty blackbird, Tennessee warbler, three-toed woodpecker.

- ❖ Incorporate the results of the 2004 State Wildlife Grant study on boreal forest birds into future monitoring efforts and data analyses.

BREEDING WATERFOWL

- ❖ Conduct more intensive surveys for common goldeneye in the Adirondacks to estimate overall abundance, document habitat use, and design a long-term monitoring program (e.g., every 5 years).
- ❖ Conduct field studies to document life history and habitat use by blue-winged teal breeding in the St. Lawrence Valley region of New York.

COMMON LOON

- ❖ Monitor breeding population trends and productivity including:
    - Northeast Lake Ontario-St. Lawrence Table 2 census of adult population using repeated standardized surveys;
    - Survey a specified sample of lakes annually or every few years to document population trend;
    - Verify breeding by the presence of recently used nests or flightless young;
    - Determine breeding chronology and outcome (chicks not considered fledged until at least 4 weeks old), and
    - Utilizing volunteer observers, implement simultaneous counts to provide an index of lake occupancy and productivity and refine statewide population totals.
    - Research migration routes and staging areas of the Adirondack population.
- ❖ Research wintering distribution and ecology of Adirondack population.
- ❖ Monitor migratory trends in distribution and abundance utilizing Christmas bird counts.
- ❖ Research the energetic requirements of adults and young, recruitment patterns of young and non-breeders into breeding populations, effects of intra-specific competition on breeding status and success, site fidelity and territory turnover patterns, duration of pair bonds, and pattern of lake colonization or recolonization.
- ❖ Research the life history of juveniles between fledging and their return to northern lakes.
- ❖ Research and utilize radio transmitter technology on loons to determine chick survival and juvenile movement patterns and behavior, and identify migration patterns, stopover sites, and wintering habitats.
- ❖ Continue the banding and marking of individual birds to determine loon movement patterns, behavioral ecology, and demography.

COMMON NIGHTHAWK

- ❖ Develop survey methodology to determine population trends for this species. BBA (2000-04) records indicate that this species was observed in several blocks throughout the basin with a concentration of confirmed breeding observations in eastern Jefferson County (Fort Drum) and St Lawrence County.

DECIDUOUS/MIXED FOREST BREEDING BIRDS

- ❖ Conduct targeted monitoring of cerulean warblers to determine precise population trends. BBA (2000-04) records indicate that this species was observed in several blocks in Jefferson, St. Lawrence, and Lewis counties, with a concentration of confirmed and probable breeding observations in northern Jefferson and southwestern St. Lawrence counties.

- Identify cerulean warbler habitat characteristics of areas being occupied and critical habitat focus areas within this basin.

EARLY SUCCESSIONAL FOREST/SHRUBLAND BIRDS

- Complete an inventory and analysis for high priority focus species that identifies core habitats (highest abundance) and geographic areas (where appropriate). For this basin, this includes golden-winged warbler, Canada warbler, and whip-poor-will. Canada warbler needs to be surveyed in riparian zones and wet woodlands.
- Develop a long-term monitoring program for golden-winged warblers. In particular, monitor status and trends of golden-winged warblers along the "front" of blue-winged warbler invasion northward.
- Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on golden-winged warbler habitat needs into future monitoring efforts and data analyses.

FOREST-BREEDING RAPTORS

- Determine the population status of long-eared owls in this basin. Surveys should initially focus on occupied sites in Jefferson, St. Lawrence, and Franklin counties (Breeding Bird Atlas, 2000-04).
- Determine the presence and breeding of golden eagle within this basin, and, if observed, document habitat use (i.e., migration, breeding, wintering, etc.).

FRESHWATER MARSH NESTING BIRDS

- Initiate baseline population surveys to determine abundance and distribution of high-priority species, and periodically re-survey to detect trends. Refine monitoring techniques to better detect population trends and determine the cause of observed changes. Focus species include American and least bitterns, pied-billed grebe, and black tern. Initially, surveys efforts should focus on marsh habitats in Jefferson and St. Lawrence counties (BBA 2000-04), then should be expanded throughout the basin.
- Identify and prepare a catalog of key migratory staging, molting areas, and wintering grounds.
- Prepare a catalog, where possible, of breeding sites identifying and mapping sites at a course scale to select sites worthy of monitoring.
- Evaluate habitats by a variety of techniques at multiple scales to better understand the micro- and macro habitat features important to nest site selection.
- Conduct studies of habitat use, prey availability, and diet at migratory staging and molting areas and wintering grounds to assess possible threats and limiting factors for high-priority species.
- Investigate aspects of behavioral ecology, such as mate selection, mate fidelity, spacing behavior, coloniality, dispersal, and post-fledging parental care.
- Incorporate the results of the 2004 State Wildlife Grant study on marsh birds into future monitoring efforts and data analyses.

GRASSLAND BIRDS

- Complete an inventory of potential grassland habitat for species present, distribution, and relative abundance of priority species within this basin. These include Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper. Survey efforts will focus on grassland areas defined as potential focus areas by the SWG study efforts. This effort will include grasslands throughout the St. Lawrence Valley, from Jefferson County through northwestern Clinton County.

- Develop and implement supplemental monitoring programs for grassland bird species that are not adequately sampled by the Breeding Bird Survey to determine precise population trends and evaluate effectiveness of conservation efforts. Use long-term trend data to determine effectiveness of grassland conservation efforts.
- Incorporate the data generated by the two tasks above into the New York State Grassland Bird Management Plan currently being developed under the 2003 State Wildlife Grant.

High-Altitude Conifer Forest Birds

- Continue the Mountain Birdwatch monitoring protocol on all Adirondack peaks where Bicknell's thrush is known to occur. Implement other long-term monitoring if needed to determine population trend.
- Evaluate the long-term viability of Bicknell's thrush as a part of New York State's breeding avifauna.

Osprey

- Annually or periodically monitor the population (or certain regions of the population) to determine the number of territorial pairs and reproductive outcome. Record notable new aspects of the species' ecology, especially those pertaining to any local declines. This task should focus on the Adirondacks and the shores of eastern Lake Ontario and the St. Lawrence River (Jefferson and St. Lawrence counties).
- Ensure that information on all new osprey nests is submitted to the Natural Heritage Program.

Mooneye

- Monitor the status of this species in Black Lake and identify critical habitats.

Pugnose Shiner

- As little is known about where this species lives in large water bodies, life history studies need to be done, and sampling techniques must be improved in order to carry out surveys.

Heritage-Strain Brook Trout

- The NELO-STL watershed is home to a large percentage of the described heritage strains of brook trout (Keller, 1979). Works needs to be completed to determine the genetic status of what we are currently calling Little Tupper strain and Horn Lake strain. An additional three strains, which have been previously described and are believed to potentially have gone extinct, need to be investigated. Genetic analysis, using modern methodology, needs to be completed not only for fish found in waters that have previously been described as having heritage strain fish, but also for other waters that have wild brook trout without a clear history of non-heritage hatchery blood lines.

Lake Sturgeon

- Identify existing critical habitats for lake sturgeon(e.g., spawning, juvenile, adult) and determine their current status.

Herpetofauna

- Conduct periodic surveys of known sites of occurrence for western chorus frog in order to detect population trends. New York State Herpetile Atlas (DEC, 2005) data indicate that the eastern Lake Ontario and St. Lawrence Valley region is one of two strongholds for this species in NYS (the other being the Lake Plains region in western NYS).

- Conduct surveys to determine the status of Blanding's and spotted turtles in this basin. Re-survey occupied sites to detect population trends over time. Herp Atlas (DEC, 2005) records for Blanding's turtle indicate that the St. Lawrence Valley (primarily Jefferson and St. Lawrence counties) is one of two strongholds for this species in NYS (the other being the lower Hudson Valley). The spotted turtle was observed in only four blocks in the basin: two from the east Lake Ontario plains region (Jefferson County) and two from the St. Lawrence Valley/Adirondack transitional region (Lewis County - St. Lawrence County border).
- Conduct periodic re-survey of known sites of occurrence for blue-spotted and Jefferson salamanders in order to detect population trends. There are Herpetile Atlas (DEC, 2005) records for these species throughout the basin.
- Conduct a periodic re-survey of known sites of occurrence for wood turtle and eastern ribbonsnake in order to detect population trends. Herp Atlas (DEC, 2005) records for wood turtles indicate that this species is distributed throughout the basin. The eastern ribbonsnake was observed in northern Jefferson/southern St. Lawrence County and northern and eastern Franklin County.
- Develop standardized population survey protocols, and implement protocols at all known and potentially suitable sites to document the extent of occupied habitat.
- Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.
- Document life history parameters specific to New York populations of these species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.
- Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on high-priority amphibian species into future monitoring efforts and data analyses.

OTHER BUTTERFLIES

- Within this basin, determine the population status and distribution of high priority butterfly species, including mottled duskywing and Olympia marble.
- Determine the best management regimes for species in each locality.
- Establish the duration of all life stages, the precise habitat needs of all life stages, and how this information should be coordinated with management actions.
- Identify important food plants and determine the relationship between food availability and species numbers.

ODONATES

- Complete the statewide inventory of odonates and their habitats as outlined in the 2003 State Wildlife Grant. "Hot spots" of odonate diversity within this basin should be identified and targeted for management action based on species richness, acuteness of threats, and overall value to odonates and other SGCN.

FURBEARERS

- Assess potential marten habitat outside of the core marten range in the central Adirondacks, and evaluate limiting factors affecting range expansion. Model habitats to identify corridors to promote genetic exchange.

- ❖ Assess effects of mercury toxicity on marten and otter.

Indiana Bat

- ❖ Continue to survey new potential hibernacula as they are discovered.
- ❖ Survey winter populations.
- ❖ Survey for Indiana bats using vocalization detectors and mist netting at sites that are geographically similar but that have differences in the density of development over large areas.
- ❖ Identify the specific summer habitat requirements for the Indiana bat by radio-tracking 1% or more of the hibernating reproductive females from winter to summer range.
- ❖ Conduct marking studies during the summer maternity, fall swarm, and spring emergence that will detect differences in mark retention and survival rates for PIT tags, and at least two types of wing bands.
- ❖ Live trap and mark Indiana bats during the fall swarm, fall entry, and spring emergence at one hibernaculum to determine the arrival and departure periods of Indiana bats by age and sex.
- ❖ Complete three years of roost temperature monitoring at all Indiana bat sites using continually monitoring temperature probes.

Tree Bats

- ❖ Conduct surveys of migrants to determine the timing, distribution, species composition and elevation of migrating bats. This is likely to include combinations of acoustical monitoring, radar, and visual monitoring.
- ❖ Conduct summer surveys of tree bats that will include capturing individuals and acoustical monitoring.
- ❖ Research threats to critical habitats and populations.

Freshwater Bivalves

- ❖ Conduct surveys to determine the distribution and abundance of mussel species-at-risk in the NELO-SLR Basin. High-priority species in this basin include elktoe and yellow lamp mussel.
- ❖ Research the best survey methods both for detection of rare species and evaluation of population status and trends.
- ❖ Conduct research to determine habitat parameters necessary for good populations of each species of at-risk listed mussels.
- ❖ Research all parameters of mussel habitat requirements including temperature, substrate, fish, flow, food, etc.
- ❖ Determine fish hosts for species where this is not known for populations living in the NELO-SLR Basin.
- ❖ Determine or confirm breeding phenology and habitat conditions necessary for successful breeding for listed mussels (e.g.. mussel density, pop. level of fish host, temp, flow).

Data Collection Recommendations for Habitats

General Habitat Requirements for SGCN

Before other conservation actions can be taken to combat the harmful effects of habitat loss and fragmentation, data need to be collected on specific habitat requirements of SGCN (e.g., landscape scale characteristics like patch size and juxtaposition, microhabitat characteristics like stem density and ground cover), population processes (e.g., minimum viable population, metapopulation dynamics, source/sink dynamics), and how, when, and where habitat management and/or restoration should occur. Specific recommendations include:

Beach and Island Ground-Nesting Birds

- Conduct and/or coordinate habitat research projects that would help define preferred habitat in order to guide restoration efforts and focus habitat protection efforts for common terns.

Deciduous/Mixed-Forest Breeding Birds

- Conduct and/or coordinate habitat research to study area sensitivity and habitat requirements of cerulean warblers.

Early Successional Forest/Shrubland Birds

- Research the possible causes for declines of Canada warbler and the effectiveness of forest management regimes in opening up the canopy and promoting ground growth and thickets beneficial to this species. BBA (2000-04) data indicate that this species is found throughout the basin, primarily south and east of the more open habitats of the St. Lawrence plain (Tug Hill Plateau northeast through the Adirondacks). These may be areas to focus a research effort.
- Research the possible causes for declines and determine the habitat requirements of whip-poor-will and golden-winged warbler. Develop habitat management guidelines that will help to guide management efforts. The St. Lawrence plain is a critical area for golden-winged warblers as populations in southern portions of the state have declined. Our knowledge of whip-poor-will distribution and habitat requirements is inadequate.

Freshwater Marsh Nesting Birds

- Conduct controlled experiments to see which management actions are effective locally in producing habitat suitable for marsh birds.
- Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations, thus the regions most important for maintaining a breeding population. This research should also document such parameters as survival, age at first breeding, recruitment, dispersal, and the factors that affect them using color-banded or radio-tagged birds.
- Further evaluate the effectiveness of artificial nest platforms for increasing nest success or densities of black tern, emphasizing placement of platforms where nest substrates appear to be limiting or where terns may be encouraged to nest in areas of low disturbance.
- High priority marsh birds within this basin include American and least bitterns, pied-billed grebe, and black tern. BBA (2000-04) data show concentrations of observations of these species from the east Lake Ontario plain (Jefferson County) northeast through wetlands in the St. Lawrence Valley (St. Lawrence and Franklin counties).

Grassland birds

- Conduct studies to determine the habitat requirements and potential benefits of various management techniques, such as prescribed fire, mowing, haying. Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" habitats and populations, thus the habitats and regions most important for maintaining a breeding population.

This research should also document such parameters as survival under various management regimes, age at first breeding, recruitment, dispersal, and the factors that affect them. These efforts should focus on grasslands of the St. Lawrence Valley (Jefferson County through northern Clinton County). High priority-species include Henslow's sparrow, northern harrier, sedge wren, short-eared owl, bobolink and upland sandpiper. Results of this research should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant.

High Altitude Conifer Forest Birds

- Develop a study to determine if management (creation of habitat, such as regenerating fir waves) can be an effective management tool for Bicknell's thrush. This relatively rare high elevation (above 2800 feet in Adirondacks) species utilizes forest disturbances that create dense regrowth. Vermont Institute of Natural Science and BBA (2000-04) data show concentrations of this species in southern Franklin County and north-central Hamilton County. It should be noted, however, that the majority of Bicknell’s thrush habitat is likely within the forest preserve and regenerating fir wave through artificial management may be prohibited. Therefore, any study should focus on suitable locations outside the preserve.

Other Butterflies

- Investigate the metapopulation dynamics of those species which appear to have distinct populations. Highlight species include mottled duskywing and Olympia marble.

Freshwater Bivalves

- Research population dynamics of listed mussel species including connectivity of populations or sub-populations and genetic distinctness of populations or sub-populations. High priority species within this Basin include elktoe and yellow lamp mussel.

Human Alteration of the Landscape and Interspecific Interactions

Landscapes that have been heavily manipulated by humans may have disrupted predator-prey cycles. Anthropogenic activities such as development and pesticide application may serve to directly reduce prey populations. In addition, human-altered habitats may favor generalist predators by creating long, linear-edge habitats and small habitat patches (with a high edge:interior ratio) that allow predators to hunt in a more efficient fashion. Changes in prey abundance and predator communities can affect survivorship of both young and adult animals (i.e., increased predation, poor nutrition increasing susceptibility to disease, predation, etc.), thus contributing to species declines. Investigating predator-prey dynamics in relatively large blocks of contiguous habitat (e.g., large forest tracts in the Adirondacks, large grassland or wetland complexes in the St. Lawrence Valley) provides insight into how to repair ecological processes in human-altered habitats. Specific data collection recommendations include:

Freshwater Marsh-Nesting Birds

- Investigate diet and nutrition in relation to breeding habitat quality and prey populations (including insects, fish, and herpetofauna of freshwater wetlands) and how this translates into nesting and fledgling success for high-priority marsh birds (American bittern, least bittern, pied-billed grebe, black tern).

This could include investigating the effects of pesticides on prey diversity and abundance. As wetlands are scattered throughout the basin, this study should take place where and when opportunity allows; however, the marsh complexes associated with eastern Lake Ontario and the wetlands and adjacent uplands of the St. Lawrence Valley may provide excellent opportunities for research.

Osprey

- Determine the relationship between habitat quality, osprey survivorship, and changes in fisheries populations due to recreational and commercial harvest, changes in water quality, and effects of wildlife such as cormorants. This research should focus on occupied habitats in the Adirondack Park and the shores of eastern Lake Ontario and the St. Lawrence River (Jefferson and St. Lawrence counties).

Habitat Availability

- Document land use and land coverage changes on both public and private land that can be interpreted into habitat availability. For example, housing developments often take hayfield grassland habitats.

WATER QUALITY

Many of the SGCN in this basin rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites, etc.). Conservation partners have identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality includes siltation, nutrient runoff, temperature increases, toxics (e.g., PCBs, mercury, pesticides, heavy metals), lowered dissolved oxygen, and altered hydrology (dams, water withdrawal, groundwater extraction). It is important to quantify the effects of these threats on the survival of SGCN before regulatory, management, or other actions can be taken to alleviate these problems. Specific data collection recommendations to address these issues include:

Common Loon

- Monitor chemical contaminants and heavy metals in adults and eggs on a regular basis.
- Monitor pH levels in lakes within the Adirondack Park and other acid deposition-affected areas, survey forage base, and research the effects of lake acidification on breeding loons.
- Determine the biological consequences of chemical and heavy metal toxicity.

Freshwater Marsh-nesting Birds

- Periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. High-priority species include American bittern, least bittern, pied-billed grebe, and black tern.

Round Whitefish

- Continue research from the 2003 State Wildlife Grant to determine the causes of population declines and losses within the Adirondack region, especially the effect of acid rain.

Other Butterflies

- ❖ Determine the actual sensitivity of species to chemical formulations, particularly diflubenzuron and other commonly used agricultural pesticides. High-priority species include mottled duskywing and Olympia marble.

Freshwater Bivalves

- ❖ Research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, adults.
- ❖ Research flow requirements of freshwater bivalves and model the effects of flow changes both in volume and timing. High-priority species for these actions include elktoe and yellow lamp mussel.

EXOTIC INVASIVE SPECIES

Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout the Basin. In wetlands and other aquatic habitats, plant species like purple loosestrife and Eurasian water milfoil with little value to wildlife displace native plant species and disrupt ecological processes. Zebra mussels decimate native mussels by attaching to their shells and inhibiting breathing and feeding. In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. For example, exotic plants like honeysuckle and buckthorn out-compete native trees and shrubs and alter the composition and function of upland plant communities. In all habitat types, disturbances associated with residential and commercial development increase the risk of new occurrences of invasive exotic plants and animals. It is important to engage in early detection for these exotic species (where they are not found) and quantify their effects (where they already exist) on SGCN and critical habitats to minimize the potential detrimental effects of exotic species on species survival and habitat quantity and quality. Specific recommendations include:

Common Loon

- ❖ Investigate the causes of type E botulism, the link to non-native mollusks and fish, and how outbreaks can be prevented or minimized.
- ❖ Continue aerial and beach transect surveys during the fall to determine effects of type E botulism on water birds utilizing the Great Lakes as stopover sites during migration.

Early Successional Forest/Shrubland Birds

- ❖ Determine effects of viburnam leaf beetle on early successional forest/shrub habitats and species utilizing them. The location will depend upon the intensity and scope of the infestation, life-history traits and management objectives for the SGCN to benefit from the action and logistics (funding, cooperating partners, feasibility of using a particular method in a specific locale). High priority species include golden-winged warbler, Canada warbler, American woodcock, and whip-poor-will.

Round Whitefish

- ❖ One of the possible reasons for the decline in round whitefish populations is predation by invading yellow perch and smallmouth bass on whitefish eggs and juveniles. Continue studies to determine the effects of invasive predatory fish on round whitefish.

Pugnose Shiner

- Inventory the habitat requirements of this species, and quantify the effect of invasive plants such as Eurasian water milfoil.

Freshwater Bivalves

- Conduct research on control of exotic bivalve species (e.g., zebra mussels, quagga mussels) that compete with native mussels and exotic crustaceans or fish which may prey on them. High-priority species include elktoe and yellow lamp mussel.

Wetland Habitats and Species

- Identify invasive species (including purple loosestrife, Eurasian water milfoil) which have the potential to negatively affect marsh habitats and quantify the effect on habitat quality for appropriate SGCN. In addition, investigate which control methods (biological vs. chemical vs. mechanical) are the most effective based on a particular species' habitat requirements and life history traits. This action should focus on:
  - Freshwater Marsh-Nesting Birds - American bittern, least bittern, pied-billed grebe, black tern
  - Freshwater Wetland Amphibians - western chorus frog, four-toed salamander
  - Lake/River Reptiles - eastern ribbon snake, wood turtle
  - Uncommon Turtles of Wetlands - spotted turtle, Blanding's turtle
  - Vernal-Pool Salamanders - blue-spotted salamander, Jefferson salamander

NATIVE INVASIVE SPECIES

Natural and/or anthropogenic forces may create a situation where populations of native species expand to levels and locations not historically observed. This is the case with double-crested cormorants on Lake Ontario. Cormorant populations have increased to the point where they are affecting other colonial nesting waterbirds by taking over nest sites or by destroying woody vegetation needed for nesting. Affected species include common tern (beach and island ground-nesting birds) and black-crowned night heron (colonial nesting herons). In response to concerns about conflicts with other colonial-nesting birds, DEC initiated cormorant control measures at several locations during the 1990s.

- Cooperating agencies (DEC, USFWS) should continue to work to evaluate the effect of cormorant control measures and to monitor the status of island-nesting colonial waterbirds and native fish species relative to the abundance and distribution of double-crested cormorants.

LAND MANAGEMENT PRACTICES

Agricultural and silvicultural practices may lack ecologically based objectives, thus may sometimes be detrimental to wildlife. Trends in modern farm operations (increased field size, loss of edge habitats, erosion due to conventional tillage, intensive grazing, earlier and more frequent timed mowing/haying of fields) can have negative consequences for wildlife and their habitats in regions where agriculture (e.g., row crops, pasture/hayland) makes up a significant portion of the landscape as seen in the St. Lawrence Valley (Jefferson County through Clinton County). In the forested landscapes that dominate the basin, forestry operations that do not comply with best management practices or that are poorly planned and executed can damage habitat function and reduce habitat quality for SGCN that reside there. Specific recommendations to investigate these issues include:

Deciduous/Mixed Forest Breeding Birds

- ❖ In areas occupied by Cerulean warblers (generally outside the Adirondacks), determine the effects of various cutting regimes (partial harvest, clear cut, etc.) and size and shape of the area harvested on "forest interior" birds, including cerulean warbler.

Early Successional Forest/Shrubland Birds

- ❖ Evaluate which cutting regimes (partial harvest, clear cut, etc.) provide the maximum benefit for the greatest number of early successional bird species. This work should take into account all of the SGCN in this group (American woodcock, black-billed cuckoo, blue-winged warbler, brown thrasher, Canada warbler, golden-winged warbler, prairie warbler, ruffed grouse, whip-poor-will, willow flycatcher).

Forest Breeding Raptors

- ❖ Experiment with different timber management techniques in order to find out which are compatible with forest-breeding raptors and which methods provide the maximum benefits for forest-breeding raptors. This includes trying different cutting regimes (partial harvest, clear cut, etc.), different buffer distances between harvest sites and occupied nests, and fire management where appropriate. This should be done in both deciduous and coniferous forests and should take into account all of the SGCN in this group (Cooper's hawk, long-eared owl, northern goshawk, red-shouldered hawk, sharp-shinned hawk).

Grassland Birds

- ❖ Evaluate the effects of specific farming and management practices, such as: timing of mowing, intensity of grazing, frequency of mowing, mowing versus haying versus prescribed fire, and width of buffer strips on productivity of all SGCN in this group (bobolink, Henslow's sparrow, Eastern meadowlark, grasshopper sparrow, horned lark, northern harrier, sedge wren, short-eared owl, upland sandpiper, vesper sparrow).
- ❖ These efforts should focus on the regions within the basin with the highest concentrations of grasslands: east Lake Ontario plains (Jefferson County) and the St. Lawrence Valley (St. Lawrence County through Clinton County). Results of this research should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant.

Structure Collisions

- ❖ Targeted efforts should be made in the unique landscapes of the NELO-SLR Basin to determine the magnitude of this threat for SGCN based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics unique to this basin. SGCN should be included in this action include migratory birds (early successional forest/shrubland birds, deciduous forest birds, forest-breeding raptors) and bats (Indiana bat, small-footed bat, tree bats). An important component of this effort that has already been initiated is the 2004 State Wildlife Grant Project, “Use of Radar to Document Bird and Bat Migrations in New York State. “

Planning Recommendations

EXISTING PLANNING EFFORTS

The NELO-SLR Basin crosses both state and international boundaries. Conservation decisions regarding Lake Ontario, the St. Lawrence River, and the landscape within which they are embedded require interstate and international cooperation. Fortunately, this region has several ongoing planning endeavors that involve a diverse array of public and private partners and that cross both state and international borders. Examples of these efforts include:

- ❖ St. Lawrence-Champlain Valley Ecoregion Biodiversity Conservation Plan (The Nature Conservancy)
- ❖ Great Lakes Water Quality Agreement and the Lakewide Management Plan for Lake Ontario (USEPA, Environment Canada, DEC, Ontario Ministry of the Environment)
- ❖ International Joint Commission's Council of Great Lakes Research Managers and the Great Lakes - St. Lawrence Research Inventory
- ❖ Great Lakes Research Consortium (more than 2 dozen universities in NYS and Canada)
- ❖ U.S. Policy Committee for the Great Lakes and the Strategic Plan for the Great Lakes Ecosystem (federal and state agencies, tribal governments)
- ❖ Great Lakes Basin Ecosystem Team (U.S. Fish and Wildlife Service)
- ❖ North American Bird Conservation Initiative Planning
- ❖ Partners in Flight Bird Conservation Planning
- ❖ NYS Grassland Planning Group

Conservation partners interested in engaging in land-use planning for this watershed should first consult the work of these entities.

RECOMMENDED NEW PLANNING

This comprehensive, strategic wildlife conservation strategy for the NELO-SLR Basin is intended as a framework for conservation planning in this region of New York State. The next step, within 2-5 years, is to develop a "stepped down ," more targeted plan for the basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented "on the ground." Some of the challenges in developing this more specific targeted plan will be to:

- ❖ Analyze and apply all of the information generated by the State Wildlife Grant research, survey, and inventory efforts and incorporate them into plans at varying spatial and temporal scales.
- ❖ Incorporate many of the on going planning efforts being conducted by government agencies (e.g., unit management plans, New York State Grassland Bird Management Plan, North American Waterbird Plan) and NGOs.
- ❖ Coordinate the diverse array of stakeholder groups that will need to be involved in land-use planning for SGCN, particularly groups that may not have been traditionally involved in a large scale conservation planning process (e.g., economic development groups, town boards, local land trusts, etc.).

There is a clear need for a habitat mosaic management plan for early successional forests/shrub habitat, mature forest stands, grasslands, and wetlands in this basin. Of the 111 SGCN occurring in the basin, 10 depend on barrens and woodlands, 43 depend on forested habitat, 39 depend on grasslands, and 20 depend on mineral soil wetlands. Some species depend on all 4 of these habitat types at some point in their life cycles. All of these habitats have competing needs and priorities among both wildlife (habitat quality and quantity) and people (timber, agriculture, residential and commercial development, water). The balance and active cooperative management of all of these habitat types among a diverse array of stakeholders is integral to the health and abundance of many of the SGCN currently living in this basin.

Cooperative Management

Land management needs to be carried out with the cooperation of many agencies. Key partners to include are DEC, NYSOPRHP, USFWS, USGS-BRD, NRCS, and local governments. Private lands comprise 85% of the total land area of the state. Use of cooperative management programs like Farm Bill programs coordinated by the USDA and NRCS, such as the Wildlife Habitat Incentive Program (WHIP) USFWS's Partners for Wildlife Program, DEC Landowner Incentive Program (LIP), and various conservation programs administered by non-governmental organizations (e.g., such as the Adirondack Land Trust, The Nature Conservancy TNC , Ducks Unlimited, Inc., Ruffed Grouse Society) will be important to achieve effective habitat protection and enhancement for many SGCN.

Forest Lands

More than 70% of the NELO-SLR Basin is forested. An opportunity to integrate the needs of many SGCN that rely on a variety of forested habitat types in both large-scale management plans and smaller plans may address only one species, habitat type, or geographic area (e.g., wildlife management area, a private forest tract). Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management. Some specific planning recommendations for species in forested habitats include:

- ❖ Develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for the suite of early successional forest/shrubland birds. High-priority species include Canada warbler, golden-winged warbler, American woodcock, and whip-poor-will.

- ❖ Investigate the feasibility of managing forests in the basin with controlled burning. Draft a fire-management plan in accordance with these findings. This would benefit many SGCN, including deciduous-forest birds, early successional forest/shrubland birds, and forest- breeding raptors.

- ❖ Develop a management plan for high-altitude conifer forest birds (i.e., Bicknell's thrush). The results of the 2004 State Wildlife Grant study on boreal forest birds should be incorporated into this work.

Aquatic Habitat

More than 11% of the NELO-SLV Basin is classified as aquatic habitat. About 8% of this is classified as wetlands, the majority of which are wooded wetlands. The proportion of wooded wetlands in this basin is among the highest in the state, and includes the extensive lowland boreal wetlands of the Adirondacks. The remaining 3% classified as "water" is comprised of more than 14,000 miles of rivers and streams, over 1,000 ponds and lakes, and roughly 1/3 of the NYS share of the shoreline of Lake Ontario. Many SGCN within this watershed rely on these critical aquatic habitats during some stage in their life cycle. It is important that these habitats and the species that depend upon them be incorporated into land use planning on both the landscape and local scale for conservation efforts to succeed. As with forested habitats, wildlife biologists and researchers should develop habitat management guidelines for wetland types important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by land managers on public lands and made available to private wetland owners interested in wildlife management. Some specific planning recommendations for species in these habitats include:

- ❖ Continue participation in the North American Waterbird Plan, North American Bird Conservation Initiative plans, and other regional planning efforts. Focus on and refine recommendations for common loon and freshwater marsh-nesting birds (American bittern, least bittern, pied-billed grebe, black tern).

- ❖ Work with USFWS, USDA APHIS Wildlife Services, and state agencies on the development of the "second phase" of the population management plan for the Interior Great Lakes population of double-crested cormorants. The plan should include the potential effects of cormorants on SGCN such as colonial-nesting herons (e.g., black-crowned night heron, cattle egret) and other island ground-nesting birds (e.g., common tern), and how to alleviate negative effects before they limit populations of at-risk species.

- ❖ Develop a monitoring/control plan that includes measures to detect invasive species problematic to freshwater bivalves in the NELO-SLV Basin and actions that will be taken to control invasive species before they become threats. There are several existing management plans in the basin with components related to the management of invasive species (Northeast Lake Ontario-St. Lawrence Table 14). The planning effort for freshwater bivalves could be incorporated into, or modeled after, these on-going efforts.

INVASIVE SPECIES

Public and private conservation partners should continue to coordinate and expand the development of a monitoring and control plan for invasive exotic species in wetlands (e.g., purple loosestrife) in the Adirondacks, St. Lawrence Valley, and coastal marshes of eastern Lake Ontario, including guidelines for various control methods (e.g., mechanical control, chemical control, biological control), and the compatibility of these control measures with SGCN life history and habitat requirements. This planning effort could be incorporated into, or modeled after, programs such as the Adirondack Invasive Plant Program (DEC, NYSDOT, Adirondack Park Agency, Adirondack Nature Conservancy) and should incorporate the needs of:

- Freshwater Marsh-Nesting Birds - American bittern, least bittern, pied-billed grebe, black tern
- Freshwater Wetland Amphibians - western chorus frog
- Lake/River Reptiles - Eastern ribbon snake, wood turtle
- Uncommon Turtles of Wetlands - spotted turtle, Blanding's turtle
- Vernal-Pool Salamanders - blue-spotted salamander, Jefferson salamander

LAKE STURGEON

Develop and implement a lake sturgeon management plan that continues efforts to return this species back to its full range and abundance. Threats that should be addressed include exploitation of stocks, construction of dams that cut off spawning and nursery areas, and habitats degraded by runoff from development and channelization. Target waters in this Basin are tributaries of Lake Ontario and the St. Lawrence River.

GRASSLANDS

About 6% of the NELO-SLV lands are grasslands, and almost 17% is classified as open habitat (pasture, hay lands, and row crops) that is potentially valuable if managed in a sustainable manner that considers the needs of grassland-dependent wildlife. When developing management plans for grasslands and the species that depend upon them in NYS, natural resource managers focus on the St. Lawrence Valley as a "hot spot" of grassland species diversity. Furthermore, the St. Lawrence Valley is comprised of extensive agricultural grasslands interspersed with freshwater wetlands and tributaries. This combination makes the region unique in the northeastern U.S. and the critical combination of grasslands and wetlands support many resident and migratory SGCN that are rare or declining elsewhere in the Northeast. The planning process for the conservation and management of grasslands in this basin should focus on both public and private lands and include the benefits of this habitat to grassland birds, such as bobolink, Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper. Results of local planning efforts should be integrated into the New York State Grassland Bird Management Plan being developed by DEC and others under the 2003 State Wildlife Grant. Specific recommendations include:

- Complete the New York State Grassland Bird Management Plan currently being developed by DEC and others (State Wildlife Grant, 2003).

- As part of the grassland bird plan mentioned above, develop habitat management guidelines and action plans for priority-focus grassland bird species. In addition, investigate the feasibility managing grasslands in the basin with controlled burning. Draft a fire-management plan in accordance with these findings.

- Work with public land managers, including NRCS, USFWS, DEC and others, to better direct funding and other resources to the highest priority areas and projects for grassland habitat management. The ability to focus funding sources in core priority grasslands will be vital. If the funding sources from NRCS can not be adequately focused in priority areas, then this will cripple the ability to conserve the most critical grassland areas and will result in continued declines in grassland birds even within these focus areas.

Land Protection Recommendations

This category of actions encompasses a variety of protection mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of protection should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations. For many of the following species and species groups, the first step will be to gather accurate information on where species are located within the basin and the location and status of the critical habitats upon which they rely. Land acquisition priorities for this basin identified in the New York State Open Space Conservation Plan that will benefit SGCN should be implemented as part of the protection and management of these species.

HABITAT LOSS AND DEGRADATION

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development (residential and commercial, roads, powerlines) and wetland dredging and draining, and natural changes such as succession. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar habitat types (or different yet complementary habitats) are needed for migration and dispersal. Isolated habitat patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, increased susceptibility to predation, reduction in population, and reduction in the types of species the patch can support. In addition, habitats fragmented by roads and power lines increase direct mortality of animals due to collisions. Specific recommendations include:

Forested Habitats

Because much of the forested habitat in the Adirondack Mountains is protected by rules governing development in the Adirondack Park and by large tracts of public land administered by DEC, OPRHP, the Adirondack Park Agency, and others, public and private entities interested in acquiring habitat for SGCN that use late successional forests should direct their limited resources to the St. Lawrence Valley and other parts of the basin outside of the Adirondack Park where development pressures pose a relatively greater threat to species of concern and their habitats. For early successional forest and shrub habitats, it is critical that private lands within the Adirondacks be managed to provide for these habitats. Because state land within the Adirondack Park is forest preserve, there is even greater need to manage private lands to benefit early successional forest species. Another alternative that merits support and expansion is the recent trend toward buying easements on working forests. Easements protect the land from fragmentation due to development but still leave the land open to forest management. This is a unique opportunity for maintaining early successional forest habitats within the Adirondack Park. Target species are:

- Deciduous/Mixed-Forest Breeding Birds - protect core areas for cerulean warblers in the basin from human development. Although this species is increasing in NYS, it is declining across its range. Protecting areas important to this species within the state may be a way to conserve critical breeding populations. Key habitats include large, mature deciduous forests. There are several probable and confirmed breeding observations from the BBA (2000-04) effort in southwestern St. Lawrence and northern Jefferson counties.

- Early Successional Forest/Shrubland Birds - Implement a Landowner Incentive Project for early successional birds that will direct funds toward conserving and creating habitat for early successional forest/shrub birds. Target species include:
  - Golden-winged warbler - primarily second growth, but also brushy hillsides, old fields, and stream edges. Much of the focus on this species has centered on the possible negative consequences for golden-winged warblers when they interact with the more numerous blue-winged warblers (hybridization, competition). BBA data (2000-04) indicate that the St. Lawrence Valley (specifically northern Jefferson County and southwestern St. Lawrence County) is a high-priority area for golden-winged warblers in NYS, and is a region that is still outside of the blue-winged warbler "hybridization front." Results of the 2003 and 2004 State Wildlife Grant studies investigating this issue should guide restoration occurs for this species.
  - Canada Warbler - deciduous woodlands with thick understory, cut over areas and riparian thickets. BBA (2000-04) data indicate that this species is found throughout the Adirondack Park and in transitional areas between the park and the St. Lawrence Valley.
  - Whip-poor-will - habitat needs to be more fully defined but includes early successional forests, open woodlands, from moist lowland deciduous forests to montane forests and pine-oak woodlands. BBA data (2000-04) indicate that along with the lower Hudson Valley and the Champlain Valley, the transitional region between the Adirondacks and the east Ontario plain/St. Lawrence Valley (northeastern Jefferson and southwestern St. Lawrence counties) is an important region for this species in NYS.
- High-Altitude Conifer Forest Birds - the sole SGCN in this group is Bicknell's thrush. This relatively rare species is often associated with the high peaks of the Adirondack Park and is found in this basin in southern Franklin and northern Hamilton counties (BBA, 2000-04).
- Vernal-Pool Salamanders - vernal pools, dotted across the forested landscape, form an extensive system of small, unregulated wetlands that provide critical wildlife habitat. This group serves as a good transition between "forested habitats" and the next habitat affiliation "freshwater wetlands," as vernal-pool salamanders use both habitat types - vernal pools within forest stands and mineral soil wetlands. Securing habitats in large blocks that contain both forests and wetlands will be critical to the survival of this species group and many other SGCN. The results of the 2003 and 2004 State Wildlife Grant work on high-priority reptile and amphibian species should help guide acquisition projects. Target vernal pool salamanders include:
  - Blue-spotted Salamander and Jefferson Salamander - New York State Herpetile Atlas (1990-99) data show records for these species in the St. Lawrence Valley from Jefferson County through Clinton County.

Wetlands and Other Aquatic Habitats

Wetland habitats are scattered throughout the basin. The wetlands of the western Adirondacks tend to be lowland boreal habitats, such as conifer swamps, low bog forests, and open sphagnum bogs. Wetlands in the St. Lawrence Valley tend to be embedded in a matrix of more open habitats such as agricultural grasslands. And then there are the coastal wetlands and embayments of the St. Lawrence River and eastern Lake Ontario. Conservation partners interested in acquiring wetland habitats should focus their resources on wetlands that support high biodiversity, provide habitat for one or more rare or declining species, are under immediate threat of development/conversion, or have other unique ecological characteristics. Other important aquatic habitats include relatively undisturbed stretches of major river systems, such as Crooked Creek and Crooked Creek Marsh along the St. Lawrence River, and unique habitat, such as the dune systems of eastern Lake Ontario (Jefferson County). The sand dunes of Lake Ontario have received significant conservation attention from both public and private conservation organizations. Specific recommendations include:

- Beach and Island Ground-Nesting Birds - protect nesting and foraging habitat and associated upland buffers for common tern through acquisition, and easement, and through regulatory constraints on development. The eastern shores of Lake Ontario and the islands and shores of the St. Lawrence River represent a stronghold for this species in NYS (the northwestern boundaries of Jefferson and St. Lawrence counties; BBA, 2000-04). Key habitats include islands or coastal beaches with sparse matted vegetation and grassy areas.
- Freshwater Marsh-Nesting Birds - Secure habitats critical to species survival by acquisition of easements by other land protection mechanisms. The results of the 2004 State Wildlife Grant work on marsh birds should help guide acquisition projects. Target species include:
  - American bittern - freshwater and brackish marshes with emergent vegetation. BBA (2000-04) data show concentrations of observations of this species in northeastern Jefferson County and central St. Lawrence County.
  - Least bittern - freshwater marshes with emergent vegetation. The vast majority of BBA (2000-04) observations for this species within this basin are in the St. Lawrence Valley from the east Ontario plains of central Jefferson County through St. Lawrence County.
  - Pied-billed grebe - well-vegetated lakes, ponds, and marshes. BBA (2000-04) observations for this species are spread throughout the basin, with several observations in the St. Lawrence Valley (primarily Jefferson and St. Lawrence counties).
  - Black tern - freshwater marshes, slough, wet meadows. Almost half of all the BBA (2000-04) blocks where this species was observed in NYS were within the NELO-SLV Basin. Most of these atlas blocks are on the eastern shore of Lake Ontario and central St. Lawrence County (in and around Upper and Lower Lakes Wildlife Management Area).
- Freshwater Wetland Amphibians - Secure habitats critical to species survival by acquisition of easements or by other land-protection mechanisms. The results of the 2003 and 2004 State Wildlife Grant work on high-priority reptile and amphibian species should help guide acquisition projects. Target species include:
  - Western chorus frog - this species can be found in a variety of habitats, including marshes, wet meadows, and other relatively open wetland habitats. Less frequently they can be found in fallow agricultural fields and wooded swamps. New York State Herpetile Atlas (1990-99) data indicate that along with the Lake Plains (western NYS the St. Lawrence Valley

(primarily Jefferson and St. Lawrence counties), is an important region of the state for this species.

- ❖ Uncommon Turtles of Wetlands - Secure habitats critical to species survival by acquisition of conservation easements for wetlands and adjacent uplands.The results of the 2003 and 2004 State Wildlife Grant work on high-priority reptile and amphibian species should help guide acquisition projects. Target species include:
  - Blanding's turtle - shallow marshy waters and ponds. Along with the lower Hudson Valley, the St. Lawrence Valley is an important region of NYS for this species (from the eastern bays of Lake Ontario northeast through St. Lawrence County, Herp Atlas, 1990-99).
  - Spotted Turtle - marshy meadows, small bogs and swamps. This species was observed in only three Atlas blocks in this basin: one from west-central Jefferson County and two from the Lewis-St. Lawrence County border (Herp Atlas, 1990-99).
- ❖ Freshwater Bivalves - In key locations, acquire development rights to protect water quality for listed mussel populations, such as tributaries of Lake Ontario, and major river systems ,such as the Black, Grass, and St. Lawrence rivers. High-priority species in this basin include elktoe and yellow lamp mussel. The elktoe is found in clean, clear small-to-large sized streams and small to medium rivers with swift currents. The yellow lamp mussel prefers small to large rivers with moderate to fast flow and a sand and gravel substrate. Acquisition efforts should coincide with zebra mussel and quagga mussel monitoring efforts to protect critical habitats under threat from invasive exotic species.

Grasslands

The lands owned by public agencies in the basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially adjacent to existing protected grasslands. This would enable better management and protection of these habitats for grassland-dependent wildlife.

Alvars are grasslands and shrublands that develop on shallow soils with limestone geology and that support rare plant communities. They are a habitat type unique not only to this basin, but on a state and global level as well. Most alvars are concentrated in Jefferson County and are a high priority for conservation. The Nature Conservancy has protected almost 4,000 acres of alvars including Chaumont Barrens and Three-Mile Creek Barrens, but conservation partners need to continue efforts to protect this rare habitat type. Specific recommendations include:

- ❖ Grassland Birds - Acquisitions focusing on grassland bird habitat should be directed toward protecting existing grasslands or acquiring and restoring grassland habitats within proximity to existing grasslands to avoid creating sink habitats. These efforts should focus on the regions within the basin with the highest concentrations of grasslands, the east Ontario plains and St. Lawrence Valley, and should reflect the recommendations of priority grassland focus areas being developed by the New York State Grassland Bird Management Plan (State Wildlife Grant, 2003). Target species include:
  - Henslow's sparrow - old fields and meadows, preferably moist, with a combination of grass, forbs. May use unmowed hayfields, but abandons

them when cut. There is a concentration of BBA (2000-04) observations for this species in the open habitats of north-central Jefferson County.

- Northern harrier - open grasslands and grasslands adjacent to wetlands. BBA (2000-04) data indicate that this species is closely associated with the open habitat of the St. Lawrence Valley, from Jefferson County through northern Clinton County.
- Sedge wren - grasslands and grassy uplands adjacent to wetlands with sedges. The majority of BBA (2000-04) observations for this species in NYS are from the St. Lawrence Valley (primarily central Jefferson County through central St. Lawrence County).
- Short-eared owl - grasslands, meadows, and grassy uplands adjacent to marshes. During the BBA (2000-04) effort, this species was observed in only 22 blocks statewide, six of which were in this basin. Short-eared owls were observed in the open habitats of Jefferson County (five blocks) and northeast St. Lawrence County (one block). Wintering habitat is another key factor and need. Winter habitat is characterized by tall standing grass with high *Microtus* populations.
- Upland sandpiper - grasslands, dry meadows and old fields with little woody vegetation. The stronghold for this species in NYS as indicated by BBA (2000-04) data is north-central Jefferson County.

Management and Restoration Recommendations

Implementation of management and restoration actions for SGCN will require large-scale cooperative effort among public and private stakeholders, where each organization contributes its strength to the management system-from coordination to data collection and implementation, monitoring/evaluation-so that habitat and species-management goals can be achieved at the basin level. DEC, the government entity responsible for conservation of the state's fish and wildlife resources, should take the lead in coordinating such an endeavor. Wildlife and land managers should ensure that BMPs are followed and if none are described for a specific activity to develop and implemented new management plans. Additionally, many of the current BMPs need to be reexamined for effectiveness, becoming living documents.

HUMAN-WILDLIFE INTERACTIONS

These actions either directly address the behavior of people (e.g., posting of signs, gating) or the behavior of wildlife (e.g., providing safe travel corridors) in order to prevent conflicts. Specific recommendations include:

Beach and Island Ground-Nesting Birds

- ❖ Where feasible, protect common tern nesting areas from human disturbance by posting signs and fencing.

Lake/River Reptiles

- ❖ Manage the variety of adverse influences which might reduce lake/river habitat suitability for eastern ribbon snakes and wood turtles, including excessive disturbance by watercraft and fishing practices which incidentally take lake/river reptiles in significant numbers.

Uncommon Turtles of Wetlands

- ❖ Conduct a variety of habitat management activities where needed, including management of human access in order to preserve wetland suitability for spotted turtles and Blanding's turtles. Turtle species experience significant road mortality when migrating from over-wintering to egg-laying locations. Develop and implement mitigation measures to manage turtle population losses to vehicular roadkill.

Vernal-Pool Salamanders

- ❖ Develop and implement measures to manage reductions of wetland habitat quality caused by off-road vehicles by restricting or prohibiting their use in sensitive habitats. High-priority species include blue-spotted and Jefferson salamanders.

Indiana bat

- ❖ Work with public and private landowners to erect gates to regulate access at selected existing and newly discovered Indiana bat hibernacula (e.g., Glen Park, Jefferson County).

HABITAT LOSS AND DEGRADATION

Anthropogenic changes like development (residential and commercial, roads, power lines), dredging, and wetland draining, and natural changes, such as succession, reduce not only habitat quantity, but the quality of habitat as well by disrupting the function of remaining habitat patches. Examples of the loss of habitat function include loss of connectivity to patches of similar habitat (or different yet complementary habitats), loss of metapopulation dynamics in small, isolated patches ("sink" habitats), increased negative edge effects (increased susceptibility to predation), and reduction in the types of species the patch can support ("area sensitive" species). Habitat management can help ameliorate these problems by either improving the quantity and/or quality of existing habitat or by restoring habitat where it has been lost. Specific recommendations include:

Forested Habitats

Forest is the predominant habitat type within the NELO-SLR Basin. Where and when management actions occur in forested habitats will depend upon the species (e.g., where it is found, forest tract size, unique microhabitat characteristics), acuteness of threats to key forested habitats, and logistics (e.g., funding, cooperating partners).

Boreal-forest Birds

- ❖ Work with private landowners to implement land-management strategies that favor spruce grouse, olive-sided flycatcher, bay-breasted warbler, and other species dependent on early successional boreal forests. Within this basin this action should focus on areas within the Adirondack Park (portions of St. Lawrence, Franklin, Essex, Hamilton, and Herkimer counties).

Deciduous/Mixed Forest Breeding Birds

- ❖ Minimize the effects of fragmentation of habitats due to human development. This will benefit species dependent upon large, intact expanses of forest, as well as species that utilize smaller patches.

Early Successional Forest/Shrubland Birds

- ❖ Increase the amount of early successional forest and shrub habitat on public and private land throughout the basin through sound timber management. High-priority species include golden-winged warbler, Canada warbler, American woodcock, and whip-poor-will.

Forest Breeding Raptors

- ❖ Maintain appropriate breeding habitat for long-eared owls around occupied nest sites. BBA (2000-04) data show breeding records for this species in only six blocks in the basin. These blocks are spread across Lewis, Jefferson, St. Lawrence, and Franklin counties.

Wetlands and Other Aquatic Habitats

Thousands of lakes, ponds, creeks, and streams are distributed across the Adirondacks and St. Lawrence Valley, as well as hundreds of miles of shoreline along eastern Lake Ontario and the St. Lawrence River. Management actions should focus on public and private lands that support high biodiversity, provide habitat for one or more rare or declining species, are under immediate threat of development/conversion, or have some other unique ecological characteristics. Specific recommendations include:

Beach and Island Ground-Nesting Birds

- Where possible, re-establish high-quality common tern foraging habitats by manufacturing sand flats, mudflats or overwash fans, or by allowing such formations to build naturally. Also, ephemeral pool creation adjacent to beach-nesting habitat for common terns should be pursued.
- Where possible, common tern-nesting habitat should be expanded to create new nesting opportunities for this species. This should be accomplished through dredge spoil management, input into beach re-nourishment projects, and de-vegetation of formerly suitable sites.

Breeding Waterfowl

- If nesting structure is determined to be a limiting factor, install nest boxes to increase populations or productivity of common goldeneye in appropriate locations in the Adirondacks.
- Maintain or increase abundance and suitability of emergent marsh habitats for breeding black ducks in the Adirondack region of the NELO-SLR Basin. Where appropriate, look to improve timber management practices as a means for maintaining appropriate habitat.

Common Loon

- Use artificial nesting platforms to improve nesting success, where feasible, on lakes that lack natural islands and have poor shoreline nesting habitat, fluctuating water levels, or a history of low productivity.
- Where water-level control structures exist (typically on publicly owned lands), maintain constant water levels during peak nesting period, except where it would be detrimental to species dependent upon water flows below the structure. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities. This should focus on nesting locations in the Adirondack Park and along eastern Lake Ontario and the St. Lawrence River (Jefferson and St. Lawrence counties).

Freshwater Marsh-Nesting Birds

- Use the Farm Bill, USFWS Wildlife Habitat Incentives Program (WHIP) Partners for Wildlife Programs, and DEC's Landowner Incentive Program to manage and restore marsh habitats on private lands. It is crucial to adapt wetland management practices throughout the basin so they can simultaneously benefit waterfowl (common goldeneye, blue-winged teal, American black duck), marsh birds (American bitterns, least bitterns, pied-billed grebe, black tern), and other water birds.
- Where water-level control structures exist (typically on public owned lands), maintain constant water levels during peak nesting period, except where it would be detrimental to species dependent upon water flows below the structure. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities.

Osprey

- Nest platforms should be maintained and new ones placed when and where appropriate.

American Eel

- Develop a management plan for the inland populations of this species in the basin. This should be part of a broader statwide plan for the management and recovery of American eels.

Lake Sturgeon

- Where feasible, spawning habitat should be restored in the St. Lawrence River.

Mooneye

- Restoration of spawning areas may be accomplished with cobble and rubble placed in streams like that done for walleye spawning. Examples near Black Lake include the Oswegatchie River at Ogdensburg and Fish Creek at Pope Mills.

Freshwater Wetland Amphibians

- Manage the variety of factors which might be limiting wetland habitat suitability for high-priority amphibian species (western chorus frog). As with marsh birds, use the Farm Bill, USFWS Wildlife Habitat Incentives Program (WHIP) and Partners for Wildlife Programs, and DEC's Landowner Incentive Program to manage and restore marsh habitats on private lands in the eastern part of the basin with the highest amphibian diversity and the direst threats.

Lake and River Reptiles

- Manage uplands adjacent to aquatic habitat in order to provide adequate and secure nesting habitat sites and to provide dispersal routes for migrating animals. High-priority species include eastern ribbonsnake and wood turtles.

Uncommon Turtles of Wetlands

- Develop and implement mitigation strategies to manage adverse effects of habitat fragmentation. This includes conducting a variety of habitat management activities where needed, including management of vegetation succession in order to preserve wetland suitability for spotted turtles. Management actions should focus on occupied (and adjacent) habitats in the basin for Blanding's and spotted turtles.

Freshwater Bivalves

- Develop an outreach program to private landowners through DEC's Landowner Incentive Program to initiate projects to prevent or repair effects from land use on mussels and to restore degraded habitat areas to allow for recolonization or reintroduction of listed mussels.

Grasslands

Most of the grasslands in the NELO-SLR Basin are in private ownership. If management of this habitat type is to be successful, public and private agencies must work closely with private landowners to protect, restore and manage grassland habitats. As mentioned above for other habitat types, conservation partners should be cognizant of how a particular grassland fits in to the landscape (e.g., patch size and shape, distance to other grasslands and the quality of those grasslands, etc.), species and habitat diversity, the scope of the threats facing a particular grassland tract (e.g., development pressures), and logistics (e.g., funding, cooperating partners). Knowing this information will help guide where and when management and/or restoration takes place. Finally, management and restoration actions should reflect the recommendations of priority grassland focus areas being developed by the New York State Grassland Bird Management Plan (State Wildlife Grant, 2003). Specific recommendations to benefit SGCN include:

Grassland Birds

- ❖ Increase the amount of grassland habitat on public and private land in regions within the basin with the highest concentrations of grasslands (east Lake Ontario Plain, St. Lawrence Valley). As mentioned above, use the Farm Bill, such as Wildlife Habitat Incentives Program (WHIP) and USFWS Partners for Wildlife Programs, and DEC's Landowner Incentive Program to aid in this effort. High-priority species include Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper.

Common Nighthawk

- ❖ Increase use of prescribed fire in natural fire-adapted communities. Where this species is found in human-altered habitats (e.g., suburban, urban environments), evaluate feasibility of artificial nest structures on roof tops.

Invasive Species

Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout the basin. In wetlands and other aquatic habitats, species like purple loosestrife, Eurasian water milfoil, and Phragmites australis with little value to wildlife, displace native plant species and disrupt ecological processes. In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. In all habitat types, new residential and commercial development increases the risk of new occurrences of invasive exotic plants and animals. It is important to look for these exotic species in critical habitats and to minimize the potential adverse effect they may have on habitat quantity and quality. Presently two invasive-plant interagency groups are working to control the spread of invasives within the area (Adirondack Park Invasive Plant Program, St. Lawrence-Eastern Lake Ontario Weed Management Program). The groups have formed active interagency and volunteer staff teams working to control invasive plants. Specific recommendations to benefit SGCN include:

- ❖ Reduce the spread and colonization of new sites by invasive exotic species (e.g., purple loosestrife), and where feasible, control invasive species which are known to have detrimental effects on aquatic wildlife through biological, chemical, or mechanical means. The location and method (biological vs. chemical vs. mechanical) will depend upon the exotic species being targeted, life history traits and management objectives for the SGCN to benefit from the action, scale of the infestation, and logistics (funding, cooperating partners, feasibility of using a particular method in a specific locale). Specific actions should be tied to a statewide or basin-wide invasive species management plan.
- ❖ Based on the research and the monitoring/control plan to address the effect of exotic bivalves and crustaceans on freshwater bivalves (see "Data Collection" and "Planning" above), implement a management program for invasive species, such as zebra mussel, quagga mussel, and other invasive mussel species.
- ❖ Native Adirondack strains of brook trout, referred to as Heritage strains, were historically abundant in head water lakes and ponds in the watershed.

Competing and population non-native fishes have caused severe declines in their abundances.

- Where feasible, pond reclamations should be conducted to eliminate non-native fishes and restore brook trout.
- Natural barriers should be enhanced or barriers constructed at appropriate locations to prevent the spread/reintroduction of non-native fishes.

Restoration of Ecological Processes

A byproduct of landscapes that have been heavily manipulated by humans is disrupted ecological processes in the form of more abundant and diverse predator communities, and the ability of predators to hunt in a more efficient fashion (e.g., foraging along linear edge habitats, foraging in small habitat patches with a high edge:interior ratio). Specific management recommendations to counteract this threat include:

Beach and Island Ground-Nesting Birds

- ❖ Encourage landowners to control predators that represent significant threats to the viability of species-at-risk such as common tern. Options to be considered include direct predator control, allowing hunting and/or trapping during legally specified seasons, and habitat modification to remove roosting or denning sites of nest predators. The mechanism for predator control by landowners should be chosen in consultation with DEC.

Common Loon

- ❖ Reduce predator caused breeding failure, where problematic, by increasing hunting or trapping participation.
- ❖ Evaluate the extent to which management actions can reduce nest and chick losses. This will depend upon the ability of people to access important loon habitats, many of which may be on private lands.

Grassland Birds

- ❖ Manipulate habitat structure and composition through restoration and/or management (e.g., grassland patch size and shape) to reduce nest losses to predators.
- ❖ Evaluate the extent to which management actions can reduce nest losses. This action should focus on areas within the basin with the highest concentration of grasslands under strong development pressures. Highlight species include northern harrier, sedge wren, short-eared owl, and upland sandpiper.

Freshwater Marsh-Nesting Birds

- ❖ Reduce predator caused breeding failure, where problematic, by increasing hunting or trapping opportunities and by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape).
- ❖ Evaluate the extent to which management actions can reduce nest and chick losses. This action may be most easily accomplished on public owned wetlands, but if successful, should be expanded to private lands throughout the basin. Highlight species include American bittern, least bittern, pied-billed grebe, and black tern.

Uncommon Turtles of Wetlands

- Reduce predator caused breeding failure, where problematic, by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape).
- Evaluate the extent to which management actions can reduce egg losses. This action may be most easily accomplished on protected wetlands (public and privately owned wetlands in the Adirondacks and WMAs in the St. Lawrence Valley), but if successful, should be expanded to private wetlands where species occur (e.g., spotted turtles, Blanding's turtles).

Vernal Pool Salamanders

- Develop and implement measures to manage reductions of wetland habitat quality and increased predation on adults, young, and eggs caused by introductions of fish and other predatory species. Management actions should focus on habitats occupied by blue-spotted and Jefferson salamanders.

Restoration of Ecological Processes

Almost 18% of the NELO-SLR Basin is comprised of habitats that have been significantly altered by humans (residential and commercial development, agriculture [row crops, hay lands], parks and golf courses, and barren habitats [quarries, strip mines, gravel pits]). Many of these habitats are maintained by suppressing ecological processes such as vegetative succession and fire; however, the reverse is also true. Mature and early successional forest habitats may suffer because of a reluctance of the public to engage in the active management of these habitats. The result is large, homogenous forest tracts with lower structural, vegetative, and species diversity than would be encountered in forests with both natural disturbances (e.g., fire, wind throws) and active management (variable cutting regimes). Where ecologically, socially, and economically feasible, private and public conservation partners should work to restore habitat function through mechanical or natural means. Specific recommendations include:

Boreal Forest Birds

- Review DEC's wildfire management policies for Forest Preserve lands. Investigate opportunities to work with public and private land managers to execute fire management for boreal-forest bird species such as spruce grouse, olive-sided flycatcher, bay-breasted warbler, and other species dependent on boreal forests. Within this basin this action should focus on high elevation areas of the Adirondack Park.

Early Successional Forest/Shrubland Birds

- Determine the feasibility of maintaining, restoring, and enhancing fire-adapted early successional ecosystems through the use of prescribed fire. This habitat type exists throughout the basin. Highlighted species include golden-winged warbler, Canada warbler, and whip-poor-will.

Grassland Birds

- Restore habitat function and manipulate habitat structure and composition through mowing, and investigate the feasibility of using prescribed fire. Highlighted species include Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper.

WATER QUALITY

Many of the SGCN in this basin rely upon aquatic habitats during some stage of their life cycle. Conservation partners have identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality can be a result of atmospheric deposition (e.g., acid rain, mercury), siltation, nutrient runoff, temperature increases, toxics (e.g., pesticides, point and non-point source pollution), lowered dissolved oxygen, and altered hydrology (dams, water withdrawal, ground water extraction). Specific recommendations to counter this threat include:

Freshwater Marsh Nesting Birds

- Improve the quality of existing wetlands by minimizing draw downs during peak nesting periods and by installing vegetated buffers between developed sites (housing, commercial, agriculture, etc.) and adjacent marsh habitats to minimize the effects of runoff from these sites. Management actions should focus on occupied (and adjacent) habitats in the parts of the basin with the highest concentrations of wetlands and/or that contain the highlighted species American bittern, least bittern, pied-billed grebe, and black tern.

Freshwater Wetland Amphibians

- Manage the variety of factors which might be limiting wetland habitat suitability for resident amphibian species, including management of toxicants, adverse hydrological alterations, and anthropogenic inputs of sediments. Highlighted species include the western chorus frog. Management actions should focus on occupied (and adjacent) habitats in the parts of the basin with the highest amphibian diversity and the direst threats (wetlands along Lake Ontario and the St. Lawrence River).

Lake and River Reptiles

- Manage the variety of adverse influences which might reduce lake/river habitat suitability for reptiles of concern (eastern ribbonsnake and wood turtle), including management of toxicants and adverse hydrological alterations. Management actions should focus on occupied (and adjacent) habitats.

Uncommon Turtles of Wetlands

- Conduct a variety of habitat management activities where needed, including maintenance of hydrological regimes and curtailment of contaminant inputs in order to preserve wetland suitability for these species (e.g., Blanding's turtles, spotted turtles). Management actions should focus on occupied (and adjacent) habitats in the St. Lawrence Valley.

Freshwater Bivalves

- Manage areas of important mussel populations, where identified, by controlling degradation factors (e.g. controlling livestock access, point source or non-point source pollution, flow alteration, etc.).

POPULATION RESTORATION

If suitable habitats exist that can produce sustainable benefits for a particular species of conservation concern, a viable management option for rare and rapidly declining species may be population restoration. These efforts are often expensive and require a great deal of expertise and logistical support. The lead agency will probably be DEC for most of these ventures; however, as seen in successful cases of reintroduction in New York State, such as wild turkeys and river otters, the support of public and private groups outside DEC is essential to the success of the reintroduction effort. Specific recommendations to benefit SGCN include:

Lake/River Reptiles

- Pending the results of State Wildlife Grant (2003) surveys for the presence of spiny softshell turtles within tributaries of Lake Ontario, employ restoration techniques for the spiny softshell at selected sites as needed, including captive breeding, head starting, nest protection, and repatriation/relocation strategies. Restoration efforts, if needed, should focus on suitable habitats in proximity to locations where this species is observed.

Uncommon Turtles of Wetlands

- Employ restoration techniques for Blanding's turtles at selected sites as needed, including captive breeding, headstarting, nest protection, and repatriation/relocation strategies. Restoration efforts, if needed, should focus on suitable habitats in proximity to locations where this species is observed.

Eastern Sand Darter

- Examine possibilities for introductions to St. Lawrence tributaries like the Oswegatchie River.

Lake Sturgeon

- Evaluations of hatchery rearing and experimental plantings should be conducted in the Oswegatchie and St. Regis rivers and Black Lake.

Round Whitefish

- Pending the results of the 2003 State Wildlife Grant study on round whitefish in the Adirondacks, enhance remnant stocks of this species through artificial propagation and restoration to additional historic waters.

Freshwater Bivalves

- Where appropriate, reintroduce listed mussels into suitable habitat within their historic range. NYNHP element occurrence records for this species group in this basin are found in the St. Regis River and Grasse River sub-watersheds (northeastern St. Lawrence County).

Information Dissemination Recommendations

The sharing of information between natural resource managers and public and private groups is one of the most powerful tools in wildlife conservation. It allows people to make informed decisions about activities that may help or harm SGCN. For example, land-use objectives may conflict with the needs of wildlife. By providing accurate, complete information to stakeholders on a species (or a species group) and its critical habitats, we can begin to institute land use practices that have ecological objectives that are compatible with traditional economic and social objectives.

Information dissemination may take many forms including education and outreach programs, development of fact sheets, web site design and delivery, literature review and compilation of existing reports studies development and dissemination of best management practices, and technical guidance for land managers.

Human-Wildlife Interactions

Human behavior that directly affects wildlife (e.g., direct or indirect harassment, uncontrolled collection and/or harvest, collisions, entanglement/impingement) can be mitigated through education and outreach. An informational campaign directed at a particular natural resource user group may be a more cost-effective and efficient method for exacting change than implementing a regulatory, legislative, or management action. Specific recommendations include:

- To reduce the detrimental effects of human disturbance on beach and island ground-nesting birds (i.e., common tern), freshwater marsh-nesting birds (i.e., American bittern, least bittern, pied-billed grebe, black tern), and osprey, develop signs and/or displays informing the public of the presence of these species, their respective threats and critical conservation issues, and the need for protection, and post where appropriate.

- Improve public understanding of common loon conservation issues, including the effect of human disturbance on loon nesting success. Post interpretive signs at boat ramps, beaches, campgrounds and other public access points, particularly in the Adirondack Park. Areas to be stressed are personal water craft usage and limitation of wakes from all water craft. Where appropriate, possible horsepower restrictions should be put into effect on small lakes. Produce and distribute informational brochures, posters, press releases and other educational materials. Provide educational programs to schools, lake associations and other groups.

- Enhance public education to limit killing, collection/translocation, and the (illegal) sale of herpetofauna in the pet trade. High-priority species include:

    - Lake/River Reptiles - eastern ribbonsnake, wood turtle, spiny softshell, northern map turtle
    - Uncommon Turtles of Wetlands - Blanding's turtle, spotted turtle, stinkpot
    - Woodland/Grassland Snakes - black ratsnake, smooth greensnake

- Address the negative effects of invasive exotic species on freshwater bivalves by developing signs for markets dealing in aquatic SGCNs, explaining the dangers of releasing exotic invasive animals into New York State. Also, post educational signs at boater access points to reduce introduction of zebra and quagga mussels into water bodies.

- Develop outreach materials on the effects of greenhouse gasses and their influence on global warming. It can change aquatic and terrestrial temperature regimes which are important for many SGCN, like heritage strain brook trout, american eel, furbearers (e.g., otter) and high altitude conifer forest birds (i.e., Bicknell's Thrush).

- Enhance public education to dissuade killing of bats roosting on human structures. The Indiana bat is known to occasionally use structures such as houses and sheds for roosting. Public education efforts to prevent the killing of endangered bats would reduce any illegal taking of this species under federal and state statutes.

HABITAT LOSS AND FRAGMENTATION

The most obvious remedy for habitat loss and fragmentation may be land protection and restoration, but providing information to public land managers, private developers, and others is an important first step in slowing or preventing further habitat loss.

- In an effort to reduce habitat loss, develop a series of GIS geographic information system based modules that help provide the public with the knowledge to appreciate and understand SGCN need and their habitats.The modules, with interactive maps embedded in appropriate sections of text, would focus on the fish, wildlife, and natural resources associated with the diverse landscapes and water bodies of the NELO-SLR Basin and the opportunities to observe and learn about them and the network of public lands owned and managed for natural resource conservation. Information on the natural history and ecology of SGCN, and on management concerns for these species and their habitats, should be included along with an efficient means to identify specific lands where New York State residents could participate in wildlife conservation opportunities.

- Public misconceptions about cutting timber may result in a homogenous forested landscape with relatively little structural and vegetative species diversity. It is important to educate the public to the benefits and need for early successional forest management and restoration, including even-aged forest stand management and the development of multiple seral[10] stages across a forested landscape. This educational program should focus on both public and private lands and include the benefits of this habitat to early successional forest/shrubland birds, such as golden-winged warbler, Canada warbler, and whip-poor-will. Information should also be made available to public and private landowners to encourage land management strategies that favor boreal-forest birds such as spruce grouse, olive-sided flycatcher, and other species dependent on early successional boreal forests.

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[10] Sere = the entire sequence of ecological communities successively occupying an area from the initial stage to the climax.

- ❖ Provide information and technical guidance to utilities agencies to manage rights-of-way in a manner that will provide maximum benefit to early successional forest/shrubland birds such as those mentioned above.

- ❖ Develop an outreach program to educate public and private land managers on the need for, and wildlife benefits of, grasslands. Also provide technical guidance on how to conserve and/or manage grasslands. Targets for these actions include providing breeding and foraging habitat for grassland birds and upland nesting habitat (grasslands adjacent to wetlands) for breeding waterfowl like blue-winged teal.

AGRICULTURAL AND SILVICULTURAL PRACTICES

Traditional agricultural and silvicultural practices may lack ecologically based objectives, thus may be detrimental to wildlife. Providing information on SGCN and their habitats to public and private land managers will allow them to develop farming or timber harvest operations that are compatible with the needs of wildlife.

- ❖ Promote the establishment of buffer areas around agricultural fields and developments adjacent to marsh habitats. Species that would benefit from this action include freshwater wetland amphibians (e.g., western chorus frog), are freshwater marsh- nesting birds (e.g., American bittern, least bittern, pied-billed grebe, black tern), and various odonates.

- ❖ Several SGCN reside in forested habitats. When selecting a forest management regime (e.g., light thinning, partial harvest, clear cut, etc.), it may be difficult for public and private forest managers to coordinate the wide array of habitat needs of these species with their timber-management goals. It is important that informational materials be developed for forest managers that explain the habitat needs of species that rely on various forested habitats (i.e., varying seral stages, vertical structure, tree and shrub species composition, etc.) and how to accommodate SGCN with seemingly competing habitat requirements. This information should then be available to land-management partners developing/modifying best management practices (BMPs) in an effort to minimize the potential negative effects of poorly planned and executed forestry practices on wildlife. This should be accomplished for the following high-priority species:
    - Deciduous/Mixed-Forest Breeding Birds - cerulean warbler
    - Early Successional Forest/Shrubland Birds - golden-winged warbler, Canada warbler, American woodcock, whip-poor-will
    - Forest-Breeding Raptors - long-eared owl
    - Vernal-Pool Salamanders - blue-spotted salamander, Jefferson's salamander
    - Tree Bats - Eastern red bat, hoary bat,

- ❖ Provide information to farmers and grassland owners about the benefits of grasslands, threats to this habitat type, and species of conservation concern that use grasslands. Furthermore, provide information and technical guidance on how to incorporate wildlife management objectives into farming practices to maximize the benefits for wildlife (e.g., timing and frequency of mowing/haying, use of prescribed fire, integrated pest management, etc.) while still allowing farmers to accomplish their harvest goals.

These efforts should focus on the regions within the basin with the highest concentrations of grasslands. This educational program should focus on both public and private lands and include the benefits of this habitat to grassland birds, such as Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper, and other birds of open habitats such as common nighthawk.

Structure Collisions

Provide technical guidance to state and private entities planning the siting and installation of tall structures (e.g., wind mills, cell towers, and power lines) that are likely to adversely affect populations of migrating birds and bats. The U.S. Fish and Wildlife Service (USFWS) is currently investigating the effects of these types of structures on wildlife. Final guidelines developed by the USFWS should be consulted when considering the placement and installation of wind mills, cell towers, etc. In addition, a pilot study funded by the 2004 State Wildlife Program will focus on landscape scale pathways of migratory birds and bats in Lewis, Jefferson, and Oswego counties. Ultimately, when key migratory pathways are discovered, this information should be disseminated to state and private planning groups and incorporated into the siting and installation of tall structures. SGCN need that will benefit from this action include various migratory birds (early successional forest/shrubland birds, deciduous-forest birds, etc.) and bats (tree bats, Indiana bat).

Regulatory and Legislative Recommendations

Regulatory and legislative proposals will likely be made at the statewide level, although local governments may have opportunities to modify or create laws and regulations to enhance local protection of SGCN. For example, local zoning and land use policies can be used to discourage sprawl and habitat fragmentation.

PREVENTION OF HABITAT LOSS

- ❖ Pursue protection of wetlands less than 12.4 acres that provide habitat for SGCN under the 'unusual local significance' provisions of Article 24 of the Environmental Conservation Law (ECL) and enhance protection of upland buffer adjoining these wetlands. Some of the priority species that will benefit from this action include freshwater wetland amphibians (i.e., western chorus frog), uncommon turtles of wetlands (i.e., spotted turtles, Blanding' turtles), and vernal-pool salamanders (i.e., Jefferson and blue-spotted salamanders). Include review of all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh-nesting birds, regardless of wetland size. Priority species include American bittern, least bittern, pied-billed grebe, and black tern.

- ❖ Increase regional permit review of potential impacts to native freshwater bivalve species from development and highway projects in the basin.

- ❖ Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN.

- ❖ Examine the need to issue general permits for all regulated activities under ECL §608.5 on navigable stream segments that provide habitat for SGCN.

- ❖ Identify and protect known common loon nesting areas with focus on the Adirondacks.

HUMAN-WILDLIFE INTERACTIONS

- ❖ The best strategy for minimizing illegal collection of herpetofauna of conservation concern may be to implement pending legislative provisions which designate the following as protected species:
  - Freshwater Wetland Amphibians - four-toed salamander
  - Lake/River Reptiles - eastern ribbonsnake, spiny softshell
  - Uncommon Turtles of Wetlands - spotted turtle, Blanding's turtle, stinkpot
  - Vernal-Pool Salamanders - blue-spotted salamander, Jefferson salamander
  - Woodland/Grassland Snakes - black ratsnake, smooth greensnake

WATER QUALITY

- ❖ Continue implementation and enforcement of existing regulations to abate NPS pollutants, erosion, sedimentation, and hydrological alterations in order to better protect critical stream segments that provide habitat for SGCN. Enhance this protection through the promotion of additional best management practices through partnership with other state and local agencies.

INVASIVE SPECIES

- Enforce regulations restricting the importation and stocking of non-native fish that feed on freshwater bivalves (e.g., black carp).

SPECIES PROTECTION STATUS

For many SGCN, particularly invertebrate species, there is a lack of information on abundance, distribution, and population trends; however, preliminary data suggest that these species may warrant protective status. It is important to complete more thorough investigations into the population status, trends, and threats to these species to determine whether regulatory action is needed.

- A comprehensive statewide inventory of odonates (dragonflies and damselflies) was selected for State Wildlife Grant funding in 2003. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state. Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. High - priority species include:
  - Odonates of Bogs/Fens/Ponds - ebony boghaunter, forcipate emerald, incurvate emerald, subarctic bluet
  - Odonates of Lakes and Ponds - lake emerald
  - Odonates of Rivers/Streams - arrow clubtail, brook snaketail, extra-striped snaketail, rapids clubtail
  - Odonates of Small Forest Streams - ocellated emerald

Incentives

An incentive program geared toward private landowners will be a key first step in engaging the public about the importance of their lands to SGCN. So much of the critical habitats for these species exists on private lands that landowner cooperation will be the ultimate deciding factor on whether species declines can be halted. Their cooperation at the level needed for meaningful change will probably hinge on some form of enrollment process and financial and/or logistical support similar to that used in Farm Bill programs coordinated by the USDA and NRCS, such as the Wildlife Habitat Incentive Program (WHIP) and USFWS Partners for Wildlife Program, DEC Landowner Incentive Program, and various conservation programs administered by non-governmental organizations (e.g., local land trusts, The Nature Conservancy, Ducks Unlimited, Inc., etc.).

❖ Cooperate with NYS farmers and grassland owners to establish the best possible nesting and foraging opportunities for grassland birds (e.g., Henslow's sparrow, northern harrier, sedge wren, short-eared owl, and upland sandpiper) and common nighthawk. Incentives focusing on grassland bird habitat should be directed toward protecting existing grasslands or restoring grassland habitats within relative close proximity to existing grasslands to avoid creating sink habitats. These efforts should focus on the regions within the basin with the highest concentrations of grasslands.

❖ Incentive-based programs are often associated with agricultural habitats, but they may be a valuable mechanism for addressing conservation concerns in other ecotypes. Conservation partners should cooperate with private landowners to encourage land-management strategies that favor spruce grouse, olive-sided flycatcher, and other boreal-forest birds.

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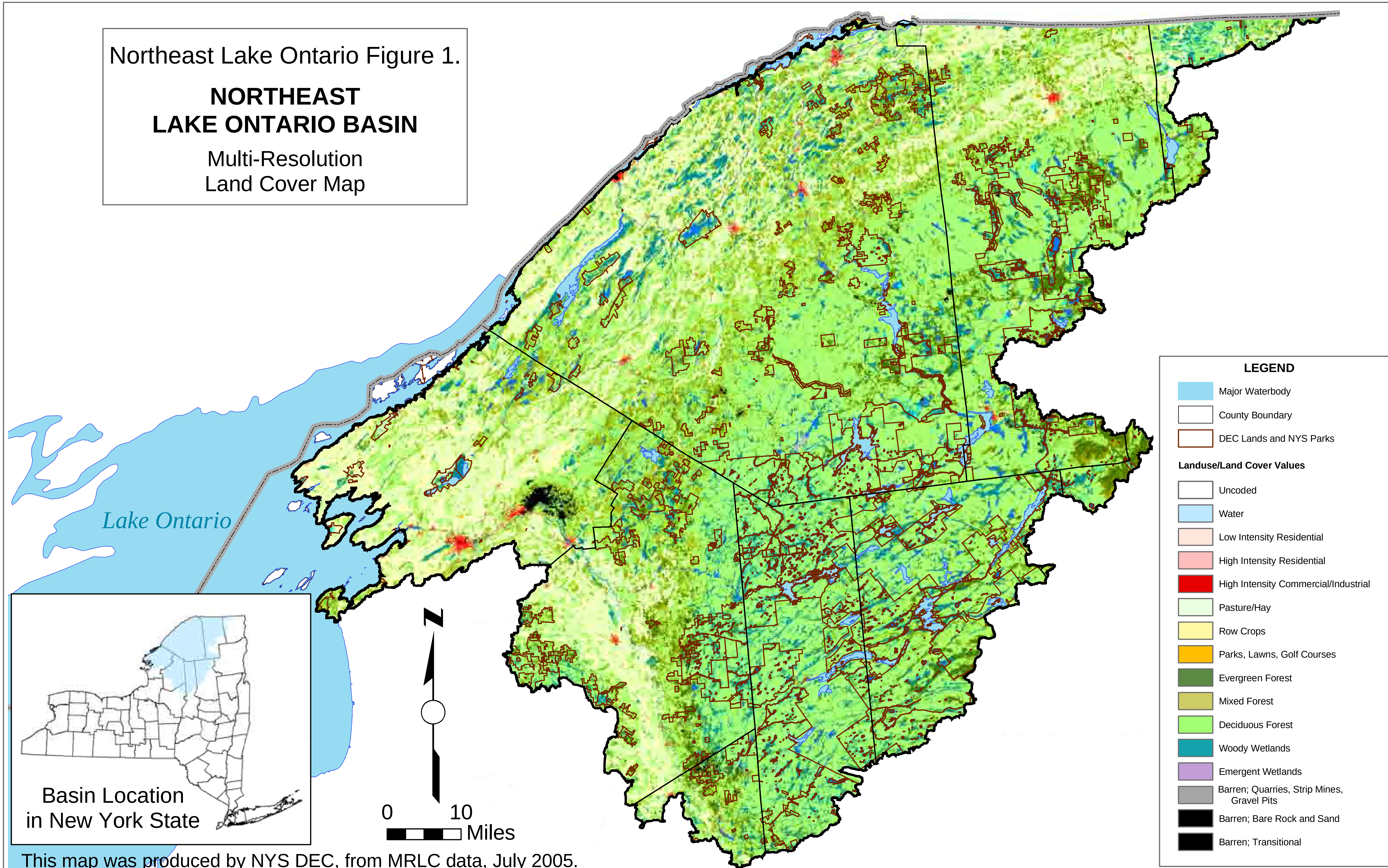
Tables and Figures

Tables

Figures


Northeast Lake Ontario Figure 1.
NORTHEAST
LAKE ONTARIO BASIN
Multi-Resolution
Land Cover Map
Lake Ontario
Basin Location
in New York State
0
10
Miles
LEGEND
Major Waterbody
County Boundary
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
This map was produced by NYS DEC, from MRLC data, July 2005.

Northeast Lake Ontario-St.Lawrence Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the NE Lake Ontario - St. Lawrence River Basin.

Classification	**% Cover**
Deciduous Forest	51.96
Mixed Forest	12.78
Row Crops	10.44
Woody Wetlands	7.63
Pasture/Hay	6.38
Evergreen Forest	5.69
Water	3.53
Barren; Quarries, Strip Mines, Gravel Pits	0.45
Emergent Wetlands	0.37
High Intensity Commercial/Industrial	0.27
High Intensity Residential	0.22
Low Intensity Residential	0.19
Parks, Lawns, Golf Courses	0.10

NE Lake Ontario - St. Lawrence River Table 2. Species of Greatest Conservation Need currently occurring in the NE Lake Ontario - St. Lawrence River Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Beach and Island ground-nesting birds	Caspian tern	Increasing
Bird	Beach and Island ground-nesting birds	Common tern	Unknown
Bird	Boreal forest birds	Bay-breasted warbler	Decreasing
Bird	Boreal forest birds	Cape May warbler	Unknown
Bird	Boreal forest birds	Olive-sided flycatcher	Decreasing
Bird	Boreal forest birds	Rusty blackbird	Unknown
Bird	Boreal forest birds	Spruce grouse	Decreasing
Bird	Boreal forest birds	Tennessee warbler	Unknown
Bird	Boreal forest birds	Three-toed woodpecker	Unknown
Bird	Breeding waterfowl	American black duck	Decreasing
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Breeding waterfowl	Common goldeneye	Unknown
Bird	Colonial-nesting herons	Black-crowned night-heron	Increasing
Bird	Colonial-nesting herons	Cattle egret	Decreasing
Bird	Common loon	Common loon	Increasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Decreasing
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Black tern	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	High Altitude Conifer Forest Birds	Bicknell's thrush	Unknown
Bird	Osprey	Osprey	Increasing
Bird	Peregrine falcon	Peregrine falcon	Increasing
Bird	Wintering waterbirds	Greater scaup	Decreasing
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Northern pintail	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Freshwater fish	Blackchin shiner	Blackchin shiner	Stable
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Eastern sand darter	Eastern sand darter	Increasing
Freshwater fish	Iowa darter	Iowa darter	Unknown
Freshwater fish	Lake sturgeon	Lake sturgeon	Increasing
Freshwater fish	Mooneye	Mooneye	Unknown

NE Lake Ontario-St. Lawrence River Table 2. (continued)

Taxa Group	Species Group	Species	Stability
Freshwater fish	Ninespine stickleback - inland	N. American ninespine stickleback	Unknown
Freshwater fish	Pugnose shiner	Pugnose shiner	Stable
Freshwater fish	Round whitefish	Round whitefish	Decreasing
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Unknown
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Northern map turtle	Unknown
Herpetofauna	Lake/river reptiles	Spiny softshell	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Mudpuppy	Common mudpuppy	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Blanding's turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Insect	Odonates of bogs/fens/ponds	Ebony boghaunter	Unknown
Insect	Odonates of bogs/fens/ponds	Forcipate emerald	Unknown
Insect	Odonates of bogs/fens/ponds	Incurvate emerald	Unknown
Insect	Odonates of bogs/fens/ponds	Subarctic bluet	Unknown
Insect	Odonates of lakes/ponds	Lake emerald	Unknown
Insect	Odonates of rivers/streams	Arrow clubtail	Unknown
Insect	Odonates of rivers/streams	Brook snaketail	Unknown
Insect	Odonates of rivers/streams	Extra-striped snaketail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Odonates of small forest streams	Ocellated emerald	Unknown
Insect	Other butterflies	Gorgone checkerspot	Decreasing
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Olympia marble	Decreasing
Insect	Other butterflies	Silvery blue	Decreasing
Insect	Other moths	*Orthodes obscura*	Stable
Mammal	Furbearers	American marten	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Indiana Bat	Indiana bat	Stable
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	American eel	American eel	Decreasing
Mollusk	Freshwater bivalves	Eastern pearlshell	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Pocketbook	Unknown
Mollusk	Freshwater bivalves	Yellow lamp mussel	Unknown

NE Lake Ontario - St. Lawrence River Table 3. NE Lake Ontario-St. Lawrence River Basin species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**16**	**61**	**118**	**51.7**
Bald Eagle		1		
Beach and Island Ground-Nesting Birds		2	7	28.6
Boreal Forest Birds		7	7	100.0
Breeding Waterfowl		3	4	75.0
Colonial Nesting Herons		2	8	25.0
Common Loon		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		7	9	77.8
Early Successional Forest Breeding Birds		10	12	83.3
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		4	6	66.7
Grassland Birds		10	11	90.9
High Altitude Conifer Forest Birds		1		
Osprey		1		
Peregrine Falcon		1		
Wintering Waterbirds		4	19	21.1
FRESHWATER FISH	**9**	**9**	**40**	**22.5**
Blackchin shiner		1		
Brook trout, Heritage strains		1		
Eastern sand darter		1		
Iowa darter		1		
Lake sturgeon		1		
Mooneye		1		
Ninespine stickleback - inland		1		
Pugnose shiner		1		
Round whitefish		1		
HERPETOFAUNA	**7**	**15**	**44**	**34.1**
Freshwater Wetland Amphibian		2	5	40.0
Lake/River Reptiles		4	5	80.0
Mudpuppy		1		
Snapping Turtle		1		
Uncommon Turtles of Wetlands		3	5	60.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		2	8	25.0
INSECT	**6**	**15**	**197**	**7.6**
Odonates of Bogs/Fens/Ponds		4	10	40.0
Odonates of Lakes/Ponds		1	5	20.0
Odonates of Rivers/Streams		4	19	21.1
Odonates of Small Forest Streams		1	3	33.3
Other Butterflies		4	18	22.2
Other Moths		1	92	1.1
MAMMAL	**3**	**5**	**21**	**23.8**
Furbearers		2	2	100.0
Indiana Bat		1		
Tree Bats		2	3	66.7
MARINE FISH	**1**	**1**	**51**	**2.0**
American Eel		1		
MOLLUSK	**1**	**4**	**59**	**6.8**
Freshwater Bivalves		4	39	10.3
TOTAL	**43**	**110**	**537**	**20.5**
% of all spp groups statewide	**33.6**			

NE Lake Ontario - St. Lawrence River Table 4. SGCN that historically occurred in the NE Lake Ontario-St. Lawrence River Basin, but are now believed to be extirpated from the basin (n=35).

Taxa Group	Species Group	Species
Bird	Barn owl	Barn owl
Bird	Loggerhead Shrike	Loggerhead shrike
Bird	Wintering waterbirds	Long-tailed duck
Freshwater fish	Extirpated Fishes	Atlantic salmon
Freshwater fish	Sauger	Sauger
Freshwater fish	Shortnose Cisco	Shortnose Cisco
Freshwater fish	Shortjaw cisco	Shortjaw cisco
Freshwater fish	Kiyi	Kiyi
Freshwater fish	Bloater	Bloater
Freshwater fish	Deepwater sculpin	Deepwater sculpin
Freshwater fish	Spoonhead sculpin	Spoonhead sculpin
Insect	Karner blue butterfly	Karner blue
Insect	Odonates of rivers/streams	Skillet clubtail
Insect	Odonates of seeps/rivulets	Gray petaltail
Insect	Other moths	*Papaipema aerata*
Insect	Other moths	Hairy artesta
Insect	Other moths	Maroonwing
Insect	Pine barrens tiger beetles	*Cicindela unipunctata*
Insect	Stoneflies/Mayflies of lotic waters	*Baetis rusticans*
Insect	Stoneflies/Mayflies of lotic waters	*Procloeon mendax*
Insect	Stoneflies/Mayflies of lotic waters	*Rhithrogena anomala*
Insect	Stoneflies/Mayflies of uncertain habitat	*Procloeon simile*
Insect	Stoneflies/Mayflies of uncertain habitat	*Procloeon vicinum*
Insect	Tomah mayfly	Tomah mayfly
Mammal	Extirpated large mammals	Canada lynx
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Tree bats	Silver-haired bat
Mollusk	Freshwater bivalves	Eastern pondmussel
Mollusk	Freshwater bivalves	Hickorynut
Mollusk	Freshwater bivalves	Paper pondshell
Mollusk	Freshwater gastropods	Campeloma spire snail
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater gastropods	Mossy valvata
Mollusk	Freshwater gastropods	Purplecap valvata

Northeast Lake Ontario-St. Lawrence Table 5. Significant Coastal Fish and Wildlife Habitats (n=28) within the NE Lake Ontario-St. Lawrence River Basin. DEC evaluates the significance of coastal fish and wildlife habitat areas, and following a recommendation from DEC, the Department of State designates and maps specific areas.

Habitat Name	County	Acres	Significance Value [a]	Description
Goose Bay and Cranberry Creek	Jefferson	2035	152	One of the largest, shallow, riverine bay and wetland ecosystems on the St. Lawrence River; subject to minimal disturbance; rare in New York State. Habitats include open waters of Goose Bay, the lower one and one-quarter miles of Cranberry Creek (up to Swan Hollow Road), and extensive wetland areas which are an integral part of these aquatic ecosystems.One of the major concentration areas for migratory birds, including waterfowl, in the St. Lawrence Plains ecological region; also a major warmwater fisheries production area in the ecological region. Blanding's turtle (T) reside in the area; also nothern harrier (T) and least bittern (SC) nesting. A major recreational fishing area in the Thousand Islands Region; also an important hunting and trapping area in Jefferson County.
Chippewa Bay	St. Lawrence	3457	110	Largest shallow, open water bay with substantial littoral zone in St. Lawrence County. High quality area, somewhat protected from exposure. The only habitat type of its kind in the St. Lawrence Plains ecological region and one of the only two examples of this ecosystem type in New York State. Muskellunge nursery habitat has been documented at two locations, other suitable nursery sitesmay be in the bay but have not been evaluated. Warmwater fish populations are unusual in the county. Migratory staging of waterfowl, shorebirds, and passerines are unusual at the county level. Common tern (T) feeding area near or adjacent to five documented tern nesting sites. Nesting by common loons (SC) on islets in the bay. Used as a feeding area by bald eagles (E) prior to ice cover; use is not available throughout winter although roosting at several sites has been documented.
Moses - Saunders Tailwater	St. Lawrence	467	103	A relatively large, deep, open water section of river; unusual in the St. Lawrence River, but rarity reduced by habitat alterations. Habitat includes a 500-acre area of riverchannel, extending about two miles from the base of Moses-Saunders Power Dam to the St. Lawrence Seaway navigation channel. This area encompasses a relatively deep (up to approximately 50 feet), wide, open water area below the dam, and a narrow waterway (referred to as Polly's Gut) which connects the two main channels of the river. The area is situated in an undeveloped, steep-sided, rocky gorge. The largely wooded adjacent land area is located within Robert Moses State Park. Bald eagle (E) wintering and feeding; lake sturgeon (T) occur in the area. A major concentration area for migrant and wintering gulls and waterfowl in the St. Lawrence Valley ecological region. One of the most popular birdwatching sites in the Thousand Islands region of New York.
Crooked Creek Marsh	Jefferson	1198	98	One of the four largest, undeveloped, coastal streamside wetlands on the St. Lawrence River; rare in the St. Lawrence Plains ecological region. Crooked Creek is a sizeable warmwater stream, with a broad floodplain occupied by extensive emergent marsh communities (predominantly cattail). All of Crooked Creek Marsh, including the mouth area at Chippewa Bay, is privately owned, and has been subject to minimal habitat disturbance. Upland areas bordering the marsh consist almost entirely of undeveloped forestland.Northern harrier (T) and least bittern (SC) nesting. Common tern (T) feeding area. Waterfowl hunting, recreational sportfishing, and trapping are of county level significance.
Little Galloo Island	Jefferson	43	95	An isolated and undeveloped island subject to minimal human disturbance, and extensive shoal area; unusual in the Great Lakes Plain ecological region. Important habitats include habitat includes the entire island and the surrounding underwater shoals to a depth of approximately 20 feet below mean low water (a total area of approximately 200 acres).One of the largest ring-billed gull colonies in North America, and one of the only Caspian tern nesting locations in New York State. Shoals support a recreational fishery for smallmouth bass of statewide importance.

Northeast Lake Ontario-St. Lawrence Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Dexter Marsh and Black River	Jefferson	2526	90	An extensive, relatively undisturbed, bay-head complex, unusual in the Great Lakes Plain. Includes one of four major New York tributaries to Lake Ontario. Habitats include a 2,000-acre wetland complex located at the confluence of the Black River, Perch River, and Muskalonge Creek. Dexter Marsh is the result of the filling of the head of Black River Bay by deposition of sediments and organic matter from these tributaries, supplemented by detritus blown up the bay from Lake Ontario. Dexter Marsh contains extensive areas of emergent wetland vegetation, dominated by cattail and wild rice. Natural open water channels meander through the marsh, often reaching depths of 10 feet or more. The remainder of the area has water depths varying from 2-8 feet, depending on Lake Ontario water levels. Most of this wetland area is located within the NYSDEC's Dexter Marsh Wildlife Management Area, and experiences relatively little human disturbance. Concentrations of salmonids, marsh-nesting birds, and migrant waterfowl are unusual in the Great Lakes ecological region. Black tern (SC) nesting and feeding area. Salmonid fishery attracts anglers from outside New York State in significant numbers; other recrea
Wilson Hill Wildlife Management Area	St. Lawrence	3386	87	An extensive shallow water area, subject to minimal human disturbance; unusual in the St. Lawrence Plains, but rarity is reduced by artificial creation of the habitat. Habitats include a very large, shallow freshwater impoundment, upland fields and woodlots, shallow river areas, and many small islands. Nesting waterfowl concentrations are unusual in the St. Lawrence Plains ecological region. Northern harrier (T) and least bittern (SC) nesting; blue-spotted salamander (SC) also present. Hunting and trapping opportunities attract considerable use by residents of New York State; also of scientific value as a major goose banding site in the region.
Wilson Bay and Marsh	Jefferson	528	84	One of the largest, undisturbed, scrub-shrub and forested wetlands on Lake Ontario; rare in ecological subregion. Wilson Bay has a maximum depth of approximately 25 feet, a sand and cobble bottom, and beds of submergent aquatic vegetation in shallow areas. Wilson Bay Marsh is located behind a barrier beach which has been stabilized by the construction of a road across its top. The wetland is dominated by an extensive area of flooded shrubs and emergent vegetation. The transition to surrounding uplands occurs through an equally extensive area of forested wetland. Largest black tern colony in New York State; also a major spawning and nursery area fo northern pike in the eastern Lake Ontario ecological subregion. Blanding's turtles (T) also reside in the area; An important waterfowl hunting area in the Thousand Islands region. Regionally significant birdwatching area.
Wellesly Island Pools	Jefferson	463	84	Relatively large, open water pools present year-round; one of four similar open water areas on the St. Lawrence River; rare in ecological region. Important habitats include the main river channel which remains partially open (i.e., ice-free) throughout the winter. The pools are quite consistent in presence and extent during most winters. The St. Lawrence River is generally more than 20 feet deep and narrow at this location, resulting in strong currents and considerable turbulence. Bottom substrates are rocky, and have minimal vegetative cover. Wellesley Island, located just north of the habitat and situated in the center of the Thousand Islands region, is a large island, with some mature woody vegetation.The only major bald eagle wintering area in the Great Lake Plains ecological region.
American Island Pools	St. Lawrence	1352	84	Relatively large, upwelling, open water pools present year-round; one of four similar open water areas on the St. Lawrence River; rare in ecological region. Habitats include a 1200-acre area of the main river channel that remains partially open (i.e., ice-free) throughout the winter. The pools are quite consistent in presence and extent during most winters. The St. Lawrence River is generally less than 20 feet deep and narrow at this location, resulting in strong currents and considerable turbulence. Bottom substrates are rocky, and have minimal vegetative cover. American Island, located at the northern portion of the habitat, is a small, seasonally inhabited rock island, with some mature woody vegetation.One of about four major bald eagle wintering areas in the St. Lawrence Plains ecological region.

Northeast Lake Ontario-St. Lawrence Table 5. (continued)

Habitat Name	County	Acres	Significance Value[a]	Description
Galop Island Pools	St. Lawrence	1332	84	Relatively large, upwelling, open water pools present year-round; one of four similar open water areas on the St. Lawrence River; rare in ecological region. One of four major bald eagle wintering areas in the St. Lawrence Plains ecological region. A major winter waterfowl and gull concentration area in the St. Lawrence Plains ecological region. Galop Island is a large, undeveloped island, with some mature woody vegetation. The island is public land held by the New York Power Authority and is managed as an undeveloped State Park.
French Creek Marsh	Jefferson	2302	82	One of the four largest, undeveloped, coastal streamside wetlands on the St. Lawrence River; rare in ecological subzone. French Creek is a sizeable warmwater stream, with a broad floodplain occupied by extensive emergent marsh communities.Northern harrier (T) and least bittern (SC) nesting. Blanding's turtles (T) reside in the area. Documented common tern (T) feeding area. Primarily of local importance for a variety of recreational uses, including warmwater fishing, waterfowl hunting and birdwatching.
Grasse River	St. Lawrence	1197	76	One of only three major tributaries in the St. Lawrence Plains ecological region; in relatively undisturbed condition. Habitat includes a mix of low intensity uses including active agriculture, fallow fields, small villages, extensive woodlands, and the Village of Massena near its confluence with the St. Lawrence River. The river corridor is largely forested. The river has been dammed at one location with a low weir which appears to be passable by fish, at least at some levels of flow. Only documented population of muskellunge inhabiting a small river system in the St. Lawrence Plain ecosystem. Possibly a rare refugium for St. Lawrence River muskellunge following the construction of the St. Lawrence Power project. Lake Sturgeon (T) present and presumed to successfully spawn based on age of individuals observed.
Chippewa Creek Marsh	St. Lawrence	1027	72	One of the four largest, undeveloped, coastal streamside wetlands on the St. Lawrence River; rare in St. Lawrence Plains ecological region. Habitats include streamside wetland and some adjacent uplands. The habitat is divided into two relatively discrete areas at Oak Point Road, where the marsh is relatively narrow; above and below Oak Point Road, the marsh is significantly wider. Chippewa Creek is a sizeable warmwater stream, with a broad floodplain occupied by extensive emergent marsh communities (predominantly cattail). Chippewa Creek Marsh is essentially undisturbed, with the exception of some habitat disturbance resulting from light residential development. Northern harrier (T) nesting.
Stony Island	Jefferson	1,500	70	A very large, isolated, and undisturbed island and associated shoals; unusual in the Great Lakes Plain ecological region. possesses several terrestrial habitat types, including freshwater wetlands, an inland lake, and upland forest. In addition, the fish and wildlife habitat includes the underwater shoals surrounding the island from shoreline to a depth of approximately 20 feet below mean low water datum.Spawning lake trout and smallmouth bass concentrations are unusual in the Great Lakes Plain ecological region. Contributes to a recreational fishery which attracts many anglers form outside New York State.
Lyme Barrel Shoals	Jefferson	1093	65	An extensive rocky shoal area located in eastern Lake Ontario, uncommon in the Great Lakes Plain ecological region. Concentrations of spawning lake trout and smallmouth bass are unusual in the Great Lakes Plain ecological region. Stony Point-Lime Barrel Shoals provides an extensive shallow water area for fish spawning and feeding that is relatively rare in New York's Great Lakes waters. This large shoal area provides habitat for several important fish species. Contributes to a recreational fishery which attracts many anglers from outside New York State.

Northeast Lake Ontario-St. Lawrence Table 5. (continued)

Habitat Name	County	Acres	Significance Value[a]	Description
Coles Creek	St. Lawrence	638	60	A flooded tributary stream mouth, with a large area of productive littoral zone: uncommon in St. Lawrence County. Coles Creek contains extensive beds of submergent aquatic vegetation and a fringe of emergent marsh vegetation. Upland areas bordering Coles Creek are almost entirely undeveloped. Common tern (T) feeding area; eastern bluebirds (SC) nest in the area.
Point Peninsula	Jefferson	5773	59	A large mosaic of active farmland and fallow old fields, with occasional woodlots and conifer plantations. Habitats include a 2000-acre mosaic of active farmland, old field, and some woodlots and conifer plantations. In some areas, tracts of red cedar mixed with various shrubs are present. The area is characterized by poor shallow soils which are more suited to pastureland and hay production rather than row crops.The most significant concentration of wintering raptors documented in New York State. Supports wintering populations of northern harrier (T) and short-eared owl (SC).
Gull and Bass Islands	Jefferson	5	56	Two isolated and relatively undisturbed islands and associated shoal areas; uncommon in the Great Lakes Plain ecological region.The islands are relatively low-lying, with a vegetative cover dominated by shrubs and grasses. Habitat disturbances at Gull and Bass Islands are minimal. The fish and wildlife habitat includes the surrounding underwater shoals to a depth of approximately 20 feet below mean low water (a total area of approximately 340 acres). Concentrations of colonial waterbirds using the islands is unusual in the Eastern Ontario Plain ecological subzone. Shoals support a recreational fishery for smallmouth bass of statewide importance.
Brandy Brook	St. Lawrence	125	52	A flooded tributary stream mouth, with a sizeable area of productive littoral zone; uncommon in St. Lawrence County. Brandy Brook is a sizeable warmwater stream, with a drainage area of approximately 30 square miles. However, most of the habitat area consists of the segment of stream that was flooded with the creation of Lake St. Lawrence, forming a freshwater "estuary". Brandy Brook is relatively shallow, and contains dense beds of submergent aquatic vegetation and a fringe of emergent marsh vegetation. Upland areas bordering Brandy Brook are rural in nature, including extensive undeveloped forestland on the east side, and low density residential development on the west. Common tern (T) feeding area. Popular recreational fishing area for a variety of warmwater fish species, important to residents of the Thousand Islands region.
Wilson Hill Island - Tucker Terrace Area	St. Lawrence	681	50	A shallow littoral embayment with moderate amounts of submerged aquatic vegetation and substrates composed of sand, gravel, and rocks; Water depths in this habitat range from 3 to 13 feet. Bottom substrates consist of rocks, gravel, and sand with some submerged vegetation. Sand Islands are small undeveloped islands, with mostly open and shrubby vegetation. Sand Islands are privately owned.Common tern (T) feeding area adjacent to three nesting sites supporting approximately 160 pairs of birds. Contributes to a sport fishery of county level importance. Also a locally important waterfowl hunting area.
Point Peninsula Marsh	Jefferson	727	43	One of the largest, undisturbed, scrub-shrub and forested wetlands on Lake Ontario; rare in the eastern Ontario Plain ecological subzone. Habitats include a 300-acre flood pond wetland on the west side of the peninsula, separated from Lake Ontario by a narrow sand and cobble barrier beach, and shoal areas immediately west and south of the wetland. Point Peninsula Marsh is a predominantly scrub-shrub and forested wetland, with a very diverse mixture of emergent and woody plant species and a high degree of interspersion. Black tern (SC) nesting area. Waterfowl hunting opportunities attract visitors from much of Jefferson County.

Habitat Name	County	Acres	Significance Value[a]	Description
Fox Island - Grenadier Island Shoals	Jefferson	4239	38	An extensive area of sheltered, shallow, open water, with beds of submergent aquatic vegetation; The fish and wildlife habitat, also referred to as the "Hardscrabble", is an approximate 4,000 acre shallow water area, containing beds of submergent aquatic vegetation (e.g., wild celery, pondweeds), and patches of emergent wetland vegetation around the shoreline.One of the major concentration areas for migrant and wintering waterfowl in the eastern Ontario Plain ecological subzone. An important recreational and commercial fishing area in eastern Lake Ontario of regional significance.
St. Lawrence River Shoreline Bays	Jefferson	711	38	Several shallow shoreline bays with dense beds of aquatic vegetation; rare in Jefferson County based on protected nature of bays. The fish and wildlife habitat consists of eight shallow bays along the River's mainland shoreline. The bays form an almost continuous three and one-half mile reach of productive littoral zone and wetland habitat. All of the bays are generally less than six feet deep (depending on River levels) and are somewhat sheltered from prevailing winds and wave action. Much of the land area surrounding the St. Lawrence River Shoreline Bays is privately owned, and has been developed into seasonal camps, permanaent residences, and small craft harbor facilities (resulting in some habitat disturbance). These bays comprise major spawning and nursery areas for muskellunge on the St. Lawrence River, of statewide significance. The St. Lawrence muskellunge fishery, which is dependent on these bays, attracts anglers from throughout New York State and beyond.
Whitehouse - Ogden Island Bays	St. Lawrence	362	32	A series of shallow littoral embayments with moderate amounts of submerged vegetation and substrates composed of sand, gravel, and rocks; one of only four similar embayment complexes in the county. Ogden Island is a large, undeveloped island, with mostly open and shrubby vegetation.The best documented muskellunge nursery area in the county supporting a young-of-year population level unusual in the St. Lawrence Plains ecological region. Common tern (T) feeding in area, however the numbers of individuals relying on these embayments is not well documented. This nursery complex significantly supports a sport fishery of importance in a major region of New York State.
Galop Island Bays	St. Lawrence	294	29	A series of shallow littoral embayments with moderate amounts of submerged vegetation and substrates composed of sand, gravel, and rocks; a rare embayment complex type in the St. Lawrence Plains ecological region. The fish and wildlife habitat encompasses the bays along the southeast shores of Galop Island; and the bays associated with the mainland shore adjacent to Galop Island. Water depths in this area range from 3 to 13 feet deep. Bottom substrates consist of rocks, sand, and silt with some submerged vegetation. Galop Island is a large, undeveloped island, with mostly open and shrubby vegetation as well as limited mature woody vegetation. The island is public land held by the New York Power Authority and is managed as an undeveloped State Park.Contributes to a sport fishery of county level importance.
Oswegatchie River	St. Lawrence	294	25	The only significant area of riffle habitat associated with the lower St. Lawrence River (ecological subzone), but rarity reduced by human disturbance. Relatively shallow with a rock and rubble bottom, comprising a sizeable area of riffle habitat. However, recent power generation discharge facilities have degraded portions of the river bottom near the dam.Farther downstream, the channel is wider, deeper, and extensively bulkheaded in conjunction with dense urban waterfront development. Records of lake sturgeon (T) and mooneye (SC) exist for the area but the extent of their use of the area has not been adequately documented. Diverse recreational fisheries attract considerable use by residents of the Thousand Islands region.

Northeast Lake Ontario-St. Lawrence Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Campbell Marsh	Jefferson	77	24	A relatively small, streamside wetland, containing a diversity of plant communities located at the eastern end of Lake Ontario in Jefferson County. A diversity of plant communities occurs in this area, including emergent marsh, submergent aquatic beds, sedge meadow, scrub/shrub wetland, and flooded deciduous forest. Much of the land area bordering Campbell Marsh is undeveloped forest, open field, and agricultural land. An important recreational fishing area for local residents and tourists, significant at the county level. Campbell Marsh is privately owned.

[a] Significance Value = [(Ecosystem Rarity + Species Vulnerability + Human Use + Population Level) x Replaceability]

Northeast Lake Ontario-St. Lawrence Table 6. Office of Parks, Recreation & Historic Preservation (OPRHP) land units (n=20) within the NE Lake Ontario - St. Lawrence River Basin. All WMAs within this Basin are in DEC Region 6.

Unit Name (DEC Region)	County	Acres
Burnham Point State Park	Jefferson	12
Cedar Point State Park	Jefferson	49
DeWolf Point State Park	Jefferson	13
Grass Point State Park	Jefferson	124
Keewadin State Park	Jefferson	230
Kring Point State Park	Jefferson	53
Long Point State Park	Jefferson	26
Mary Island State Park	Jefferson	12
Waterson Point State Park	Jefferson	6
Wellesley Island State Park	Jefferson	2,630
Westcott Beach State Park	Jefferson	316
Whetstone Gulf State Park	Lewis	1,886
Cedar Island State Park	St. Lawrence	10
Coles Creek State Park	St. Lawrence	1,737
Eel Weir State Park	St. Lawrence	15
Galop Island State Park	St. Lawrence	675
Higley Flow State Park	St. Lawrence	1,104
Jacques Cartier State Park	St. Lawrence	460
Robert Moses State Park	St. Lawrence	2,654

Northeastern Lake Ontario-St. Lawrence Table 7. NYSDEC Wildlife Management Area (WMA) land units (n=12) within the NE Lake Ontario - St. Lawrence River Basin. All WMAs within this Basin are in DEC Region 6.

Unit Name (DEC Region)	County	Acres
Ashland Wildlife Management Area	Jefferson	2,024
Collins Landing Wildlife Management Area	Jefferson	55
Cranberry Creek Wildlife Management Area	Jefferson	13
Dexter Marsh Wildlife Management Area	Jefferson	1,365
French Creek Wildlife Management Area	Jefferson	2,300
Indian River Wildlife Management Area	Jefferson	975
Lake Ontario Islands Wildlife Management Area	Jefferson	64
Perch River Wildlife Management Area	Jefferson	7,838
Point Peninsula Wildlife Management Area	Jefferson	1,046
Tug Hill Wildlife Management Area	Lewis	5,734
Fish Creek Marsh Wildlife Management Area	St. Lawrence	4,539
Upper and Lower Lakes Wildlife Management Area	St. Lawrence	8,640
Wilson Hill Wildlife Management Area	St. Lawrence	3,513

Northeast Lake Ontario-St. Lawrence Table 8. NYSDEC State Forest, Wild Forest, Wilderness, Primitive Area, and Unique Area land units (n=95) within the NE Lake Ontario - St. Lawrence River Basin.

Unit Name	County	DEC Region	Acres
The Gulf Unique Area	Clinton	5	623
Saranac Lakes Wild Forest	Essex/Franklin	5	25,775
High Peaks Wilderness	Essex/Franklin/Hamilton	5	190,466
Blue Mountain Wild Forest	Essex/Hamilton	5	23,219
Bombay State Forest	Franklin	5	2,763
Debar Mountain Wild Forest	Franklin	5	107,243
Deer River State Forest	Franklin	5	11,760
St. Regis Canoe Area	Franklin	5	17,606
St. Regis River State Forest	Franklin	5	947
Titusville Mountain State Forest	Franklin	5	7,077
Trout River State Forest	Franklin	5	635
Blue Ridge Wilderness	Hamilton	5	46,786
Lake Lila Wilderness	Hamilton	5	4,085
Sargent Ponds Wild Forest	Hamilton	5	42,737
Wakely Mountain Primitive Area	Hamilton	5	226
William C. Whitney Wilderness	Hamilton	5	12,018
Fulton Chain Wild Forest	Hamilton/Herkimer	5, 6	14,705
Moose River Plains Wild Forest	Hamilton/Herkimer	5, 6	82,394
Pigeon Lake Wilderness	Hamilton/Herkimer	5, 6	48,767
West Canada Lake Wilderness	Hamilton/Herkimer	5, 6	169,003
Pepperbox Wilderness	Herkimer	6	14,347
Ha-de-ron-dah Wilderness	Herkimer/Lewis	6	26,081
Independence River Wild Forest	Herkimer/Lewis	6	72,143
Watsons East Triangle Wild Forest	Herkimer/Lewis/St. Lawrence	6	13,910
Black River Wild Forest	Herkimer/Oneida/Lewis	6	123,114
Five Ponds Wilderness	Herkimer/St. Lawrence	6	141268
Coyote Flats State Forest	Jefferson	6	580
Henderson Shores Unique Area	Jefferson	6	889
Pulpit Rock State Forest	Jefferson	6	1,611
Balsam Creek State Forest	Lewis	6	543
Beartown State Forest	Lewis	6	7,281
Bonapartes Cave State Forest	Lewis	6	1,423
Cobb Creek State Forest	Lewis	6	2,201
Frank E. Jadwin State Forest	Lewis	6	20,559
Glenmeal State Forest	Lewis	6	830
Grant Powell State Forest	Lewis	6	8,267
High Towers State Forest	Lewis	6	658
Independence River State Forest	Lewis	6	653
Indian Pipe State Forest	Lewis	6	587
Lesser Wilderness State Forest	Lewis	6	12,897
Lookout State Forest	Lewis	6	3,265
Mohawk Springs State Forest	Lewis	6	592
Onjebonge State Forest	Lewis	6	1,825
Otter Creek State Forest	Lewis	6	1,400
Sandy Bay State Forest	Lewis	6	127
Sandy Flats State Forest	Lewis	6	2,572
Sears Pond State Forest	Lewis	6	5,856
Pinckney State Forest	Lewis/Jefferson	6	2,120
Tug Hill State Forest	Lewis/Jefferson	6	6,553
Hogsback State Forest	Lewis/Oneida	6	1,757
Jackson Hill State Forest	Oneida	6	1,185
Penn Mountain State Forest	Oneida	6	3,500
Popple Pond State Forest	Oneida	6	2,286
Woodhull State Forest	Oneida	6	555
Aldrich Pond Wild Forest	St. Lawrence	6	25,818
Beaver Creek State Forest	St. Lawrence	6	3,679
Brasher Falls State Forest	St. Lawrence	6	19,523
California State Forest	St. Lawrence	6	1,259
Catherineville State Forest	St. Lawrence	6	1,609
Cbuckton State Forest	St. Lawrence	6	1,067
Cold Spring Brook State Forest	St. Lawrence	6	770
Cranberry Lake Wild Forest	St. Lawrence	6	25,189
Crary Mills State Forest	St. Lawrence	6	590
DeGrasse State Forest	St. Lawrence	6	1,171
Downerville State Forest	St. Lawrence	6	1,437
Fire-Fall State Forest	St. Lawrence	6	1,589
Fort Jackson State Forest	St. Lawrence	6	911
Grantville State Forest	St. Lawrence	6	778

Northeast Lake Ontario-St. Lawrence Table 8. (continued)

Unit Name	County	DEC Region	Acres
Grass River Wild Forest	St. Lawrence	6	12,855
Greenwood Creek State Forest	St. Lawrence	6	1,009
Hickory Lake State Forest	St. Lawrence	6	580
High Flats State Forest	St. Lawrence	6	1,880
Horseshoe Lake Wild Forest	St. Lawrence	6	26,067
Knapp Station State Forest	St. Lawrence	6	1,000
Lonesome Bay State Forest	St. Lawrence	6	1,125
Lost Nation State Forest	St. Lawrence	6	1,911
Ore Bed Creek State Forest	St. Lawrence	6	768
Pleasant Lake State Forest	St. Lawrence	6	964
Raquette Boreal Wild Forest	St. Lawrence	6	14,907
Raymondville State Forest	St. Lawrence	6	620
Silver Hill State Forest	St. Lawrence	6	775
Snow Bowl State Forest	St. Lawrence	6	833
Sodom State Forest	St. Lawrence	6	1,417
South Hammond State Forest	St. Lawrence	6	2,093
Southville State Forest	St. Lawrence	6	554
Stammer Creek State Forest	St. Lawrence	6	465
Taylor Creek State Forest	St. Lawrence	6	1,858
Toothaker Creek State Forest	St. Lawrence	6	702
Trout Lake State Forest	St. Lawrence	6	1,085
West Parishville State Forest	St. Lawrence	6	785
Whipporwill Corners State Forest	St. Lawrence	6	1,285
Whiskey Flats State Forest	St. Lawrence	6	2,553
White Hill Wild Forest	St. Lawrence	6	9,517
Wolf Lake State Forest	St. Lawrence	6	4,349
Yellow Lake State Forest	St. Lawrence	6	747

Northeast Lake Ontario-St. Lawrence Table 9. Bird Conservation Areas (BCA) within the NE Lake Ontario-St. Lawrence River Basin (n=5). NYSDEC's BCA Program, established in 1997, is modeled after the National Audubon Society's Important Bird Areas (IBA) program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to state-owned properties.

Bird Conservation Area	County	DEC Region	Acres	Description
Adirondack Sub-alpine Forest	Franklin/Clinton/Essex/Warren	5	69,000	This BCA includes Adirondack Mountain summits above 2,800 feet in Clinton, Essex, Franklin, Hamilton and Warren counties. Surveyed and confirmed nesting locations for Bicknell's Thrush include: Mount Marcy, Algonquin Peak, Blue Mountain, Cascade Mountain, Giant Mountain, Kilburn Mountain, Hurricane Mountain, Lower Wolfjaw Mountain, Lyon Mountain, Mount Haystack, Phelps Mountain, Porter Mountain, Rocky Ridge Peak, Santanoni Peak, Snowy Mountain, Vanderwhacker Mountain, Wakely Mountain, Whiteface Mountain and Wright Peak. Critical habitats include dense subalpine coniferous thickets, and to a lesser degree, young or stunted and heavy second growth of cherry or birch.
Upper and Lower Lakes	St. Lawrence	6	8,781	A large complex of open water surrounded by marsh, shrub, swamp, and upland forest. Upland areas include grassland and some shrubland, as well as forest. Species of interest include: Black Tern (endangered), Pied-billed Grebe (threatened), Least Bittern (threatened), Northern Harrier (threatened), Upland Sandpiper (threatened), Sedge Wren (threatened), American Bittern (special concern), Osprey (special concern), Common Loon (special concern), and Cerulean Warbler (special concern).
Ashland	Jefferson	6	2,037	Area has relatively large areas of early successional habitats, including grassland and shrub land. There are also forested areas, and limestone barrens. These habitats support a diversity of early successional bird species, including Short-eared Owl (endangered), Henslow's Sparrow (threatened), Sedge Wren (threatened), Northern Harrier (threatened) and Upland Sandpiper (threatened). Critical habitats include large, contiguous areas of grassland and shrubland.
Perch River	Jefferson	6	7,862	Consists of the entire Perch River WMA. High quality wetlands bordered by deciduous forest, shrubland, and open agricultural fields. There is an interspersion of open water, marsh, shrubland and forested wetland areas. The area supports a diverse array of wetland-associated and grassland species including many state-listed species. Critical habitats include deep emergent marsh, shallow emergent marsh, shrub swamp, and forested wetlands.
Eastern Lake Ontario Marshes	Jefferson/Oswego	6, 7	4,940	A complex of long barrier beaches, embayments, dunes, marshes, and swamps with cold water streams. Lakeshore barrier beach and wetland complexes such as this are rare in New York State. This area has been recognized by the Department of State as a Significant Coastal Fish and Wildlife Habitat and, in part, has also been designated as a National Natural Landmark. This BCA has significant breeding and over-wintering habitats, and serves as a critical migratory corridor for birds. Critical habitats include a mosaic of Great Lakes inland dunes and high quality wetlands with extensive barrier beaches backed by shrub/scrub and forested lands. Rare or exemplary ecological communities: silver maple-ash swamp, Great Lakes dunes, rich shrub fen, medium fen, red maple-hardwood swamp, red maple-tamarack peat swamp, maple-basswood rich mesic forest, deep emergent marsh, sand beach.

Northeast Lake Ontario-St. Lawrence Table 10. Critical **aquatic** habitats found in the NE Lake Ontario-St. Lawrence River Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/ sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Palustrine	mineral soil wetland	20
Riverine	cold water stream	14
Lacustrine	cold water deep	13
Lacustrine	warm water shallow	11
Riverine	warm water stream	10
Palustrine	peatlands	6
Riverine	deep water river	6
Lacustrine	cold water shallow	5
Lacustrine	warm water deep	5
Riverine	coastal plain stream	4
Lacustrine	unknown	2
Lacustrine	coastal plain	1
Palustrine	unknown	1
Palustrine	warm water stream	1
Riverine	cold water deep	1
Riverine	unknown	1
Riverine	warm water deep	1
Riverine	warm water shallow	1

Northeastern Lake Ontario-St. Lawrence Table 11. Critical **terrestrial** habitats found in th NE Lake Ontario-St. Lawrence River Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/ sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Terrestrial	forested	43
Terrestrial	open upland	39
Terrestrial	barrens/woodlands	10
Terrestrial	alpine/mountain	4
Terrestrial	coastal	3
Subterranean	natural/cultural	1

Northeast Lake Ontario-St. Lawrence Table 12. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the NE Lake Ontario-St. Lawrence River Basin. For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	**# of Species Groups Affected**	**% of All Spp Groups in Basin**	**% of All Threats in Basin**
Habitat Loss - cultural (e.g., development)	28	63.6	10.4
Contaminants	21	47.7	7.8
Degradation of Water Quality	16	36.4	5.9
Human Disturbance - illegal/unregulated harvest	15	34.1	5.6
Human Disturbance - collisions	14	31.8	5.2
Barriers to Movement in Aquatic Habitats (e.g., dams, weirs, culverts)	13	29.5	4.8
Disrupted Predator-Prey Cycles	13	29.5	4.8
Interspecific Competition for Resources	13	29.5	4.8
Disease	12	27.3	4.4
Fragmentation	10	22.7	3.7
Human Disturbance - general	8	18.2	3.0
Insensitive/Unsustainable Agricultural/Silvicultural Practices	8	18.2	3.0
Habitat Loss - natural (e.g., succession)	8	18.2	3.0
Sedimentation/Erosion (impacts on aquatic habitats)	8	18.2	3.0
Competition from Invasive Exotics	7	15.9	2.6
Active Alteration/Suppression of Natural Processes (e.g., fire)	7	15.9	2.6
Human Disturbance - entanglement, entrainment, impingement	5	11.4	1.9
Susceptibility to Stochastic Events (isolated pop'ns)	5	11.4	1.9
Unknown Threats	5	11.4	1.9
Loss of Streamside Buffers	4	9.1	1.5
Pollution (e.g., acid rain, soil contamination)	4	9.1	1.5
Habitat Composition Altered by Terrestrial Invasive Species	4	9.1	1.5
Altered Hydrology (water level management/extraction)	4	9.1	1.5
Reduction of Patch Size, Shape, Area	4	9.1	1.5
Loss of Connectivity/Metapopulation Dynamics	4	9.1	1.5
Susceptibility to Stochastic Events (weather, storms)	4	9.1	1.5
Climate Change (change in species range, distb'n, migration)	4	9.1	1.5
Habitat Composition Altered by Aquatic Invasive Species	3	6.8	1.1
Detrimental Hybridization	3	6.8	1.1
Climate Change (change in water level, temperature)	3	6.8	1.1
Barriers to Movement in Terrestrial Habitats (e.g., roads, powerlines)	2	4.5	0.7
Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	4.5	0.7
Loss of Host Species	2	4.5	0.7
Parasites	2	4.5	0.7
Susceptibility to Stochastic Events (rare species)	2	4.5	0.7
Aquatic Habitat Composition Altered by Overuse (e.g., swans, muskrat)	1	2.3	0.4
Negative Edge Effects (i.e., increased predation, "ecological traps")	1	2.3	0.4
Aquatic Habitat Altered by Natural Processes (e.g., beaver)	1	2.3	0.4

Northeast Lake Ontario-St. Lawrence Table 13. pproved State Wildlife Grant studies relevant to the NE Lake Ontario-St. Lawrence River Basin (Coordination Grant T-1, Wildlife Grants T-2-1 and T-2-2, and Fish/Marine Grant T-3).

State Wildlife Grant Study	Location	Description
COORDINATION GRANT		
Project 1: Comprehensive Wildlife Conservation Planning & Coordinatior		
Job 1: SWG Coordination & Development of the Comprehensive Wildlife Conservation Strategy	Statewide	New York will develop a Comprehensive Wildlife Conservation Strategy by October 2005, focusing on species of greatest conservation need in the state. We will work closely with partner organizations and the public to develop the plan, which will identify management needs, goals and strategies for more than 500 animal species that are rare, declining, vulnerable, or status unknown in New York State.
WILDLIFE CONSERVATION GRANT		
Project 1: Conservation Planning for Species of Greatest Conservation Need		
Bird Conservation		
Job 1: New York State's 2nd Breeding Bird Atlas	Statewide	New York completed its first Breeding Bird Atlas during 1980-1985, and the second atlas project (2000-2004) is underway. State Wildlife Grant funding will ensure completion of the second atlas, which will document the current distribution of breeding birds in New York State and quantify changes in distributions of species between the two atlas periods. Once completed, Atlas results will be made available in book and web-based formats for use by conservation biologists, planners, and the public.
Job 2: Developing a Grassland Bird Conservation Plan for New York State	Statewide, where grassland habitats are present	Because of widespread loss and fragmentation of grassland habitat, grassland bird populations are declining in New York and throughout North America. This project will develop a comprehensive plan to guide and direct grassland bird conservation and management on public and private lands in New York State. The plan will help direct conservation efforts to the most important areas, provide guidance to grassland owners and managers, and identify monitoring and research needs for grassland birds.
Job 3: Spruce Grouse in Lowland Boreal Habitat of New York State: Distribution, Populations and Movements	Essex, Hamilton, Herkimer counties	The spruce grouse is an endangered species in New York, where some of its spruce-fir forest habitat has been lost due to forest maturation, habitat fragmentation, and logging. Confusion with the more common ruffed grouse has led to accidental hunting, and the species' unwariness has made it vulnerable to human disturbance. Urgently needed are: surveys to determine status and distribution; research to assess factors causing rarity or declines; population or habitat protection and management to secure the species' status; and completion and implementation of a state recovery plan. This project will help address those needs.
Job 4: Common Loon Migration and Wintering Areas	Adirondack Park	We know very little about where common loons, a species of special concern in New York State, spend their non-breeding periods. This project will use satellite telemetry to determine migration routes, wintering areas and seasonal movements of loons that summer in New York. The results will help identify potential threats to common loons during non-breeding periods, including coastal energy developments, exposure to Type E botulism in the Great Lakes, ocean contaminants, and commercial fishing gear.
Job 5: Golden-winged Warbler Habitat and Hybridization Study	Sterling Forest State Park, Orange County	The golden-winged warbler has declined at an annual rate of 8 percent for the last 35 years in the northeastern U.S. Possible factors in its decline include reforestation and range expansion of the blue-winged warbler. This project will investigate genetics and habitat segregation among these two species. Results will help to establish whether they should be considered distinct species and provide guidance for habitat management plans to sustain golden-winged warbler populations.
Job 6: Conservation Plan for Common Terns in Upstate New York	Oneida Lake & St. Lawrence River	Nesting populations of common tern, a threatened species in New York, occur in three upstate areas (Niagara River, Oneida Lake and St. Lawrence River). Most nesting occurs on artificial structures such as piers and navigation structures, which often require annual maintenance of nesting substrate, predator deterrents, and other measures to ensure successful nesting. In order to make management efforts more effective and efficient, a long-term plan will be developed for conservation of common terns in upstate New York.
Job 17: Marshbird Conservation in New York State	Statewide, where freshwater emergent marshes are present	Baseline information on distribution and abundance is needed for many marsh-nesting species in New York State. Species of concern include pied-billed grebe, black tern, least bittern, American bittern, and king rail. This project will survey representative freshwater marsh habitats across the state during 2004-2006 to quantify abundance and habitat use of marsh birds, identify focus areas for marsh bird conservation, and develop a long-term monitoring program.

State Wildlife Grant Study	Location	Description
Job 18: Coordinated Comprehensive Bird Monitoring Plan for New York State	Statewide	Comprehensive and coordinated monitoring programs are needed to reliably assess the status of all bird "species of greatest conservation need" in New York State. This project will document details of existing bird monitoring and survey programs in New York and assess their utility for monitoring various species of concern. We will form a bird monitoring partnership, involving agencies, organizations, and individuals, to recommend and help implement new or improved monitoring and survey programs for all bird species in New York State.
Job 19: Assesment of Boreal Forest Bird Habitats in the Adirondack Park	Adirondack Park	Boreal forests are recognized as critical breeding grounds for a variety of bird species that occur nowhere else in New York State. Within the state there are two relatively distinct assemblages of bird species found in "low elevation" and "high elevation" boreal forest types, each of which includes a number of New York's "species of greatest conservation need." The overall goal of this project is to better quantify the status and habitat requirements of various low and high elevation boreal forest birds.
Job 21: Use of Radar to Document Bird and Bat Migrations in New York State	Lewis, Jefferson, Oswego counties	Effective conservation of migratory birds and bats, including many species of greatest conservation need, requires better information on their migration patterns through New York State. This information is needed to help plan wind energy developments (or other tall structures) to prevent significant mortality of migratory species. This project will assess the utility of various techniques, including radar studies, acoustic monitoring, and thermal imaging for documenting timing, altitude, corridors or stopover habitats of birds and bats migrating through New York State.
Job 22: Golden-winged Warbler Habitat Restoration Investigation	Sterling Forest State Park, Orange County	The golden-winged warbler (GWWA) has declined at an annual rate of eight percent for the last 35 years in the northeastern U.S. and is a candidate for federal listing as a threatened or endangered species. Possible factors in its decline include loss of habitat due to reforestation and hybridization with the blue-winged warbler. Results of prior SWG-funded research will be used to design and conduct an experimental habitat restoration project in Sterling Forest State Park to assess the feasibility of creating or maintaining suitable habitat for GWWA in southeastern New York.
Mammal Conservation		
Job 7: Determining Winter Roost Selection of *M. leibii* and summer destination of hibernating *M. sodalis* and *M. Leibii*	Essex and Ulster counties	The small-footed bat is the least common bat encountered during winter surveys in the eastern U.S., and 75 percent occur in New York. The species may be more common than winter counts suggest because it hibernates in hidden locations (under rocks, in crevices). DEC plans to radio-tag a sample of these bats as they enter a major hibernaculum to determine how many are detected during routine surveys. We also plan to radio-tag Indiana and small-footed bats as they emerge from their hibernacula and follow them by airplane to determine summer distribution and habitat preferences.
Job 8: Feasibility of Implementing a Robust Design Mark-Recapture Study for Indiana Bats	Statewide, where Indiana bats are present	The Indiana bat, a federally endangered species, has declined from roughly 600,000 in the 1960s to about 350,000 today. Population declines in southern portions of its range, primarily Kentucky and Missouri, have far exceeded increases in the north, including New York. We hope to conduct a large scale mark-recapture study to identify causes of the decline and regional differences in population trends. The first step is a feasibility study to determine if we can adequately address assumptions of the study design.
Job 9: Determining the Feasibility of a Statewide Summer Survey of Tree Bats	Statewide, north of NYC and Long Island	Tree bats (red, hoary and silver-haired bats) are among the least understood vertebrates in the state. We do not know the current status or distribution of any of these species, and the most comprehensive surveys were conducted more than 100 years ago. Recent technical innovations have increased the reliability of field sampling while reducing costs. We plan to conduct initial surveys to determine the costs and effectiveness of conducting a statewide status survey for tree bats in New York State.
Reptile & Amphibian Conservation		
Job 10: Assessment of the Status and Abundance of High Priority Reptile and Amphibian Species	Statewide	As a group, a higher proportion of amphibian and reptile species have suffered significant declines than any other vertebrate groups in New York State. To date, much effort has been placed on documenting distribution of these endangered and threatened species. This project will focus on collecting information on the status of known populations, following standard protocols, so that conservation efforts can be prioritized on those in greatest need.
Job 12: Reducing Turtle Mortality During Nesting	Statewide	Certain turtle species experience high mortality of females when they migrate from over-wintering locations to traditional egg-laying sites. This project will investigate methods of reducing this mortality through use of subsurface tunnels for crossing roadways, creation of protected nesting sites, and predator exclusions.

Northeast Lake Ontario-St. Lawrence Table 13. (continued)

State Wildlife Grant Study	Location	Description
Job 25: Spiny Softshell Turtle Survey and Life History Studies	Shores of Lake Ontario and its tributaries	Little is know about the distribution, life history, seasonal movements, and habitat-use of spiny softshell turtles in New York State. NYSDEC will assess the status and distribution of spiny softshell turtles in the Finger Lakes and the bays on the southern shore line of Lake Ontario, including the streams and creeks that enter Lake Ontario, in order to make recommendations concerning the management of critical habitats for this species.
Job 26: Reptile and Amphibian Species Inventory (cont'd from Job 10, Grant T-2-1)	Statewide	Previous studies have identified many reptile and amphibian species in need of conservation, which is the first step in developing baseline information to measure changes in populations. This project will help complete surveys of other reptile and amphibian species that are listed as species of special concern by New York State. Completion of these surveys will produce a mechanism to assure continuity of surveys for this group of species, as gather well as data to determine the status of special concern reptile and amphibian species.
Invertebrate Conservation		
Job 15: Odonate Inventory	Statewide	There is a need for a comprehensive survey or inventory for odonates (dragonflies and damselflies) statewide. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state.
FISH AND MARINE CONSERVATION GRANT		
Project 1: Conservation Planning for Aquatic Resources		
Freshwater Fish Conservation		
Job 1: Adirondack Round Whitefish Investigation	Adirondack Park	Round whitefish are classified as threatened in New York and their recovery plan calls for an investigation of causes for and solutions to their decline. This project will include field studies to develop sampling protocols in Adirondack lakes, evaluate existing stocking efforts, and prioritize historic waters for likelihood of successful reestablishment.
Job 2: Conservation of Lesser Known Species of Fish	Statewide	This project involves review of DEC and New York State Museum fish records to identify information needs about the status of rare species. Findings will be used to plan new surveys that will eventually allow a complete assessment of the status and distribution of these "lesser known" freshwater fish species of New York State.

For more information on these projects visit NYSDEC website at www.dec.state.ny.us
or contact NYSDEC at:
State Wildlife Grants Program Coordinator
New York Division of Fish, Wildlife and Marine Resources
625 Broadway
Albany, NY 12233-4754
Phone: (518) 402-8924
Fax: (518) 402-8925
swgidea@gw.dec.state.ny.us

Northeast Lake Ontario-St. Lawrence Table 14. Existing management plans and agreements relevant to the NE Lake Ontario-St. Lawrence River Basin. This is an assortment of the major planning efforts within the Basin and is not a comprehensive list. Other planning efforts may exist at both the local and landscape scale and should be consulted before implementing conservation actions.

Plan/Agreement Name	Involved Parties	Information
St. Lawrence-Champlain Valley Ecoregion Biodiversity Conservation Plan (2002)	The Nature Conservancy	Vision, ecological description, threats assessment, issues and information needs
Fish Community Objectives for Lake Ontario (1999, 2003)	NYSDEC, Ontario MNR	Goals, description of the lake, habitat alterations, fish species, management actions
Fish Community Objectives for the St. Lawrence River (2002)	NYSDEC, Ontario MNR	Goals, description of the waterway, habitat alterations, fish species, management actions
Twenty-five Year Plan for the Great Lakes (1991)	NYSDEC	Goals, water quality, economic development, interstate/internationa partnerships
Lakewide Management Plan for Lake Ontario (1998)	USEPA, Environment Canada, NYSDEC, Ontario Ministry of the Environment	Problem identification, public involvement, monitoring progress
Biodiversity Around the Great Lakes (2002)	USEPA, Purdue University	Educational software program, Great Lakes history, case studies, monitoring, species inventory, habitat restoration
Fish and Wildlife Habitat Status and Trends in the Canadian Watershed of Lake Ontario (2000)	Environment Canada, CWS Ontario Region	Current habitat conditions, threats, current habitat protection/restoration efforts, summary analysis of the status of fish and wildlife habitat, monitoring/evaluation
Lake Ontario and St. Lawrence River - Changes in the Institutiona Structure and Their Impact on Water Levels, 1950-2001 (2002)	International Joint Commission, Federal and State Agencies of U.S. & Canada, Tribal Governments, Universities	Evaluation of current criteria used for regulating water levels on Lake Ontario and in the St. Lawrence River, decision-making process, stakeholders
Strategic Plan for Wetlands of the Great Lakes Basin (1993)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Twenty-five year strategy for wetlands conservation in the Great Lakes Basin
Great Lakes Wetlands Conservation Action Plan (1994, 2002)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Long-term strategies for wetland conservation, implementation of the 25-year Strategic Plan for Wetlands of the Great Lakes Basin
Great Lakes Wetlands Conservation Action Plan Report 2000-2003	Environment Canada	Wetland conservation highlights, review of strategies, partners
Conservation Blueprint for the Great Lakes (2003)	The Nature Conservancy	Preserving biodiversity; framework for action; scientific foundation; threats
Towards a New Conservation Vision for the Great Lakes Region: A Second Iteration (2003)	The Nature Conservancy	Ecoregional planning, visions, goals, identify datagaps and core conservation areas, threats, target species
Great Lakes Strategy - A Plan for the New Millennium (2002)	US Policy Committee for the Great Lakes	Goals, chemical, physical, and biological integrity, partnerships
New York Power Authority Land Management Plan for the St. Lawrence - FDR Power Project (2003)	New York Power Authority	Land management goals, public participation process, description of project area, natural resources, related planning efforts
Fort Drum Integrated Natural Resources Management Plan 2001-2005 (2001)	U.S. Army, NYSDEC, USFWS	Goals, partnerships, history of the property, natural resource inventory, natural resource management and monitoring
Final Environmental Impact Statement Double-crested Cormorant Management in the United States (2003)	U.S. Fish and Wildlife Service, USDA APHIS Wildlife Services	Cormorant population trends and impacts on wildlife and habitats, public input process, evaluation of action alternatives, selection of an alternative and justification
NYSDEC Unit Management Plans	NYSDEC	Assessment of the natural and physical resources present within a unit; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Aldrich Pond Wild Forest (1995) Blue Mountain Wild Forest (1995) Blue Ridge Wilderness (Draft) Bog River Complex (2003) Brasher Falls State Forest (Draft) Colton State Forest (Draft) Debar Mountain Wild Forest (Draft) Five Ponds Wilderness (1994) Grass River Wild Forest (Draft) High Peaks Wilderness (1999) Independence River Wild Forest (1986) Moose River Plains Wild Forest (Draft) Raquette Boreal Wild Forest (Draft)	Saranac Lakes Wild Forest (Draft) St. Regis Canoe Area (Draft) White Hill Wild Forest (Draft) William C. Whitney Wilderness (1998)	
Bird Conservation Area Management Guidance Summaries	NYSDEC, OPRHP, Audubon	A physical description of the site, BCA criteria met, important species & habitat types, guidance for management, op/maintenance, research, education and outreach. Includes local contacts.
Adirondack Sub-Alpine Forest Ashland Eastern Lake Ontario Marshes Perch River Upper and Lower Lakes		
Wildlife Management Area Plans	NYSDEC	Assessment of the wildlife, habitats and physical resources present history of the property; management, op/maintenance, research, education and outreach objectives; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Cranberry Creek WMA (1966) Fish Creek Marsh WMA (1988) Lake Ontario Islands WMA (2002) Perch River WMA (1969) Tug Hill WMA (1970) Upper & Lower Lakes WMA (1970) Wilson Hill WMA (1970)		

Other UMPs (in development?):

Black River Wild Forest
Cranberry Lake Wild Forest
Croghan-Diana State Forest
Deer River State Forest
Edwards State Forest
Fulton Chain Wild Forest
Ha-de-ron-dah Wilderness
Hogsback State Forest
Indian River Lakes State Forest
Lesser Wilderness State Forest
Northern Tier State Forest
Norwood State Forest
Ontario Shores State Forest
Osceola State Forest
Penn Mountain State Forest
Pepperbox Wilderness
Pigeon Lake Wilderness
Sargent Ponds Wild Forest
St. Lawrence Plains State Forest
St. Regis River State Forest
Thousand Islands State Forest
Titusville Mountain State Forest
Trout Lake State Forest
Tug Hill State Forest
Watson East Triangle Wild Forest
West Canada Lake Wilderness
Westward Waters State Forest

Description of the Basin

The Southeast Lake Ontario Basin covers 4.3 million acres of land and an additional portion of the New York waters of Lake Ontario from Rochester to just south of Stony Point at the mouth of Stony Creek. The basin sits within the Great Lakes Plain ecosystem and has five sub-watersheds, the largest of which is the Finger Lakes sub-watershed. The basin encompasses all or part of 19 counties. There are several distinctive regions within the basin; Lake Ontario and its shoreline, the Finger Lakes region, the Tug Hill region, and the Syracuse metro area.

According to the U.S. Environmental Protection Agency's (EPA) Multi-Resolution Land Cover (MRLC) data, the basin's lands are 47% forested. The forest cover is primarily deciduous forest, with some mixed forest and evergreen stands. The remainder of the land cover is dominated by agricultural uses. Row crops cover 24% of the basin and pasture and hay lands cover another 16% of the basin. A complete listing of the land cover types is found in Table 1. Wetlands, especially freshwater emergent marshes are also a major feature of this basin, although this is not accurately reflected by the MRLC data. In Oswego County, wetlands comprise as much as 20% of the land area.

There are several prominent lakes in the basin and water comprises 5% of the land cover outside of Lake Ontario. The basin includes the major Finger Lakes (Canandaigua, Keuka, Seneca, Cayuga, and Owasco), Oneida Lake, and Onondaga Lake. The two major rivers in the basin are the Oswego River that runs from Onondaga County to Lake Ontario, and the Salmon River that runs across the lower Tug Hill area. The basin also contains sections of the New York State Barge Canal system. The Erie Canal section runs east-west across the upper third of the basin, with other major sections incorporating parts of the Oswego and Oneida Rivers, Seneca River, and other smaller feeder canals around the Finger Lakes.

The largest urban areas in the basin are the city of Syracuse, and the eastern half of the city of Rochester. There are several smaller cities including Oswego, Auburn, Ithaca, and the western part of Rome. There are about 1.7 million people living in the basin, about 45% of which live in and around Syracuse. The population of the basin has been decreasing steadily over the past decade and the decline is expected to continue according to the U.S. Census Bureau. The total percentage of developed land in the basin other than agriculture is 5%. This includes developed parklands and golf courses.

There are numerous state protected lands in the basin, owned and managed by both DEC and OPRHP. Lists of these lands can be found in Tables 6 through 8.

Eastern Finger Lakes Region

This portion of the basin has been shaped by scouring and melting of the Pleistocene Era ice sheet. The dominant landscape features left by the glacial action are the Finger Lakes and the series of glacial drumlins that dot the central New York landscape. The Finger Lakes are long, narrow, and deep with maximum depths over 900 feet. Generally the eastern and western slopes surrounding the lakes are steep, with low lying valleys at the north and south ends of the lakes. The lakes are generally cold and very oligotrophic, though some of the lakes support warm water fisheries in shallower sections at the northern and southern ends.

The micro-climates and steep slopes of the lake valleys support a healthy wine grape-growing industry. There are about 90 wineries in the Finger Lakes region and over 10,400 acres of vineyard. The steep slopes cause cold air to sink away from the hillside vines. The adjacent lake waters buffer the air temperatures in spring and fall, effectively lengthening the grape growing season. Native New York, European, and hybrid grape varieties are all grown in the area. Wine production in the area dates back to the 1820s.

The Finger Lakes are a source of drinking water to several municipalities and a major recreational resource for the central New York area. Both of these uses rely on good water quality in the lakes and their tributaries. Four of the lakes, Canandaigua, Cayuga, Keuka, and Seneca, are home to state parks.

The lands between the lake valleys are mixed agricultural lands interspersed with deciduous forest and occasional patches of woody wetlands. Finger Lakes National Forest sits between the southern ends of Seneca and Cayuga Lakes, and encompasses approximately 16,000 acres of deciduous and mixed forest (7,500 acres), grassland (6,000 acres) and shrubland (2,500 acres). It is the only national forest in New York State. The National Forest had its origins in extensive farm abandonment in New York from 1890 through the Great Depression. Between 1938 and 1941, over 100 farms were purchased in the area now in the National Forest. Because this was done on a willing-seller, willing-buyer basis, the resulting Federal ownership resembled a patchwork quilt. This was especially true in the Seneca County end of the Forest, where soils were more productive, and some families elected to stay. This ownership pattern still exists today. Much of the federal land that is now part of the National Forest was planted with conifers to stabilize the soils of the abandoned farms. However, extensive areas of the federal lands are still managed as grasslands.

Lake Ontario and the Lake Plain

Lake Ontario has a total surface area of over 7,500 mi2 and a maximum depth of over 800 feet. About 1,700 mi2 of Lake Ontario is included in the Southeast Lake Ontario basin. There are several bays along the southern lake shore including Irondequoit Bay, Sodus Bay, Little Sodus Bay, Port Bay, and Mexico Bay. Most of the sheltered areas along the lake shore have emergent wetlands within them, some of which are within the Lakeshore Marshes Wildlife Management Area. Sodus Bay has a barrier beach and extensive submerged aquatic vegetation beds and is designated a Significant Coastal Fish and Wildlife Habitat by the New York Department of State. Irondequoit Bay is a popular recreation area.

The eastern shore of Lake Ontario features a 17-mile long barrier beach of Great Lakes dunes and a globally significant complex of pond, marshes, and fens that harbors numerous rare and endangered plant and animal species. This barrier system contains the largest and most extensive freshwater sand dune formations in New York State. Extensive emergent wetlands, including Deer Creek Marsh, Lakeview Marsh and North and South Sandy Ponds, occur behind this dune formation. Each of these wetland areas are at least 3,300 acres in size and are designated Significant Coastal Fish and Wildlife Habitat. Of the 17 miles of beach that constitute the shore, more than eight miles are in protected ownership of

New York State and The Nature Conservancy. This area has always posed a management challenge because the sandy beaches are a natural magnet for thousands of summer visitors who help sustain a lively and very important tourism economy in the area. It is located approximately mid-way between Rochester and Syracuse just north of the NYS Thruway.

The Montezuma Wetlands Complex, close to 36,000 acres in total, sits about midway between Syracuse and Rochester, and is one of the largest marsh complexes in the state. This area includes the federally-owned Montezuma National Wildlife Refuge, the state-owned Northern Montezuma Wildlife Management Area (including the former Howlands Island WMA), lands owned by conservation groups, and private property. The wetlands complex is one of the most significant stopover and foraging locations for waterfowl and shorebirds in upstate New York, regularly hosting 1,000 or more individuals of dozens of species. There is also a large cerulean warbler breeding population. Cerulean warblers are locally abundant in New York but regionally rare throughout the Northeast. The refuge and wetlands complex have important grasslands within them that are being managed for grassland breeding birds. The Seneca River once meandered through the marsh area, and diverse habitats with submerged aquatic plants supported a unique fish community that was a relict of the post-glacial refugia.

Syracuse Metro Area

The city of Syracuse is the largest population center in the basin, home to nearly 150,000 people. While the entire population of the City of Rochester (at over 219,000 residents) is larger than Syracuse, only about half the city sits within the basin boundary. The Syracuse metro area is also home to some of the most affected and most unique resources in the basin.

Onondaga Lake is situated at the northwest portion of the city and borders the suburban communities of Lakeland, Solvay, and Liverpool. The 4.6 mile^2 lake was once claimed to be the most polluted body of water in the United States due to unregulated industrial discharge from the early 20th century to the late 1980s. The principal industrial pollutants were mercury and ionic salts derived from the Allied Chemical Company on the lake shore. DEC and EPA recently signed the *Record of Decision for the Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site* that outlines the proposed cleanup method for the past industrial discharges to the lake. The lake also receives nutrient and ammonia discharges from the Onondaga County sewage treatment plant that discharges to the lake. Upgrades to the sewage treatment plant have resulted in reduction of the ammonia and nutrient levels in the lake. Discharges from industrial effluent have also been greatly reduced. Recovery of the lake has begun and there are now reproducing fish populations there.

The Syracuse Metro area is also home to Oneida Lake, the largest inland lake in the state. Unlike the Finger Lakes, Oneida Lake is quite shallow and nutrient rich. The lake provides habitat for a highly productive warm water fishery, migratory and resident waterfowl, various SGCN, and is a valuable recreational resource in the state. The lake has islands, shoals, and marshes that provide valuable nesting and nursery habitat for many aquatic and semi-aquatic species. The lake historically supported Atlantic salmon, lake sturgeon, and American eel populations and is home to a DEC fish hatchery. The Oneida Hatchery rearing program is focused on walleye, and includes egg collections from Oneida Lake and stocking of millions of walleye fry and fingerlings. Experimental culture of rare or threatened fishes, such as lake sturgeon and paddlefish, also occurs here. The hatchery-reared lake sturgeon have supported a strong recovery of these fish in Oneida Lake.

Just north of Oneida Lake is a section of mixed forest and woody wetlands. To the south, between the lake and the city of Syracuse is the 3,787 acre Cicero Swamp. The swamp is supplied with seasonal flooding from Chittenango Creek and is home to several rare species including Eastern massasauga rattlesnakes, one of only two known populations in the state. Portions of the swamp are managed by DEC for wildlife and recreation in the Cicero Swamp Wildlife Management Area (WMA).

East of Oneida Lake, in the city of Rome, is the Rome Sand Plains, a complex of wetlands and forested uplands occurring on lake sediments (generally sands) of the former glacial Lake Iroquois. The sand plains are part of a complex of glacial dunes that extend west from Rome toward Lake Ontario. A series of wind-formed sand dunes are interspersed with interdunal wetlands; these relict dunes (which formed not long after the post glacial draining of Lake Iroquois) are now vegetated with forest cover, including patches of pitch pine-heath barrens. DEC has partnered with a coalition of public and private partners (The Rome Sand Plains Management Team) to protect the Rome Sand Plains. Additional recognition of the importance of this site comes through The Nature Conservancy's Great Lakes Ecoregional planning process which identifies the Rome Sand Plains as a priority portfolio site.

Tug Hill Area

The Tug Hill area sits east of Lake Ontario and west of the Adirondack Mountains in north central New York. The central portion of Tug Hill is a sandstone bedrock plateau at 1,300 to 1,900 feet elevation. Surrounding the plateau is a transition zone of siltstone and shale bedrock that slopes down to the Great Lakes Plain. The entire area is overlain by glacial till soils. The central plateau area is heavily forested dominated by beech-maple mesic forests, mixed deciduous/coniferous forests, and northern successional hardwoods. The forests of this area are largely working forests with large unfragmented tracts (but including stands of various ages) in both public and private ownership.

The Tug Hill area is one of the most intact landscapes in the state with over 4,000 miles of rivers and streams and complex drainage patterns. Major streams include the East and West Branches of Fish Creek and the Salmon River. The Central Tug Hill Forest has been included in several publications produced for the New York State Tug Hill Commission. It is thought to have one of the largest roadless blocks in the state at 121,000 acres (New York Natural Heritage Program, 2005). The level of landscape alteration increases with proximity to the Syracuse Metro area. The headwater streams of the plateau are generally intact, with high-quality cold water streams. Slimy sculpin is an indicator of stream integrity and has been reported in several Tug Hill streams, the Oneida River, and Oswego River. Lake effect snowfall, often exceeding amounts received anywhere east of the Rocky Mountains, provides more than half the annual stream flow to the Tug Hill area and results in large seasonal fluctuation in stream flows. This also results in some of the highest amounts of acid deposition, especially nitrogen compounds, in the country. There are numerous dams on streams that flow from the plateau across the transition zone to the Lake Plain. Examples of these dams created the Salmon River reservoir and the East Branch of Fish Creek's Rome Reservoir for hydropower production; recent licensing of these dams established minimum stream flow requirements to protect and restore aquatic habitats in the basin.

The land in the transition zone shifts from forest cover to agriculture, mostly pasture and hay lands, out toward the Lake Plain. There is a DEC fish hatchery on the Salmon River that takes advantage of the high flows and water quality to grow several Pacific salmon species for stocking in the lake and tributaries. Steelhead, coho salmon, and chinook salmon ascend streams to the hatchery and are processed for propagation. Atlantic salmon have been re-introduced to provide a presence of this formerly native species in the eastern Lake Ontario basin.

Critical Habitats of the Basin and the Species That Use Them

The Southeast Lake Ontario Basin is currently home to at least 129 Species of Greatest Conservation Need (SGCN) (Table 2) representing 24% of the total SGCN statewide (Table 3). Another 49 SGCN are thought to be extirpated from the basin at this time (Table 4).

There are several species of particular note in the Southeast Lake Ontario Basin. The basin is home to the only globally known population of Chittenango ovate amber snail in Chittenango Falls State Park. There is also a wintering population of Indiana Bats in Jamesville. Both of these species are federally-listed as endangered. One of the best known locations in New York for Eastern massasauga rattlesnake (a candidate for federal listing) is Cicero Swamp near Syracuse. Bog turtle, federally-listed as threatened, occurs in a number of locations in this basin. The only known location for bog buckmoth is at Selkirk Fen near Deer Creek Marsh. The last recorded nesting by piping plovers in upstate New York (federally-listed as endangered) was on the barrier beaches near Deer Creek Marsh in 1984. At one time, Atlantic salmon had the largest inland (and landlocked) population here in New York, and it had resident as well as migratory components from Lake Ontario into the Oswego sub-watershed. It has been sustained with a hatchery-raised strain from Maine stocked in Cayuga Lake and Point Rock Creek.

DEC staff members who compiled the SGCN information in the State Wildlife Grants database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The habitat classifications in the database were adapted from the New York Natural Heritage Program's Ecological Communities of New York State, Second Edition. In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the Lacustrine and Riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers in DEC, e.g., "cold water-shallow".

Each of these systems and subsystems are further refined into a habitat category in the SGCN species database and can be viewed in the Taxa Reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. The aquatic System-Subsystem classes that are listed as critical to species in Southeastern Lake Ontario Basin are listed in Table 11. The terrestrial System-Subsystem classes are listed in Table 12. These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather it is a subset of habitats deemed critical to SGCN that occur in the basin.

The terrestrial open upland system-subsystem association includes several habitats in the basin that support 45 SGCN. Grasslands, lakeside beaches, and cliffs and open talus are all part of this association. Although the MRLC mapping project did not find any natural grassland cover types in this basin, the 39% land cover of hay and pasture lands and row crops fill some of the same ecological functions. There are also sandplain grasslands found near Rome. Grasslands provide critical nesting habitat for grassland birds, foraging areas for raptors, and habitat for many species of butterflies and adult odonates. Not all areas of the basin are important and appropriate for conservation of grassland species. U.S. Department of Agriculture (USDA) Farm Bill programs, DEC's Landowner Incentive Program, and Audubon New York's Important Bird Areas program have all identified and designated certain priority "focus areas" for grassland birds in this basin, making them eligible for agricultural subsidies and conservation incentives. These include areas around the Finger Lakes and Montezuma that have been designated as "Grassland Wildlife Zones" or as "Grassland Related Biodiversity and Significant Ecological Communities" by the USDA.

Forested lands in the basin support at least 38 SGCN. Forests provide critical breeding habitat for deciduous/mixed forest breeding birds, early successional forest/shrubland birds, and forest breeding raptors. Of the forest breeding birds in this basin, Cerulean warbler is notable because it is a candidate for federal listing as a Threatened species, although numbers in New York have been stable or increasing. Vernal pool salamanders and several other species of amphibians also use forests and the wetlands in them to breed and forage as adults. Indiana bats breed and roost in mature trees during the summer months, but specific locations are unknown.

The large number of lakes and streams and high annual precipitation in the basin support many wetlands. Many of the lakes have emergent wetlands at their fringes and there are extensive wooded wetlands in the Tug Hill region and in the Cicero Swamp. Nearly all of the large bays along the shore of Lake Ontario support extensive emergent wetlands and the Montezuma wetlands complex is a wetland area of statewide significance. These wetlands provide some of the best and most extensive habitat for freshwater marsh-nesting birds and are critical for many turtle and amphibian SGCN. Bog turtles have been documented at a number of locations in this basin, comprising a population in New York that is second only to that found in the Hudson Valley. Calcareous fens are rare, largely open, minerotropic peatlands, typically with a high pH (6.0-8.0). These unique communities are used by several SGCN, including bog buckmoth, bog turtle, and at least one rare odonate species. Cicero Swamp has a large section of peat bog that provides critical habitat for Eastern massasauga rattlesnakes. At least 30 SGCN in the basin are dependent on the palustrine mineral soil wetland association.

The unique barrier beaches and dunes on Lake Ontario, as well as seasonal mudflats and certain agricultural lands in the basin, provide critical habitat for migrating shorebirds.

Aquatic habitats in this basin have diverse habitat features, including warm and cold water, still and flowing waters, and an extreme range of water depths. Collectively, aquatic habitats are critical to more than 40 SGCN in the basin. A wide variety of animals from birds to fish to insects are found in the open waters of lakes in the basin. The lakes have several distinct zones based on water depth and temperature. Some species like brook trout are dependent on cold water temperatures and high water quality, while turtles require warmer water. Riverine habitats in the basin also collectively support about 40 SGCN and have warm water, cold water and depth distinctions like lakes. A number of highly specialized fish species, such as sticklebacks and whitefishes, occur in the Finger Lakes and Lake Ontario.

Overall Trends in the Basin

The basin has been dramatically altered by human activities since the late 18th century. Agriculture and timber industry resulted in the clearing of forests across much of the basin. In 1900, 90% of the land in the basin was used for agriculture, contrasted with just 40% today. Damming of streams and rivers to power mills and generate electricity degraded habitat for fish and mussels in the basin. These effects were compounded by creation of the barge canal system in the mid-19th century that altered the hydrology of wetlands and aquatic habitats in the Oswego River, Montezuma wetlands, Seneca River, Clyde River and connections to Rochester. The industrial centers in Syracuse, Rome, and Rochester discharged toxic substances into many lakes in the basin, with very high levels discharged into Onondaga Lake and Lake Ontario.

While the basin has suffered continuing effects of industrial pollution, the overall situation is improving. Onondaga Lake, once declared the most polluted lake in North America, has been designated an inactive hazardous waste site under the "Superfund" program. Discharges from the Onondaga County sewage treatment plant have been improved by infrastructure upgrades through the 1996 Clean Water/Clean Air Bond Act. Industrial waste discharges from Allied Chemical and its successor corporations have ceased. A proposed cleanup plan for the lake has been released by DEC.

Decline of the insecticide DDT and its metabolites in Canandaigua Lake were sufficient to lift fish consumption advisories, though polychlorinated biphenyl (PCB) contamination remains a problem. Many of the Finger Lakes and Oneida Lake have or are in the process of creating watershed management plans to reduce point and nonpoint discharges to the lakes. However, in the case of Oneida Lake, phosphorus levels have been substantially reduced, and further reductions could adversely affect the productive warm water fishery. Tissue concentrations of persistent toxics in Lake Ontario fauna have been declining, except for mercury, which remains high.

The spread of zebra mussels throughout the Great Lakes and connected waters has been ongoing since zebra mussels were first reported from the area in the late 1980s. Quagga mussels, round goby and other aquatic invaders are literally poised at the threshold of the inland waterways of this basin. The discovery of a single Chinese mitten crab in the St. Lawrence River estuary (downstream from New York) highlights the potential for new introductions through international shipping traffic, live food imports, and recreational boating.

Dramatic changes in the Lake Ontario fish community have been underway for several decades and several species are extirpated or extinct. The predator fish community has been supplemented with major programs stocking salmonids, but these species have also been affected by changes in water quality and forage species, which are related in part to effects of zebra mussels in the lake ecosystem and phosphorus reductions in the lake, which have resulted in lower productivity and a return to oligotrophic status.

This basin is not the most diverse in the state relative to SGCN, but it forms an important landscape link with the Northeast Lake Ontario Basin and Southwest

Lake Ontario Basin. Of SGCN found in the Southeast Lake Ontario Basin, 35% are in decline and 45% are of unknown status (Table 3). These do not include 49 SGCN thought to be extirpated from this basin (Table 4).

The human population in the basin has declined steadily over the past 10 years according to the U.S. Census Bureau. The population of the City of Syracuse alone declined just over 10% between 1990 and 2000. This trend is expected to continue into the next decade. Unfortunately, the decline in population has not slowed the rate of habitat loss due to human development. A publication by the Brookings Institution (Pendall, 2003) found that over 100,000 acres became urbanized in Central New York between 1982 and 1997, even though there was a loss of 6,500 residents in the same time period.

Threats

Habitat Loss and Degradation

Habitat loss due to development was the most commonly listed threat to SGCN in the Southeast Lake Ontario Basin. This is not surprising since nearly half the land in the basin has been altered by human activity (Table 1). This threat is more prevalent in urban and expanding suburban areas of the basin, like the Syracuse Metro area, eastern Rochester and its suburbs, the city of Rome, Ithaca, and others. This threat was the most frequently listed for both terrestrial and aquatic species. This threat includes hardening of the landscape with buildings and roads, but can also include activities like land clearing and wetland draining for agriculture and mining. While wetland drainage for agriculture is not presently occurring to a large extent in the basin, the effects of past drainage (on large and small scales) are still an issue. Pasture and hay lands provide a surrogate for natural grasslands in the Lake Plains, and when managed with the needs of wildlife in mind, these agricultural uses may be very beneficial to grassland wildlife. However, when agricultural management activities like mowing of hayfields occurs at the wrong time of year, grassland nesting species may be disturbed or killed. Management of remaining natural areas and appropriate altered landscapes is essential to stabilize declining populations of SGCN in the basin.

Fragmentation of remaining habitat is also a significant threat to terrestrial species. The overall human population of the Southeast Lake Ontario Basin has not increased significantly in the last 50 years and projections to 2021 show that this trend will remain unchanged (Demographia, 2005). At first glance this would appear to indicate no increase in development threats in this basin. However, the humans in the watershed are, in fact, developing more and more of the landscape, creating a "sprawl" effect unrelated to population growth. According to the Brookings Institution's Center on Urban and Metropolitan Policy (Pendall, 2003), overall human population increased slightly in the Rochester and Finger Lakes region between 1982 and 1997 by 56,570. In the same period, 50,000 acres of land became urbanized and population density dropped by 14% to 4.2 persons per acre. The result is increased fragmentation of habitats by residential and commercial developments, roads and other infrastructure and a decrease in the size of contiguous habitat blocks and interior habitats. The development of roads and utility rights-of-way can directly affect the number of species that can utilize certain habitat types. Hardening of the landscape is also resulting in increased runoff and nonpoint source pollution into lakes and rivers in the basin. Better land use planning and management of population growth can help reduce this effect.

In addition to direct loss of habitats by conversion to other land uses or fragmentation, natural ecological succession is a constant force contributing to loss of grasslands, shrublands and early successional forest. Where grasslands remain, intensive agricultural practices (e.g., early or frequent mowing of hayfields) have a major effect on use of those habitats by SGCN. On the other hand, a reduction in forest management activities has resulted in less habitat for early successional wildlife species. Sustainable forestry programs, including some even-aged management (i.e., clear cuts in appropriate locations), would benefit many SGCN in this basin.

Energy developments of various kinds pose a significant threat to many aquatic and migratory fish and wildlife species in this basin. The past damming of rivers and streams for hydropower has had a lasting effect on aquatic habitats throughout the basin. Large power plants that use Lake Ontario for cooling water withdraw and discharge large volumes of warmer water that can affect aquatic species and associated water birds. The potential for wind energy development near Lake Ontario or elsewhere poses an unknown future risk to migratory birds and bats in this region. Recent developments in use of biofuels for energy could stimulate major changes in agriculture in this basin, with potential effects on many terrestrial wildlife species.

Water level fluctuations and management directly affect the suitability of wetlands as habitat for many fish and wildlife species. For example, management of Lake Ontario water regimes (to regulate flows for navigation in the St. Lawrence Seaway) have diminished habitat quality for marsh-nesting birds, warm water fish and other species, whereas intensive wetland management at Montezuma has created outstanding habitat to meet the seasonal needs of a diversity of nesting and migratory bird species.

Human disturbance can also be a form of habitat degradation, depending on the nature of the activity, the time of year, and sensitivity of species. Heavy recreational use of the Lake Ontario beaches probably precludes re-colonization by piping plovers, and water craft use of certain wetlands may cause black terns to abandon critical nesting areas.

Contaminants and Degradation of Water Quality

Southeast Lake Ontario Basin is a study in contrasts. Some of the cleanest and most unfragmented habitats in the state are found in the Tug Hill region of the basin, and less than 100 miles away is one of the most polluted areas in the state, Onondaga Lake. There is toxic contamination in other lakes in the basin including Lake Ontario, Cayuga Lake, and Seneca Lake. Chloride contamination from road salts is a concern in some of the smaller lakes. The nature of the contamination depends on the land uses surrounding the lakes and the discharges to the lakes and their tributaries. Several of the lakes and many tributary streams receive discharge from sewage treatment plants in the basin. Those discharges contain nutrients, heavy metals, and endocrine disrupting compounds. Low dissolved oxygen levels are a continuing problem for aquatic species in Onondaga Lake and Seneca River, due in part to phosphorus loading from the county sewage treatment plant. Although reduced nutrient loading is generally desirable, there are exceptions. For example, phosphorus levels in Oneida Lake have already been reduced to a level (20 ppb) where further reductions are not recommended by the Oneida Lake Watershed Management Plan.

Some persistent toxins are identified in the Lake Ontario Management Plan as impairments to reproduction and survival of several SGCN. For example, PCBs, dioxin, and DDT compounds can negatively affect reproduction and survival of bald eagles and other fish-eating birds. Mercury is also found in sport fish tissues in Lake Ontario at levels high enough to cause concern for those and other species in the basin. Levels of all of these persistent toxins in the fish communities of Lake

Ontario have been dropping since the 1970s, except for mercury. Fish tissue testing for mercury has revealed no statistically significant trend. According to the Lake Ontario Management plan there is no indication that current PCB, dioxin and DDT levels in the open water of the lake are degrading fish populations, but the toxins are still causing negative effects on piscivorus wildlife.

Pesticide use on agricultural lands is of concern to herpetofauna, insects, mussels and freshwater crustacea. Agricultural pesticides are generally non-specific in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Agriculture in New York depends on healthy populations of pollinating insects to produce fruit and vegetables. Amphibians are particularly susceptible to pesticides and other toxins. The emergence of West Nile Virus in the past few years and the persistence of Eastern Equine Encephalitis in central New York have led to widespread pesticide use in the control of mosquitoes in many wetland areas including Cicero Swamp. The use of these insecticides can be toxic to amphibians and deplete their natural food sources as a secondary effect. Use of lampricides in tributary streams can affect resident amphibians, such as mudpuppies, if protocols to minimize non-target mortality are not followed.

Acid deposition is another form of contamination affecting SGCN in this basin. Although generally thought of as an Adirondack problem, Tug Hill receives very high amounts of nitrogen as a result of the heavy lake effect snowfalls that carry emissions from Midwestern states and provinces. This deposition can affect the basic soil and water characteristics, and plant communities upon which fish and wildlife depend.

Exotic, Invasive and Overabundant Species

There are several invasive plants and animals of concern in this basin, both aquatic and terrestrial. For example, sea lampreys are an invasive species that historically contributed to the collapse of a number of native fish stocks, including lake trout and lake whitefish. Many of the aquatic invasive species have been introduced into Lake Ontario by ballast water from international shipping. Zebra and quagga mussels are native to the Baltic Sea and have severely compromised native mussel species in many of the lakes and streams of the basin. Round gobies are a known vector for type E botulism that infects and kills common loons and lake sturgeon along the shore of Lake Ontario. The canal system that connects the Finger Lakes, Great Lakes and the Mohawk sub-watershed enhances the spread of aquatic invasive species. Zebra mussels have invaded most of the larger lakes in the basin. Invasive aquatic animal species, including fish species, can be introduced via inadvertent stocking and disposal of live bait by anglers. Mute swan is a non-native species that has recently colonized several locations around Lake Ontario, including Irondequoit Bay. Mute swans can affect aquatic plant communities and may displace native fish and wildlife species, including several SGCN.

Some native species can become problematic to SGCN, too. Double-crested cormorants on Lake Ontario and Oneida Lake have rebounded after near extinction due to DDT contamination in the mid-20th century. Large numbers of cormorants on these lakes can have significant effects on other colonial bird species (including SGCN) and game fish populations in the basin. Ongoing management of cormorants on Oneida Lake and eastern Lake Ontario has helped to mitigate these effects. Beaver are common throughout the Southeast Lake Ontario basin, and have created or enhanced habitat for many wetland wildlife species. However, the impoundment of small streams could adversely affect aquatic SGCN in some drainages.

Aquatic plant invaders have serious consequences for SGCN, too. Purple loosestrife and common reed have become established throughout the basin, altering wetland habitats and affecting wetland dependent species. Dense stands of common reed at Oneida and Onondaga Lake have diminished what was once prime waterfowl habitat. Biological control of purple loosestrife (using leaf-eating beetles) in this and other basins has shown promise for reducing the spread and effects of this invasive plant species in the Lake Plains region. Eurasian water milfoil is a submerged aquatic plant that forms dense beds in nutrient enriched waters. The invasion by milfoil is associated with the decline of pugnose shiner in Wisconsin and recommended as an avenue of investigation for New York populations (Carlson, 2004). In many bodies of water across the state, water chestnut grows thick enough to block light and reduce the levels of dissolved oxygen in the water column.

Terrestrial invasive plants in the basin alter vegetational composition of common habitats and reduce food sources for SGCN. Species of particular concern in this basin include Japanese knotweed, garlic mustard, glossy buckthorn, and black swallowwort. Seeds of these plants can be transported via wind, vehicles, shoes, outdoor clothing, and pets.

Priority Issues in the Basin

Priority issues have been discussed above.

Vision, Goals and Objectives for the Basin

Vision

The Southeast Lake Ontario Basin will be part of a landscape where a balance exists between economic growth needs of the region and effective wildlife management on public and private lands. Land management will be conducted with the best available information to ensure the long-term conservation (or restoration) of SGCN and other wildlife in the basin.

Public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on SGCN within the basin in a format that can easily be shared among natural resource managers and disseminated to the public to raise awareness of the issues facing species of concern and their habitats.

The result of these efforts will be healthier and secure animal populations, habitats, and communities. Loss of SGCN to extirpation will be slowed or halted. Species that currently are common will remain common and populations of threatened/endangered/special concern species will improve to the point where they can eventually be de-listed.

Goals and Objectives

- Establish a conservation framework within the SELO Basin through which public and private stakeholders (including local government, Native Americans, and private landowners) interested in wildlife conservation can work cooperatively towards the management, enhancement, and protection of biodiversity in the Basin.

- Ensure that no at-risk (threatened/endangered) species becomes extirpated from the Basin, and seek opportunities to restore extirpated species where feasible.

- Manage animals, habitats, and land use practices to produce long-term benefits for species of conservation concern.

- Maintain knowledge of species and their habitats in sufficient detail to recognize long-term population shifts.

- Fill “data gaps” for those species where population status, distribution, and habitat needs are unknown.

- Identify, manage, protect, maintain, and restore habitat/natural communities over as broad a spatial scale as possible. Work to keep large forest, wetland, and grassland complexes unfragmented, and to restore fragmented habitats where feasible to increase patch size and connectivity.

- Work with land managers to incorporate wildlife-based objectives into traditional land management activities such as forestry and agriculture that still allow these activities to be economically sustainable.

- Strengthen existing relationships between water quality and wildlife management planning programs in the basin and create new ones.

- Develop a “stepped down”, more targeted plan for the Basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented “on the ground”.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations

GENERAL

- Current information on distribution, abundance, life history, minimum viable population size, and habitat requirements is needed to implement effective management actions for many SGCN in this basin. Even in areas under protective public ownership, such as state parks and DEC lands, knowledge of the array of species and resources in the land unit is incomplete. In many cases, parks are bought for non-natural resource needs, but become default reservoirs for natural resources. By filling information gaps for SGCN, land managers can make informed decisions on how best to balance recreation and natural resource needs on public lands.

- Continue and expand collection of information on the concentration of persistent toxic substances in SGCN and their habitats in the basin, especially for wetland and aquatic species, such as piscivorous birds. Sampling of indicator species, such as snapping turtles (or their eggs), may be most cost-effective for monitoring trends in contaminant levels. Any new or expanded contaminant monitoring should be coordinated with ongoing sampling by DEC, DOH and others, e.g., resident species of Onondaga Lake are already sampled as part of the hazardous waste remediation program there.

- Continue monitoring for Type E Botulism in birds and fish found along the entire Lake Ontario shoreline. While direct management of the disease is not currently possible, effects of the disease on these populations of fish and wildlife have implications for other management decisions related to harvest limitations, habitat protection and restoration, etc.

- Due to the extensive wetland acreage, this basin should be a high priority region for establishing long-term monitoring programs for marsh-nesting birds, aquatic herps and wetland-associated invertebrates.

- Monitor effects of water level controls on wetland and aquatic species habitats adjoining Lake Ontario, Oneida Lake and the Finger Lakes. Particular issues to monitor include :
  - The effects of human-influenced water level controls on freshwater marsh nesting birds, especially black tern, least bittern, and pied-billed grebe;
  - Relationship of water level controls to distribution of invasive species, including purple loosestrife; and

  - The effects of water level controls on habitat suitability for various turtles (especially Blanding's turtle, Bog turtle, spiny softshell and spotted turtle) and salamanders (especially blue-spotted and Jefferson).

- Sentinel monitoring of aquatic invasive species such as zebra mussels, round goby, Eurasian water milfoil, and others should be undertaken among the interconnected waters of the Finger Lakes and Erie Canal system. Early detection may allow managers to reduce the effects of aquatic invaders or treat early invasions. Priority should be placed on waters that are currently supporting SGCN like lake sturgeon, pugnose shiner, and Elktoe mussels that are known to be acutely affected by these invasive species.

- Comprehensive water quality monitoring in lakes and streams should be implemented in priority water bodies that have potential habitat for aquatic SGCN. An excellent example is Onondaga County's Ambient Monitoring Plan, which includes nutrients, dissolved oxygen, bacteria counts, as well as plankton, macroinvertebrates, macrophytes and extensive fish studies at all life stages.

- Monitor data collected from ongoing fish population and harvest surveys to detect changes in species composition or other environmental conditions in the basin.

- Conduct research to assess the effects of wheeled off-road vehicle use on wildlife SGCN in the Tug Hill region.

DATA COLLECTION RECOMMENDATIONS FOR SGCN

- Document and monitor massasauga and timber rattlesnake populations at known or historic locations in the Southeast Lake Ontario Basin, and identify specific threats to existing populations. For massasauga, determine upland/wetland habitat requirements ratio, population size and trends, predator-prey relationships, and reproductive success.

- Support research and management activities within the basin as outlined in established recovery or management plans for common tern and piping plover.

- Continue to monitor the population of Chittenango ovate amber snail and the introduced competitor, *Succinea sp. B*, in Chittenango Falls State Park. Determine microhabitat preferences of the two species as recommended by the federal recovery plan.

- Create an inventory of freshwater marsh bird nesting and migratory stopover areas in the basin as part of a statewide survey effort. Document important habitat characteristics to guide restoration efforts at historic sites no longer used.

- Survey Jamesville Quarry in Onondaga County for Indiana bats on an annual basis during fall swarm, fall entry, and spring emergence to monitor population status. Conduct marking studies of Indiana bats using the quarry as hibernacula to identify habitats used during summer maternity period and migration.

- Sample portions of Lake Ontario in the basin for ninespine stickleback and blackchin shiner and develop preferred habitat profiles for each to support restoration planning. Sample inlets to Cayuga and Seneca Lakes that have harbored fish SGCN, such as pugnose shiner, and assess unique habitat features needing protection.

- Continue to evaluate success rate of hatchery stocking programs of lake sturgeon in Oneida and Cayuga lakes. Include genetic components in the evaluation as recommended by Pyatskowski in 1998.

- Survey known sites from the NYS Herpetile Atlas for reptile and amphibian SGCN, especially bog turtle (a federally-listed species), as well as Western chorus frog, blue spotted and Jefferson's salamanders, Blanding's turtle, wood turtle, spotted turtle, spiny softshell and eastern ribbon snake. Determine basic ecological parameters, including population size and reproductive status, preferred food items, preferred habitat parameters, etc to assess viability of local populations.

- Survey potential habitats in the basin for bog buckmoth. Determine preferred pupation habitat and rates of loss to development, food sources, and population dynamics.

- Monitor grassland bird populations and habitat use in designated focus areas for conservation of these species.

- Maintain current information on distribution and abundance of cerulean warblers in the basin, especially in the Finger Lakes region.

- Document migration corridors, stopovers and concentration areas for migratory birds (including any SGCN) and bats in the SELO basin to help assess potential effects of future wind energy development.

Planning Recommendations

- Develop a comprehensive plan for management of public lands (State Forest lands, WMAs, State Parks, etc.) in the basin to best conserve viable populations of SGCN in the SELO basin.

- Identify specific and appropriate focus areas for grassland bird conservation in the basin, where it would not conflict with efforts to protect large forest blocks. The entire lake plain area, including Southeast Lake Ontario supports grassland breeding birds in large, but shrinking numbers. The decline of farming in the region and concomitant reforestation, as well as changes to more intensive agriculture in areas that remain farmed, have lead to significant declines and has serious implications for maintaining viable populations of grassland birds. Grassland management plans need to be created collaboratively with all agencies with responsibility over grassland species and habitat. For example, NRCS, DEC, OPRHP, USFWS, Farm Bureaus and other interested non-governmental organizations should be consulted during the creation of these plans.

- The decline of terrestrial open uplands is intertwined with the fate of not only grassland breeding birds, but also early successional forest breeding birds, forest breeding birds, and deciduous/mixed forest breeding birds. The effective management of all these species in the basin requires careful planning for the best mix of grassland, forest, and transitional habitats to set and meet realistic goals for as many species as possible. There are many SGCN other than birds that depend on these habitats, and their habitat needs must be included in these planning efforts.

- Planning in conjunction with data collection is needed to identify the best candidate sites for restoration of lake sturgeon to suitable habitat in the basin and in Lake Ontario. Feasibility of restoring various forage fish species should be assessed also.

- Water level management in lakes, the canal system and at numerous dams in the basin require careful planning to maintain appropriate flow volume and temperature for a variety of SGCN. Water levels and volume affect floodplain wetlands, emergent wetland structure and extent, and thermal stresses for cold water fishes. Opportunities to enhance habitat for SGCN need to be incorporated into international plans for future management of water levels in the Great Lakes and St. Lawrence River.

- Examine dams appropriate for removal or bypass to support spawning runs of Atlantic salmon, lake sturgeon, and other migratory fish in this basin.

- Update the federal recovery plan to guide establishment of additional populations of Chittenango ovate amber snail.

- Develop a management plan, including population goals, for common tern in the basin.

- Assess feasibility of restoring nesting piping plovers to the eastern Lake Ontario shoreline, and develop an action plan for implementation, as appropriate.

- Assess feasibility of restoring Karner blue butterfly to the Rome Sand Plains, in accordance with the federal recovery plan for this species. Develop an action plan for implementation, as appropriate.

- Develop a conservation plan to increase cerulean warbler populations in the Finger Lakes and Lake Plains portions of this basin.

- Develop a plan to maintain or expand habitat for American woodcock and other bird SGCN associated with early successional forests and shrublands.

Land Protection Recommendations

- Easement acquisitions by DEC or other land conservation organizations (e.g., local land trusts) are recommended for conservation of private agricultural lands that are suitable for management of grassland dependent SGCN in designated focus areas. Fee acquisition (from willing sellers only), may be more appropriate for parcels adjacent to existing public lands.

- Conservation easements or other management incentives are recommended for private working forest lands (of various ages and composition) that support SGCN in the basin, especially in the Tug Hill and Finger Lakes highlands. Easements should include not only timber harvest areas, but woodland vernal pools as well. Easements or acquisition to reduce habitat fragmentation are encouraged.

- Easement acquisitions are recommended for riparian habitat to buffer stream and lake habitats that are home to elktoe mussels and other aquatic SGCN from nutrients and sediment loading. Priority should be given to buffer zones along tributaries with the greatest potential to support natural fish reproduction.

- Acquire core habitats for cerulean warblers in the basin, and secure conservation of adjacent lands that can be managed to provide additional habitat for this species.

- Acquire known critical habitats for bog turtles in the basin, in accordance with the federal recovery plan for this species.

- There are several acquisition parcels in the 2002 Open Space Plan recommendations for DEC Regions 6, 7, and 8 that support the needs of SGCN in this basin:
  - Northern Montezuma Wetlands marsh property additions
  - Irondequoit Bay woods, wetlands and bluffs
  - Catharine Valley Complex: Horseheads Marsh parcels, Rock Cabin Road cliff parcels, and Queen Catharine wetland parcels
  - Junius Ponds complex
  - Dresden Flats portion of the Keuka Lake floodplain
  - Tug Hill core forests & headwater streams
  - Rome Sand Plains expansion
  - North shore of Oneida Lake wetland parcels in Toad Harbor and Big Bay swamps
  - Salmon River corridor parcels that protect water quality for SGCN

- Identify additional acquisition targets for SGCN and incorporate those in periodic updates (e.g., 2005, 2008) of the Open Space Plan. Low land prices and a declining human population in this basin may create favorable economic opportunities for acquiring conservation lands.

- A proposed new 3 million acre Forest Legacy Area in the Finger Lakes/Northern Plateau region of central and western New York would protect the forest resources and water quality of the Finger Lakes and upper Susquehanna River watersheds through property easements and acquisition.

Management and Restoration Recommendations

- Restrict and manage human access to Jamesville Quarry (by gating) to prevent damage or disturbance of Indiana bat hibernacula.

- Restrict and manage human access (at appropriate times of the year) to minimize disturbance and taking of massasauga rattlesnakes in critical habitat areas at Cicero Swamp. Compatible public uses of the area should continue.

- Implement applicable management recommendations in the federal recovery plan for the Prairie Peninsula/Lake Plain population of bog turtle.

- Promote proper and reduced use of toxic pesticides and fertilizers in and adjacent to known critical habitats for freshwater wetland amphibians and lake/river reptiles.

- Restore degraded emergent marshes that could provide habitat for SGCN in the basin, including control of invasive plants and water level management. This will benefit freshwater wetland amphibians, uncommon turtles of wetlands, and freshwater marsh nesting birds.

- Manage invasive plant species to enhance habitats for SGCN, including massasauga, Blanding's turtle, bog turtle, spotted turtle, and marsh-nesting birds. Eliminate mute swan populations in the SELO basin.

- Manage uplands adjacent to aquatic habitats used by lake and river reptiles to maintain necessary linkages between the two for nesting and dispersal habitat. Further enhance and protect riparian habitat, especially through agricultural properties, to protect freshwater bivalves.

- Continue hatchery rearing of lake sturgeon and Atlantic salmon and expand restorations to rebuild the Lake Ontario populations. Restore stream habitats for fish spawning, by dam removal or other fish passage accommodations, where it will not affect sea lamprey control (by allowing range expansion).

- Continue exploring the feasibility of restoring deepwater fish species such as bloater, kiyi, and shortnose cisco to Lake Ontario.

- Explore captive breeding to expand populations of freshwater mussels, especially elktoe.

- Where possible, mitigate fragmentation of habitat for herpetofauna in the basin by creating below grade road passages, or relocation of obsolete roadways. Species to benefit from this action include Blanding's turtle, bog turtle, and spotted turtle.

- Manage and expand nesting sites for common tern on Oneida Lake and Lake Ontario through vegetation or substrate management, control of competing species, and limiting human disturbance during critical nesting periods.

- Maintain or increase the amount of early successional forest and shrublands in the basin through timber harvest and maintain habitat suitability of grasslands through properly-timed mowing. Also, assess the feasibility of using prescribed fire and managed grazing by domestic livestock (e.g., goats, cattle) to manage grasslands and other early successional plant communities.

- Increase capabilities for water level management, especially for wetlands along Lake Ontario, and use other wetland management techniques in the basin to simultaneously benefit the most critical species of freshwater marsh nesting birds and herpetofauna. Where possible, weirs or other structures should be considered to mimic natural water levels to benefit SGCN.

- Employ captive breeding, head-starting, nest protection, and repatriation techniques to enhance populations of massasauga, Blanding's turtle, spiny softshell, bog turtle, wood turtle, piping plover, and karner blue butterfly, consistent with species recovery plans where applicable.

- Maintain or enhance habitats for SGCN that occur on existing public lands (State Forest lands, WMAs, State Parks, etc.). Limit seasonal use of wheeled off-road vehicles in specific areas where SGCN may be adversely affected.

Information Dissemination Recommendations

- Continue and enhance educational programs to private landowners, local governments and others regarding BMPs for all SGCN. These include existing USDA and Cooperative Extension programs for wetland and grassland species, and sustainable forestry and forest stewardship programs for early successional and mature forest species.

- Educate the public to dispel myths and fear of massasauga (and other snakes) and convey their ecological role and value.

- Develop educational materials to foster public support or acceptance of dam removal, invasive species management, and access restrictions to protect SGCN at critical times of the year.

- Update educational signs at Chittenango Falls State Park regarding Chittenango ovate amber snails. Create signage for zoos that participate in the captive breeding program.

- Develop and disseminate BMPs for mosquito control to protect SGCN at Cicero Swamp and other wetland ecosystems.

Regulatory and Legislative Recommendations

- Encourage the protection of marsh-nesting birds and aquatic herpetofauna by local governments through use of personal watercraft regulations.

- Pursue protection of wetlands not currently covered by Article 24 regulations through map amendments or by working with local government to adopt local ordinance where such wetlands provide critical habitat for the most critical species of freshwater marsh nesting birds, freshwater wetland amphibians, vernal pool salamanders, and uncommon turtles of wetlands. In the case of freshwater wetland amphibians and vernal pool salamanders, expand the 100 foot upland buffer around wetlands to reflect a more accurate upland forage range for these species.

- Strengthen legal protection for reptiles and amphibians in New York, and support law enforcement efforts to prevent illegal taking of massasauga and other herp SGCN.

- Protect critical stream segments that provide habitat (including water quality) for SGCN through Article 15 or other regulations to limit non-point source pollutants, erosion, sedimentation and hydrologic alterations.

- Make necessary law changes to ensure that revenue generated from use of State lands goes into a dedicated account for stewardship purposes including habitat conservation.

Incentives

- Provide LIP payments to private landowners for conservation of habitats for grassland species and bog turtles in the SELO basin. Expand the LIP in future years to meet the needs of many other SGCN.

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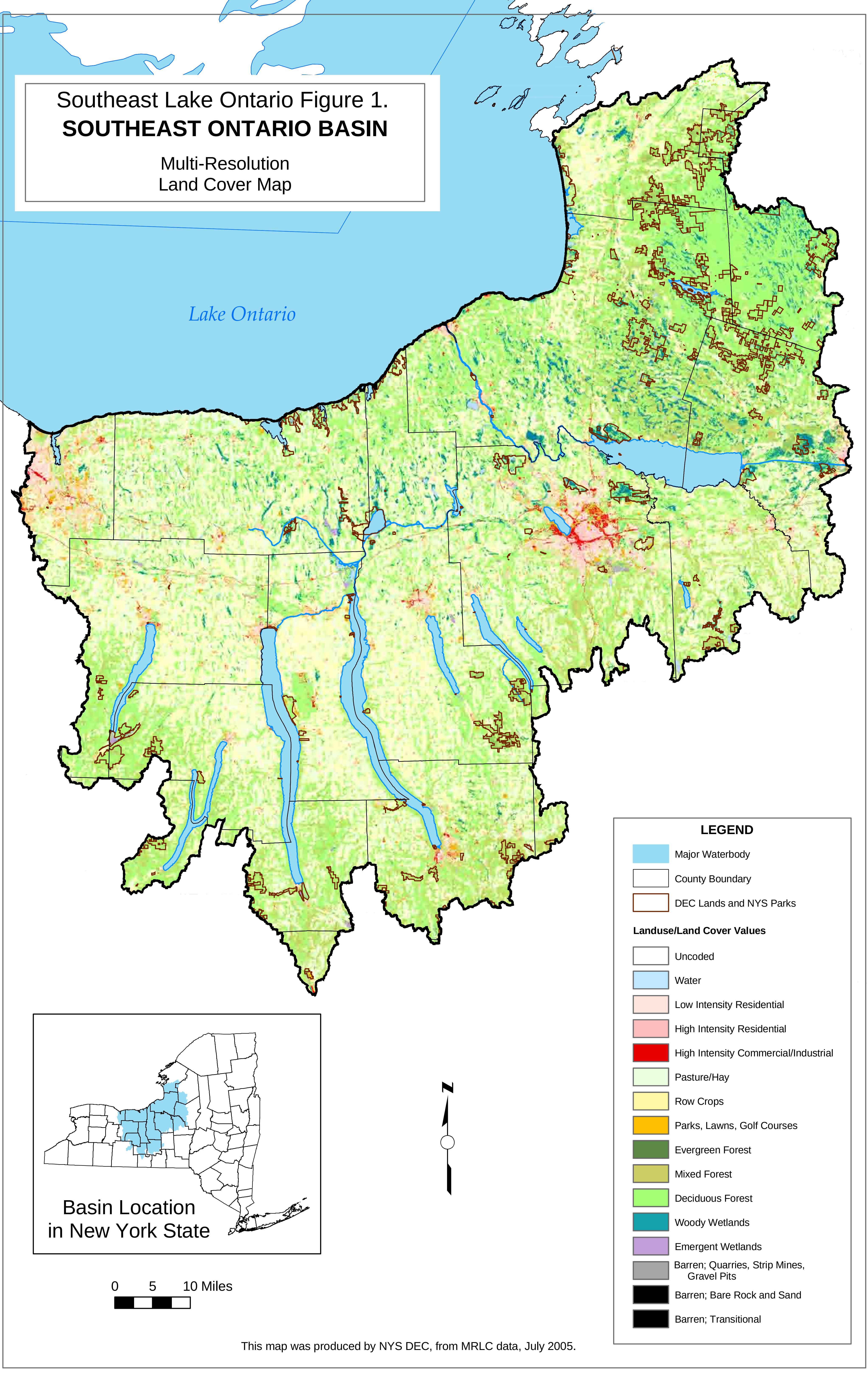
Tables and Figures

Tables

Figures

Figure 1. Multi-Resolution Land Classification (MRLC) land cover map of the SE Lake Ontario Basin.


Southeast Lake Ontario Figure 1.
SOUTHEAST ONTARIO BASIN
Multi-Resolution
Land Cover Map
Lake Ontario
LEGEND
Major Waterbody
County Boundary
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
N
Basin Location
in New York State
0 5 10 Miles
This map was produced by NYS DEC, from MRLC data, July 2005.

SE Lake Ontario Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the SE Lake Ontario Basin.

Classification	% Cover
Deciduous Forest	34.17
Row Crops	24.38
Pasture/Hay	15.53
Mixed Forest	11.01
Water	5.01
Wooded Wetlands	3.17
Low Intensity Residential	2.57
Evergreen Forest	1.32
Parks, Lawns, Golf Courses	1.07
High Intensity Commercial/Industrial	0.79
High Intensity Residential	0.60
Emergent Wetlands	0.24
Barren; Quarries, Strip Mines, Gravel Pits	0.11

SE Lake Ontario Table 2. Species of Greatest Conservation Need currently occurring in the SE Lake Ontario Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Beach and Island ground-nesting birds	Common tern	Unknown
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Breeding waterfowl	Ruddy duck	Increasing
Bird	Colonial-nesting herons	Black-crowned night-heron	Decreasing
Bird	Common loon	Common loon	Unknown
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Kentucky warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Decreasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Black tern	Decreasing
Bird	Freshwater marsh nesting birds	King rail	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Freshwater marsh nesting birds	Yellow rail	Unknown
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Osprey	Osprey	Increasing
Bird	Peregrine falcon	Peregrine falcon	Increasing
Bird	Transient shorebirds	Black-bellied plover	Unknown
Bird	Transient shorebirds	Buff-breasted sandpiper	Unknown
Bird	Transient shorebirds	Dunlin	Unknown
Bird	Transient shorebirds	Greater yellowlegs	Unknown
Bird	Transient shorebirds	Hudsonian godwit	Unknown
Bird	Transient shorebirds	Ruddy turnstone	Unknown
Bird	Transient shorebirds	Sanderling	Unknown
Bird	Transient shorebirds	Semipalmated sandpiper	Unknown
Bird	Transient shorebirds	Whimbrel	Unknown
Bird	Wintering waterbirds	Greater scaup	Decreasing
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Lesser scaup	Stable
Bird	Wintering waterbirds	Long-tailed duck	Unknown
Bird	Wintering waterbirds	Northern pintail	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Freshwater fish	Blackchin shiner	Blackchin shiner	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Comely shiner	Comely shiner	Stable
Freshwater fish	Deepwater sculpin	Deepwater sculpin	Decreasing

SE Lake Ontario Table 2. (continued)

Taxa Group	Species Group	Species	Stability
Freshwater fish	Iowa darter	Iowa darter	Unknown
Freshwater fish	Lake sturgeon	Lake sturgeon	Increasing
Freshwater fish	Ninespine stickleback - inland	N. American ninespine stickleback	Unknown
Freshwater fish	Pugnose shiner	Pugnose shiner	Stable
Freshwater fish	Western pirate perch	Western pirate perch	Decreasing
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Unknown
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Northern map turtle	Unknown
Herpetofauna	Lake/river reptiles	Spiny softshell	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Massasauga	Eastern massasauga	Decreasing
Herpetofauna	Mudpuppy	Common mudpuppy	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Blanding's turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Bog turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Northern black racer	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Bog buckmoth	Bog buckmoth	Decreasing
Insect	Odonates of lakes/ponds	Comet darner	Unknown
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Blue-tipped dancer	Unknown
Insect	Odonates of rivers/streams	Midland clubtail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Odonates of seeps/rivulets	Arrowhead spiketail	Unknown
Insect	Odonates of seeps/rivulets	Gray petaltail	Unknown
Insect	Odonates of seeps/rivulets	Tiger spiketail	Unknown
Insect	Odonates of small forest streams	Ocellated emerald	Unknown
Insect	Other butterflies	Bog elfin	Decreasing
Insect	Other butterflies	Checkered white	Decreasing
Insect	Other butterflies	Frosted elfin	Decreasing
Insect	Other butterflies	Henry's elfin	Unknown
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Northern oak hairstreak	Stable
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Silvery blue	Decreasing
Insect	Other butterflies	Southern grizzled skipper	Unknown
Insect	Other butterflies	Tawny crescent	Decreasing
Insect	Other moths	*Hydraecia stramentosa*	Unknown
Insect	Other moths	Imperial moth	Unknown
Insect	Stoneflies/Mayflies of lentic waters	*Siphlonurus barbaroides*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Eurylophella bicoloroides*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Rhithrogena anomala*	Unknown
Insect	Stoneflies/Mayflies of uncertain habitat	*Dannella provonshai*	Unknown
Insect	Stoneflies/Mayflies of uncertain habitat	*Procloeon simile*	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Indiana Bat	Indiana bat	Increasing
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Marine fish	American eel	American eel	Decreasing
Mollusk	Freshwater bivalves	Eastern pearlshell	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Rainbow	Unknown
Mollusk	Terrestrial gastropods	Chittenango ovate amber snail	Decreasing

SE Lake Ontario Table 3. SE Lake Ontario Basin species diversity relative to the total number of SGCN statewide

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**15**	**65**	**118**	**55.1**
Bald Eagle		1		
Beach and Island Ground-Nesting Birds		1	7	14.3
Breeding Waterfowl		2	4	50.0
Colonial Nesting Herons		1	8	12.5
Common Loon		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		8	9	88.9
Early Successional Forest Breeding Birds		11	12	91.7
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		6	6	100.0
Grassland Birds		10	11	90.9
Osprey		1		
Peregrine Falcon		1		
Transient Shorebirds		9	14	64.3
Wintering Waterbirds		6	19	31.6
FRESHWATER FISH	**9**	**9**	**40**	**22.5**
Blackchin shiner		1		
Brook trout, Heritage strains		1		
Comely shiner		1		
Deepwater sculpin		1		
Iowa darter		1		
Lake sturgeon		1		
Ninespine stickleback - inland		1		
Pugnose shiner		1		
Western pirate perch		1		
HERPETOFAUNA	**8**	**19**	**44**	**43.2**
Freshwater Wetland Amphibian		2	5	40.0
Lake/River Reptiles		4	5	80.0
Massasauga		1		
Mudpuppy		1		
Snapping Turtle		1		
Uncommon Turtles of Wetlands		4	5	80.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		4	8	50.0
INSECT	**10**	**27**	**197**	**13.7**
Bog Buckmoth		1		
Odonates of Lakes/Ponds		1	5	20.0
Odonates of Rivers/Streams		4	19	21.1
Odonates of Seeps/Rivulets		3	4	75.0
Odonates of Small Forest Streams		1	3	33.3
Other Butterflies		10	18	55.6
Other Moths		2	92	2.2
Stoneflies/Mayflies - Lentic		1	1	100.0
Stoneflies/Mayflies - Lotic		2	20	10.0
Stoneflies/Mayflies - Uncertain Habitat		2	6	33.3
MAMMAL	**3**	**4**	**21**	**19.0**
Furbearers		1	2	50.0
Indiana Bat		1		
Tree Bats		2	3	66.7
MARINE FISH	**1**	**1**	**51**	**2.0**
American Eel		1		
MOLLUSK	**2**	**4**	**59**	**6.8**
Freshwater Bivalves		3	39	7.7
Terrestrial Gastropods		1		
TOTAL	**48**	**129**	**537**	**24.0**
% of all spp groups statewide	**37.5**			

SE Lake Ontario Table 4. SGCN that historically occurred in the SE Lake Ontario Basin, but are now believed to be extirpated from the basin (n=49).

Taxa Group	Species Group	Species
Bird	Barn owl	Barn owl
Bird	Beach and Island ground-nesting birds	Piping plover
Bird	Breeding waterfowl	American black duck
Bird	Loggerhead Shrike	Loggerhead shrike
Crustacea/Meristomata	Freshwater crustacea	Piedmont groundwater amphipod
Freshwater fish	Extirpated Fishes	Atlantic salmon
Freshwater fish	Extirpated Fishes	Bloater
Freshwater fish	Extirpated Fishes	Kiyi
Freshwater fish	Extirpated Fishes	Shortnose cisco
Freshwater fish	Extirpated Fishes	Silver chub
Freshwater fish	Extirpated Fishes	Spoonhead sculpin
Freshwater fish	Longear sunfish	Longear sunfish
Freshwater fish	Sauger	Sauger
Freshwater fish	Swallowtail shiner	Swallowtail shiner
Insect	Karner blue butterfly	Karner blue
Insect	Odonates of rivers/streams	Arrow clubtail
Insect	Odonates of rivers/streams	Elusive clubtail
Insect	Odonates of rivers/streams	Spine-crowned clubtail
Insect	Odonates of small forest streams	Mocha emerald
Insect	Other moths	*Papaipema aerata*
Insect	Other moths	Aweme borer moth
Insect	Other moths	Hairy artesta
Insect	Other moths	Phyllira tiger moth
Insect	Pine barrens tiger beetles	*Cicindela patruela*
Insect	Stoneflies/Mayflies of lotic waters	*Epeorus suffusus*
Insect	Stoneflies/Mayflies of lotic waters	*Heptagenia julia*
Insect	Stoneflies/Mayflies of lotic waters	*Nixe rusticalis*
Insect	Stoneflies/Mayflies of lotic waters	*Procloeon ozburni*
Insect	Stoneflies/Mayflies of lotic waters	*Pteronarcys comstocki*
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mammal	Tree bats	Silver-haired bat
Mollusk	Freshwater bivalves	Eastern pondmussel
Mollusk	Freshwater bivalves	Green floater
Mollusk	Freshwater bivalves	Hickorynut
Mollusk	Freshwater bivalves	Lilliput
Mollusk	Freshwater bivalves	Paper pondshell
Mollusk	Freshwater bivalves	Pocketbook
Mollusk	Freshwater bivalves	Slippershell mussel
Mollusk	Freshwater bivalves	Threeridge
Mollusk	Freshwater bivalves	White heelsplitter
Mollusk	Freshwater bivalves	Yellow lamp mussel
Mollusk	Freshwater gastropods	Buffalo pebblesnail
Mollusk	Freshwater gastropods	Campeloma spire snail
Mollusk	Freshwater gastropods	Globe siltsnail
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater gastropods	Mossy valvata
Mollusk	Freshwater gastropods	Spindle lymnaea

SE Lake Ontario Table 5. Significant Coastal Fish and Wildlife Habitats (n=23) within the SE Lake Ontario Basin. DEC evaluates the significance of coastal fish and wildlife habitat areas, and following a recommendation from NYSDEC, the Department of State designates and maps specific areas.

Habitat Name	County	Acres	Significance Value [a]	Description
Salmon River	Oswego	934	166	The Salmon River is the largest coldwater tributary to the Great Lakes in New York State. Critical habitat extends approximately sixteen miles from the river mouth the Altmar Dam (Lower Reservoir), and includes the entire river channel and associated islands and wetlands. The habitat also includes two principal tributaries of the river: Beaverdam Brook, and Orwell Creek. The Salmon River is a very large, medium gradient, coldwater stream, with a predominantly rock and gravel substrate. The river drains approximately 270 square miles of forested headwaters, agricultural lands, and rural residential areas. The lower one and one-half miles of the river are approximately at lake level, forming a wetland embayment over 300 acres in size. Extensive beds of emergent marsh vegetation and submergent aquatic vegetation are interspersed throughout this lower area.Concentrations of salmonids are among the highest in the northeastern United States. Black tern (SC) and least bittern (SC) nesting. Salmonid fisheries attract recreational fishermen from throughout the northeastern United States.
Lakeview Marsh	Jefferson	3,400	157	An extensive undeveloped, lake shore barrier beach, wetland, and tributary complex. Rare in New York State. Area consists of a five mile long barrier beach, freshwater marshes and ponds, two coldwater streams (Sandy Creek and South Sandy Creek), and interspersed uplands. Most of the area is included in the NYSDEC's Lakeview Marsh Wildlife Management Area (WMA), and in Southwick Beach State Park.Salmonid concentrations are of regional significance; population level of nesting black terns is unknown, but may be unusual in the region. Northern harrier (T), least bittern (SC), and black tern (SC) nesting. Recreational salmonid fishery of Statewide significance, and commercial bullhead fishery of regional significance.
North and South Sandy Ponds	Oswego; Jefferson	3,300	125	The largest barrier-bay ecosystem on Lake Ontario, but rarity reduced by human disturbance. Critical habitat is an approximate 3000 acre embayment, separated from the lake by an extensive barrier beach formation. North Sandy Pond ("North Pond"), which comprises about 3/4 of the area, is predominantly shallow (less than 20 feet deep) open water, with dense beds of submergent aquatic vegetation. This pond is connected to Lake Ontario by a very broad, shallow outlet through the beach, and receives inflow from Skinner, Lindsey, Blind, and Little Sandy Creeks. Sizeable areas of emergent wetland vegetation have developed at the lower ends of these tributaries, and at the north and south ends of the pond in sheltered coves. South Sandy Pond ("South Pond") is a sheltered bay that receives relatively little upland runoff. This is one of the major spawning and nursery areas for many fish species on Lake Ontario; also regionally important concentration area for migrant shorebirds, passerines, and raptors. Common tern (T), least bittern (SC), and black tern (SC) nesting; importance to piping plover (E) not adequately documented.
Lake Shore Marshes	Wayne	3,300	118	An extensive complex of undeveloped coastal wetland ecosystems; unusual in New York State. Critical habitat consists of ten relatively discrete units, each encompassing a sizeable coastal wetland area. From west to east, these units are: South Sodus Bay (approximately 225 acres); Hog Island (50 acres); Root Swamp (160 acres); East Bay (730 acres); Brush Marsh (80 acres); Beaver Creek (350 acres); Cottrell Marsh (75 acres); Port Bay (430 acres); Red Creek (380 acres); and Black Creek (500 acres). Most of these areas are located within the NYSDEC's Lake Shore Marshes Wildlife Management Area; only Brush Marsh and a portion of the Black Creek area are privately owned. The various units are generally dominated by emergent wetland vegetation, but relatively large areas of scrub-shrub and forested wetlands also occur.
Deer Creek Marsh	Oswego	1,200	92	One of the largest undeveloped, coastal barrier-wetland ecosystems in the Great Lakes Plain ecological region, comprised of an extensive freshwater wetland complex, a mile-long segment of undeveloped barrier beach, and Deer Creek. The marsh is dominated by cattail and other emergent wetland vegetation, and makes up a major portion of the NYSDEC's Deer Creek Marsh Wildlife Management Area. The southern one third of the habitat area is predominantly scrub-shrub and forested wetland, and is privately owned. All of Deer Creek Marsh is densely vegetated, with less than 2% of the area in open water. The land area bordering the north, east, and south sides of the wetland is rural in nature, including deciduous forest, abandoned fields, agricultural lands, and low density residential development. Concentrations of many wetland wildlife species are among the largest in the Great Lakes Plain ecological region. Northern harrier (T), least bittern (SC), and black tern (SC) nesting.

SE Lake Ontario Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Irondequoit Bay and Creek	Monroe	2,200	80	One of the major coastal bay and tributary systems on the Great Lakes coastal region. Critical habitat includes the entire bay area, a large emergent wetland area at the south end of the bay, and Irondequoit Creek. Irondequoit Bay is separated from Lake Ontario by a sandy barrier beach formation, and is bordered by relatively steep wooded slopes and bluffs. However, much of the western shoreline has been developed for residential and commercial uses. Irondequoit Creek is a very large, medium gradient, coolwater stream, which drains approximately 170 square miles of predominantly suburban and rural residential lands. Concentrations of many warmwater fish species and salmonids are unusual in the Great Lakes Plain ecological region. Least bittern (SC) and sedge wren (SC) nesting. A major recreational fishing area on Lake Ontario, attracting anglers from throughout western and central New York.
Oswego River	Oswego	750	72	One of only 4 river tributaries of New York's Great Lakes, but rarity reduced by extensive human disturbances. Critical habitat includes the one and one-half mile segment of river below Varick Dam, and an approximate 450 acre area of Lake Ontario at the river mouth, encompassing all of Oswego Harbor. The Oswego River has a drainage area of over 5,000 square miles, and an average annual discharge of approximately 6,700 cubic feet per second. Varick Dam serves as a control structure for Navigation Lock No. 7 of the Oswego Canal and for generation of hydroelectric power. The first half-mile of river below the dam is relatively shallow, with a rock and rubble bottom, and small wooded islands. Farther down-stream, the channel is wider, deeper, and extensively bulkheaded in conjunction with high density urban waterfront development. Breakwalls have been constructed at the mouth of the Oswego River, creating a major sheltered harbor.One of the major concentration areas for wintering waterfowl and salmonids in eastern Lake Ontario. Lake sturgeon (T) spawning area. One of the most popular waterfowl hunting and salmonid fishing ar
El Dorado Beach and Black Pond Wetlands	Jefferson	750	71	One of the largest undeveloped, coastal barrier-wetland ecosystems in the Great Lakes Plain ecological region. Critical habitat includes an extensive freshwater wetland complex, a mile-long segment of undeveloped barrier beach, rocky shores, and interspersed uplands. This area includes all of the NYSDEC's Black Pond Wildlife Management Area, The Nature Conservancy's El Dorado Beach Preserve, and some privately owned lands. Black Pond is an approximate 25 acre, shallow pond, located at the point on Lake Ontario where the extensive barrier beaches of the eastern shore give way to rocky coastline. Little Stony Creek (a small, slow-moving, warmwater stream) and several unnamed tributaries flow into Black Pond, which opens through a small outlet to Lake Ontario. Much of El Dorado Beach and Black Pond Wetlands is scrub-shrub and forested wetland, with lesser amounts of emergent marsh; Black Pond is the only sizeable area of open water included in the habitat. Upland areas include the wooded barrier beach, and dense groves of eastern red cedar.A major concentration area on Lake Ontario for migrant shorebirds; populations le
Sodus Bay	Wayne	3,340	56	One of the largest sheltered bay ecosystems on the Great Lakes, but rarity reduced by human disturbance. Critical habitat includes an approximate 3,000 acre embayment, separated from the lake by a narrow barrier beach. Maximum depth of Sodus Bay is approximately 45 feet, but much of the area is relatively shallow (less than 20 feet deep), with dense beds of submergent aquatic vegetation. The outlet of Sodus Bay has been reduced to a narrow, stabilized channel, by the construction of concrete and steel jetties. Sodus Bay receives inflow from First, Second, Third, and Sodus Creeks; all but Sodus are small, low to medium gradient, warmwater streams. Sodus Creek is a relatively large, medium gradient, coolwater stream, draining approximately 20 square miles of rural farmland. Sizeable areas of emergent wetland vegetation have developed at the lower ends of these tributaries, and in sheltered portions of Sodus Bay.One of the major spawning and nursery areas for yellow perch and other warmwater fish species in Laka Ontario.
Genesee River	Monroe	385	54	One of 4 major New York tributaries of Lake Ontario; unusual in the Great Lakes Plain ecological region, but rarity is reduced by human disturbances. Critical habitat is an approximate six and one-half mile segment of the river, extending from Lake Ontario to "Lower Falls" (located just above Driving Park Avenue), which is a natural impassable barrier to fish. The Genesee River is a large, warmwater river, with a drainage area of nearly 2,500 square miles, and an average annual discharge of approximately 2,800 cubic feet per second. Maximum water depths of up to 25 feet occur near the river mouth, and a navigation channel has been dredged upstream approximately two and one-half miles. Much of this lower segment is bordered by dense commercial, industrial, and residential development, accompanied by extensive bulkheading. Above this area, the Genesee River flows through a relatively undeveloped wooded gorge, and has a fringe of emergent wetland vegetation along much of its shoreline. This portion of the river is relatively shallow, with a rocky bottom.Concentrations of spawning slamonids are among the largest occuring in New York's Great Lakes trib

SE Lake Ontario Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Sandy Pond Tributaries	Oswego; Jefferson	75	44	High quality, unobstructed, coldwater tributaries; rare on Lake Ontario, but rarity is reduced by human disturbance. Critical habitat includes portions of the three largest tributaries of North Sandy Pond: Skinner Creek (approximately 7 miles included); Lindsey Creek (6 miles); and Little Sandy Creek (5 miles). Each of these streams are relatively small (less than 20' wide), free flowing, medium gradient, and coldwater, with a gravelly substrate and high water quality. Sandy Pond Tributaries drain out of forested headwaters in eastern Oswego County and flow through rural residential and agricultural areas en route to Lake Ontario. Portions of these streams have been disturbed by livestock grazing, bank clearing, road crossings, and channeliza-tion, resulting in some degradation of the habitat. Includes 2 of 3 streams in New York that have been stocked with Atlantic salmon to restore this species to Lake Ontario; concentrations of naturally reproducing salmonids are unusual on Lake Ontario.
Port Bay	Wayne	440	41	Relatively large, shallow, sheltered bay; unusual in the Lake Ontario subzone. habitat is an approximate 400 acre open water portion of the bay, situated north of the NYSDEC's Lake Shore Marshes Wildlife Management Area (Port Bay Unit), and separated from the lake by a barrier beach formation. Port Bay is relatively shallow (less than 25 feet deep), with dense beds of submergent aquatic vegetation. The bay is connected to Lake Ontario by a small outlet through the beach, and receives inflow primarily from Wolcott Creek. Wolcott Creek is a relatively large, medium gradient, warmwater stream, draining approximately 27 square miles of rural farmland.One of the major spawning and nursery areas for yellow perch in Lake Ontario.
Butterfly Creek Wetlands	Oswego	375	37	One of the largest, undisturbed, coastal wetland ecosystems in Oswego County. A 375-acre wetland, separated from Lake Ontario by a narrow barrier beach. The area contains a diversity of wetland plant communities, including emergent, scrub-shrub, and forested wetland types. It is densely vegetated, with scattered shallow water areas, and small wooded islands comprising a secondary dune system. Least bittern (SC) nesting; pugnose shiner reported (E), but not confirmed. Concentrations of many wetland wildlife species are among the largest in Oswego County.
Snake Creek Marsh	Oswego	144	35	Relatively large, scrub-shrub and emegent wetland; uncommon in Oswego County. Area consists of an approximate 120 acre wetland, separated from Lake Ontario by a narrow barrier beach, and bisected by Lake Shore Road. Below Lake Shore Road, the area is predominantly scrub-shrub and emergent wetland; above the road, it is predominantly scrub-shrub and forested wetland. Snake Creek is a small, slow-moving, intermittent stream which flows through the marsh and drains into Lake Ontario via underground seepage through the barrier beach. Snake Creek Marsh is densely vegetated, with scattered shallow, open water areas.Least bittern (SC) nesting; lake chubsucker (T) reported but not confirmed.
Teal Marsh	Oswego	285	35	Relatively large, diverse scrub-shrub and emergent wetland; unusual in Oswego County. Critical habitat encompasses an approximate 250 acre wetland, separated from Lake Ontario by a narrow barrier beach. The area is predominantly scrub-shrub and forested wetland, hydrologically connected to the lake via underground seepage through the beach. Two unnamed intermittent streams flow into the wetland. Teal Marsh is densely vegetated, with scattered shallow water areas, small wooded islands, and a highly irregular edge. The surrounding land area to the west, south, and east, is dominated by mixed deciduous and coniferous woodlands. The interior is essentially undisturbed, but areas along the northern shore have been developed into summer camps and residences, resulting in some encroachment into the marsh. Least bittern (SC) nesting.
Ramona Beach Marsh	Oswego	117	30	Relatively large, undeveloped, emergent wetland ecosystem, unusual in Oswego County. Critical habitat includes an approximate 70 acre emergent wetland that has developed where Snake Creek empties into Lake Ontario. Vegetation in the area is dominated by narrow-leaved and broad-leaved persistent emergents (e.g., cattail, pickerelweed, and burreed); there are also areas of scrub-shrub wetland and submergent aquatic beds. Above the marsh, Snake Creek is a small, medium gradient, intermittent stream. Much of the land area bordering Ramona Beach Marsh is undeveloped forestland. However, the barrier beach separating the marsh from Lake Ontario has been completely developed for seasonal camps and permanent residences. Least bittern (SC) nesting; pugnose shiner (E) reported but not confirmed.

SE Lake Ontario Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Sage Creek Marsh	Oswego	50	30	Relatively small, undisturbed, flood pond wetland dominated by nonpersistent emergents; unusual in Oswego County. Critical habitats include an approximate 35 acre streamside wetland and flood pond system that has developed where Sage Creek empties into Lake Ontario. Vegetation in the area is dominated by narrow-leaved and broad-leaved nonpersistent emergents (e.g., burreed, pickerelweed, and arrow-arum); there are also areas of submergent aquatic beds and wet meadows. Above the marsh, Sage Creek is a small, medium gradient, intermittent stream. Much of the land area bordering Sage Creek Marsh is undeveloped forest and open field; there is little evidence of human disturbance, except for several seasonal camps and permanent residences on the barrier beach at the mouth of the creek.Black tern (SC) nesting.
Sterling Creek and Wetlands	Cayuga	1,012	29	Relatively large, undisturbed, coastal wetland ecosystem; unusual in Great Lakes region. Critical habitat habitat consists primarily of approximately 900 acres of emergent marsh, dominated by broad-leaved cattail. This extensive wetland area is separated from Lake Ontario by a band of eroding drumlins and barrier beaches, located in Fair Haven Beach State Park. The park is heavily used for camping, picnicking, boating and water sports, resulting in some disturbance of the habitat. Much of the central marsh area is privately owned, and is bordered by undeveloped wooded hills and sparse residential development. Also included in the habitat are Sterling Creek, and its principal tributary, Sterling Valley Creek. These are relatively wide (25-50'), slow-moving, warmwater streams which meander through the marsh. A large, shallow, bay area (referred to as "The Pond"), containing dense beds of submergent aquatic vegetation, exists at the mouth of Sterling Creek.Northern harriers (T) occur in the area, but extent of use is not adequately documented.
Derby Hill	Oswego	108	26	Located along the southeastern shore of Lake Ontario, comprised of upland fields, woodlands, and bluffs. Critical habitat includes a small drumlin, containing abandoned fields, woodlots, and active agricultural lands. Derby Hill drops off abruptly into Lake Ontario, from an elevation of 316 feet above mean sea level (approximately 60 feet above the lake). This area includes most of the 60 acre Derby Hill Bird Observatory, Concentrations of raptors observed here during spring are unusual in New York State, but the species seen here are probably concentrated at many locations along the eastern shore of Lake Ontario. A valuable site for observation of migratory birds; a major source of population data in northeastern US, and one of the most popular birdwatching areas in New York.
Little Salmon River	Oswego	150	26	One of about 10 major Lake Ontario tributaries and associated wetlands, but rarity reduced by human disturbance. The Little Salmon River has a relatively wide (50-150'), deep, meandering channel, bordered by emergent wetland vegetation and wooded banks in undisturbed areas. Beds of submergent aquatic vegetation occur throughout this area. However, since the 1970's, portions of the lower river and adjacent area have been developed for residences, camps, marinas, and motorboat access facilities, resulting in considerable habitat disturbance.One of the most productive warmwater fish spawning areas around Lake Ontario (ecological subzone). A major access point to Lake Ontario.
Salmon Creek	Wayne	69	26	One of the largest and least disturbed tributaries of Lake Ontario in Wayne County. Critical habitat is an approximate six mile segment of the stream, extending from the mouth to a dam near the hamlet of Sodus Center. Salmon Creek is a shallow, medium gradient, coolwater stream, with perennial flow and a gravel and rubble substrate. Near its mouth, the creek (locally referred to as Maxwell Creek), forms an approximate 25 acre embayment known as Maxwell Bay. The bay contains extensive beds of submergent and emergent wetland vegetation, and is separated from Lake Ontario by a wooded barrier beach that averages about 100 feet in width. The outlet of Salmon Creek is relatively small and shallow. Salmon Creek drains approximately 26 square miles of rural farmland, and is bordered by woody riparian vegetation along much of its length. Habitat disturbances in the area are generally limited to road crossings, litter, and discharges of runoff from active agricultural lands.Concentrations of spawning salmonids are unusual in Wayne County. One of the most popular salmonid fishing ares on Lake Ontario's south shore (Finger Lakes region).

SE Lake Ontario Table 5. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Grindstone Creek and Marsh	Oswego	160	22	Relatively large, undeveloped, flood pond wetland and tributary ecosystem; unusual in Oswego County. Critical habitat is an approximate one and one-half mile section of the creek (up to N.Y.S. Route 3) and associated wetlands, comprising approximately 160 acres. This portion of Grindstone Creek has a relatively wide, deep, meandering channel, bordered by emergent wetland vegetation and wooded banks. The marsh is separated from the lake by a narrow barrier beach, and the outlet is very shallow. The northern half of this area, and the adjacent uplands, are located in Selkirk Shores State Park. One of the most popular recreational fishing areas on the eastern end of Lake Ontario.
East Bay	Wayne	120	19	An approximate 120-acre open water portion of the shallow, sheltered bay, situated north of the NYSDEC's Lake Shore Marshes Wildlife Management Area (East Bay Unit), and separated from the lake by a narrow, undeveloped, barrier beach. East Bay is relatively shallow (less than 10 feet deep), with dense beds of submergent aquatic vegetation, and a fringe of emergent wetland vegetation. The bay is intermittently connected to Lake Ontario by a very small inlet through the beach, and receives inflow from several small, low gradient, warmwater streams.

[a] Significance Value = [(Ecosystem Rarity + Species Vulnerability + Human Use + Population Level) x Replaceability]

SE Lake Ontario Table 6. Office of Parks, Recreation & Historic Preservation (OPRHP) land units (n=34) within the SE Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
Southwick Beach State Park	Jefferson	6	214
Westcott Beach State Park	Jefferson	6	316
Verona Beach State Park	Oneida	6	1,678
Fillmore Glen State Park	Cayuga	7	948
Long Point State Park	Cayuga	7	233
Sterling Conservation Easement	Cayuga	7	1,167
Chittenango Falls State Park	Madison	7	198
Helen L. Mcnitt State Park	Madison	7	154
Clark Reservation State Park	Onondaga	7	348
Frenchman Island	Onondaga	7	25
Green Lakes State Park	Onondaga	7	1,760
Battle Island State Park	Oswego	7	210
Mexico Point State Park	Oswego	7	126
Selkirk Shores State Park	Oswego	7	1,046
Allan H. Treman Marine Park	Tompkins	7	98
Buttermilk Falls State Park	Tompkins	7	733
Robert H. Treman State Park	Tompkins	7	860
Taughannock Falls State Park	Tompkins	7	816
Mark Twain State Park	Chemung	8	531
Canal Park - Lock 32 (Pittsford)	Monroe	8	15
Durand Eastman (Irondequoit Bay)	Monroe	8	18
Irondequoit Bay Marine Park	Monroe	8	30
Isaac (Irondequoit Bay)	Monroe	8	24
Canandaigua Lake Marine Park	Ontario	8	13
Watkins Glen State Park	Schuyler	8	704
Bonavista State Park	Seneca	8	251
Cayuga Lake State Park	Seneca	8	134
Lodi Point Marine Park	Seneca	8	12
Sampson State Park	Seneca	8	1,879
Seneca Lake State Park	Seneca	8	155
Beechwood State Park	Wayne	8	147
Chimney Bluffs State Park	Wayne	8	438
Fair Haven Beach State Park	Wayne	8	838
Keuka Lake State Park	Yates	8	647

SE Lake Ontario Table 7. NYSDEC Wildlife Management Area (WMA) land units (n=25) within the SE Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
Black Pond Wildlife Management Area	Jefferson	6	526
Honeyville Wildlife Management Area	Jefferson	6	111
Lakeview Marsh Wildlife Management Area	Jefferson	6	3,461
Littlejohn Wildlife Management Area	Oswego/Jefferson	7	8,020
Rome Wildlife Management Area	Oneida	6	1,004
Tug Hill Wildlife Management Area	Lewis	6	5,114
Tioughnioga Wildlife Management Area	Madison	7	3,705
Cicero Swamp Wildlife Management Area	Onondaga	7	3,961
Cross Lake Islands Wildlife Management Area	Onondaga	7	32
Hamlin Marsh Wildlife Management Area	Onondaga	7	1,473
Three Rivers Wildlife Management Area	Onondaga	7	3,497
Curtiss-Gale Wildlife Management Area	Oswego	7	45
Deer Creek Marsh Wildlife Management Area	Oswego	7	1,200
Happy Valley Wildlife Management Area	Oswego	7	8,703
Three Mile Bay / Big Bay Wildlife Mgmt. Area	Oswego	7	3,615
Connecticut Hill Wildlife Management Area	Tompkins	7	11,645
Northern Montezuma Wildlife Management Area	Cayuga/Wayne/Seneca	7, 8	6,937
Stid Hill Multiple Use Area	Ontario	8	840
Catharine Creek Wildlife Management Area	Schuyler	8	660
Canoga Marsh Wildlife Management Area	Seneca	8	104
Willard Wildlife Management Area	Seneca	8	158
Cold Brook Wildlife Management Area	Steuben	8	68
Galen Marsh Wildlife Management Area	Wayne	8	741
Lake Shore Marshes Wildlife Management Area	Wayne	8	6,179
High Tor Wildlife Management Area	Yates	8	6,288

SE Lake Ontario Table 8. NYSDEC State Forest and Unique Area land units (n=67) within the SE Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
Gould Corners State Forest	Jefferson	6	2,036
Pinckney State Forest	Jefferson/Lewis	6	2,166
Tug Hill State Forest	Jefferson/Lewis	6	11,981
Cottrell State Forest	Lewis	6	592
East Osceola State Forest	Lewis	6	2,150
Granger State Forest	Lewis	6	720
Lesser Wilderness State Forest	Lewis	6	11,333
Line Brook State Forest	Lewis	6	684
Lookout State Forest	Lewis	6	4,064
Mohawk Springs State Forest	Lewis	6	620
Raywood Unique Area	Lewis	6	279
Sears Pond State Forest	Lewis	6	5,856
Swancott Mill State Forest	Lewis	6	732
Swancott Hill State Forest	Lewis/Oneida	6	2,034
Big Brook State Forest	Oneida	6	3,857
Canada Creek State Forest	Oneida	6	622
Cobb Brook State Forest	Oneida	6	680
Fall Brook State Forest	Oneida	6	4,477
Fish Creek State Forest	Oneida	6	676
Florence Hill State Forest	Oneida	6	1,364
Furnace Creek State Forest	Oneida	6	1,396
Mad River State Forest	Oneida	6	2,925
Point Rock State Forest	Oneida	6	1,207
Rome Sand Plains Unique Area	Oneida	6	1,799
Stone Barn State Forest	Oneida	6	617
Tri-County State Forest	Oneida	6	474
West Branch State Forest	Oneida	6	528
West Osceola State Forest	Lewis/Oswego	6, 7	1,883
Bear Swamp State Forest	Cayuga	7	3,359
Frozen Ocean State Forest	Cayuga	7	750
Summer Hill State Forest	Cayuga	7	4,413
Hewitt State Forest	Cortland	7	946
Kennedy State Forest	Cortland	7	4,470
Labrador Hollow Unique Area	Cortland	7	1,489
Deruyter State Forest	Madison	7	972
Nelson Swamp Unique Area	Madison	7	874
Stoney Pond State Forest	Madison	7	1,492
Camillus Forest Unique Area	Onondaga	7	351
Morgan Hill State Forest	Onondaga	7	2,174
Split Rock Unique Area	Onondaga	7	29
Altmar State Forest	Oswego	7	934
Battle Hill State Forest	Oswego	7	1,692
Chateaugay State Forest	Oswego	7	3,447
Hall Island State Forest	Oswego	7	2,454
Kasoag State Forest	Oswego	7	986
Klondike State Forest	Oswego	7	881
O'Hara State Forest	Oswego	7	1,021
Orton Hollow State Forest	Oswego	7	514
Salmon River Falls Unique Area	Oswego	7	110
Salmon River State Forest	Oswego	7	2,095
Sandy Creek State Forest	Oswego	7	535
Sandy Pond Beach Unique Area	Oswego	7	83
Stone Hill State Forest	Oswego	7	1,020
Trout Brook State Forest	Oswego	7	635
Winona State Forest	Oswego	7	9,387
Danby State Forest	Tompkins	7	7,011
Hammond Hill State Forest	Tompkins	7	3,578
Shindagin Hollow State Forest	Tompkins	7	5,252
Yellow Barn State Forest	Tompkins	7	1,292
Squaw Island Unique Area	Ontario	8	< 1
Coon Hollow State Forest	Schuyler	8	2,522
Sugar Hill State Forest	Schuyler	8	8,951
Texas Hollow State Forest	Schuyler	8	912
Pigtail Hollow State Forest	Steuben	8	1,015
Urbana State Forest	Steuben	8	2,728
Bare Hill Unique Area	Yates	8	296
Italy Hill State Forest	Yates	8	1,918

SE Lake Ontario Table 9. Bird Conservation Areas (BCA) within the SE Lake Ontario Basin (n=3). NYSDEC's BCA Program, established in 1997, is modeled after the National Audubon Society's Important Bird Areas (IBA) program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to state-owned properties.

Bird Conservation Area	County	DEC Region	Acres	Description
Eastern Lake Ontario Marshes	Jefferson/Oswego	6, 7	4,940	A complex of long barrier beaches, embayments, dunes, marshes, and swamps with cold water streams. Lakeshore barrier beach and wetland complexes such as this are rare in New York State. This area has been recognized by the Department of State as a Significant Coastal Fish and Wildlife Habitat and, in part, has also been designated as a National Natural Landmark. This BCA has significant breeding and over-wintering habitats, and serves as a critical migratory corridor for birds. Critical habitats include a mosaic of Great Lakes inland dunes and high quality wetlands with extensive barrier beaches backed by shrub/scrub and forested lands. Rare or exemplary ecological communities: silver maple-ash swamp, Great Lakes dunes, rich shrub fen, medium fen, red maple-hardwood swamp, red maple-tamarack peat swamp, maple-basswood rich mesic forest, deep emergent marsh, sand beach.
Montezuma Wetlands Complex	Seneca/Wayne/Cayuga	7, 8	6,937	Part of a larger complex of state, federal and private lands.Critical habitats include high quality wetlands bordered by deciduous forest and shrub/scrub, open agricultural fields, and grasslands provide diverse habitat for bird species. Riparian wetlands provide open water and flood plain forests. Unique habitats include bogs and inland salt marshes. Exemplary ecological communities include: deep emergent marsh, shallow emergent marsh, shrub swamp, forested wetlands. The site hosts one of the largest migratory concentrations of waterfowl in the Northeast. Over 500,000 Canada Geese pass through the complex during migration. During spring migration, over 25,000 Snow Geese regularly use the area. In late fall, Mallard numbers peak at 100,000 and American Black Ducks at 25,000 or more. This BCA is one of the most significant stopover and foraging locations for shorebirds in upstate New York, regularly hosting 1,000 or more individuals of 25 species. The site supports breeding colonies of Great Blue Heron and Black-crowned Night Heron and hosts one of the largest fall swallow concentrations in the state, sometimes estimated at more than 50,000-100
High Tor	Yates/Ontario	8	6,288	Area includes three separate areas of diverse habitat including approximately 3,400 acres of steep wooded terrain with several man-made impoundments; 1,700 acres of freshwater marsh bordering the south end of Canandaigua Lake; and 1,000 acres of overgrown fields with steep, wooded hillsides. A concentration site for migratory species, at-risk species, and overall bird diversity. Species of interest include: Pied-billed Grebe (Threatened), Bald Eagle (Threatened), Least Bittern (Threatened), American Bittern (Special Concern), Northern Goshawk (Special Concern), Cooper's Hawk (Special Concern), Bobolink, and Canada Warbler.

SE Lake Ontario Table 10. Critical Environmental Areas (CEA) within the SE Lake Ontario Basin (n=6). CEAs are traditionally designated by DEC to protect drinking water supplies; however, DEC and other government agencies may designate CEAs to protect wildlife and their habitats and other natural resource elements.

Critical Environmental Area	Location	DEC Region	Reason for Designation
Sandy Pond	Sandy Creek, Oswego County	7	Protect barrier dunes,wetlands,resources
Coy Glen	Ithaca, Tompkins County	7	Wide variety of botanical species
Ninemile Creek	Camillus, Onondaga County	7	Protect habitat, water quality
Cobbs Hill	Rochester, Monroe County	8	Protect open space
Pinnacle Hill	Rochester, Monroe County	8	Protect open space
Village of East Bloomfield	East Bloomfield, Ontario County	8	Protect the municipal water supply

SE Lake Ontario Table 11. Critical **aquatic** habitats found in the SE Lake Ontario Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Palustrine	mineral soil wetland	30
Riverine	cold water stream	15
Lacustrine	cold water deep	12
Lacustrine	warm water shallow	12
Riverine	warm water stream	12
Palustrine	peatlands	8
Lacustrine	warm water deep	7
Lacustrine	cold water shallow	6
Riverine	deep water river	6
Riverine	unknown	5
Lacustrine	unknown	4
Riverine	coastal plain stream	4
Lacustrine	coastal plain	2
Palustrine	unknown	1
Riverine	warm water deep	1
Riverine	warm water shallow	1

SE Lake Ontario Table 12. Critical **terrestrial** habitats found in the SE Lake Ontario Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Terrestrial	open upland	45
Terrestrial	forested	38
Terrestrial	barrens/woodlands	17
Terrestrial	coastal	7
Terrestrial	alpine/mountain	3
Subterranean	natural/cultural	1
Terrestrial	unknown	1

SE Lake Ontario Table 13. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the SE Lake Ontario Basin
For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Habitat Loss - cultural (e.g., development)	30	62.5	10.8
Contaminants	22	45.8	7.9
Degradation of Water Quality	18	37.5	6.5
Human Disturbance - illegal/unregulated harvest	15	31.3	5.4
Barriers to Movement in Aquatic Habitats (e.g., dams, weirs, culverts)	14	29.2	5.0
Human Disturbance - collisions	14	29.2	5.0
Interspecific Competition for Resources	14	29.2	5.0
Disrupted Predator-Prey Cycles	13	27.1	4.7
Human Disturbance - general	12	25.0	4.3
Disease	10	20.8	3.6
Fragmentation	10	20.8	3.6
Habitat Loss - natural (e.g., succession)	9	18.8	3.2
Competition from Invasive Exotics	8	16.7	2.9
Sedimentation/Erosion (impacts on aquatic habitats)	8	16.7	2.9
Insensitive/Unsustainable Agricultural/Silvicultural Practices	7	14.6	2.5
Active Alteration/Suppression of Natural Processes (e.g., fire)	6	12.5	2.2
Unknown Threats	6	12.5	2.2
Loss of Streamside Buffers	5	10.4	1.8
Altered Hydrology (water level management/extraction)	5	10.4	1.8
Human Disturbance - entanglement, entrainment, impingement	5	10.4	1.8
Habitat Composition Altered by Aquatic Invasive Species	4	8.3	1.4
Reduction of Patch Size, Shape, Area	4	8.3	1.4
Loss of Connectivity/Metapopulation Dynamics	4	8.3	1.4
Susceptibility to Stochastic Events (weather, storms)	4	8.3	1.4
Susceptibility to Stochastic Events (isolated pop'ns)	4	8.3	1.4
Climate Change (change in water level, temperature)	4	8.3	1.4
Habitat Composition Altered by Terrestrial Invasive Species	3	6.3	1.1
Detrimental Hybridization	3	6.3	1.1
Susceptibility to Stochastic Events (rare species)	3	6.3	1.1
Barriers to Movement in Terrestrial Habitats (e.g., roads, powerlines)	2	4.2	0.7
Pollution (e.g., acid rain, soil contamination)	2	4.2	0.7
Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	4.2	0.7
Loss of Host Species	2	4.2	0.7
Parasites	2	4.2	0.7
Climate Change (change in species range, distb'n, migration)	2	4.2	0.7
Aquatic Habitat Composition Altered by Overuse (e.g., swans, muskrat)	1	2.1	0.4
Negative Edge Effects (i.e., increased predation, "ecological traps")	1	2.1	0.4
Aquatic Habitat Altered by Natural Processes (e.g., beaver)	1	2.1	0.4

SE Lake Ontario Table 14. Approved State Wildlife Grant studies relevant to the SE Lake Ontario Basin (Coordination Grant T-1, Wildlife Grants T-2-1 and T-2-2, and Fish/Marine Grant T-3).

State Wildlife Grant Study	Location	Description
COORDINATION GRANT		
Project 1: Comprehensive Wildlife Conservation Planning & Coordination		
Job 1: SWG Coordination & Development of the Comprehensive Wildlife Conservation Strategy	Statewide	New York will develop a Comprehensive Wildlife Conservation Strategy by October 2005, focusing on species of greatest conservation need in the state. We will work closely with partner organizations and the public to develop the plan, which will identify management needs, goals and strategies for more than 500 animal species that are rare, declining, vulnerable, or status unknown in New York State.
WILDLIFE CONSERVATION GRANT		
Project 1: Conservation Planning for Species of Greatest Conservation Need		
Bird Conservation		
Job 1: New York State's 2nd Breeding Bird Atlas	Statewide	New York completed its first Breeding Bird Atlas during 1980-1985, and the second atlas project (2000-2004) is underway. State Wildlife Grant funding will ensure completion of the second atlas, which will document the current distribution of breeding birds in New York State and quantify changes in distributions of species between the two atlas periods. Once completed, Atlas results will be made available in book and web-based formats for use by conservation biologists, planners, and the public.
Job 2: Developing a Grassland Bird Conservation Plan for New York State	Statewide, where grassland habitats are present	Because of widespread loss and fragmentation of grassland habitat, grassland bird populations are declining in New York and throughout North America. This project will develop a comprehensive plan to guide and direct grassland bird conservation and management on public and private lands in New York State. The plan will help direct conservation efforts to the most important areas, provide guidance to grassland owners and managers, and identify monitoring and research needs for grassland birds.
Job 3: Spruce Grouse in Lowland Boreal Habitat of New York State: Distribution, Populations and Movements	Essex, Hamilton, Herkimer counties	The spruce grouse is an endangered species in New York, where some of its spruce-fir forest habitat has been lost due to forest maturation, habitat fragmentation, and logging. Confusion with the more common ruffed grouse has led to accidental hunting, and the species' unwariness has made it vulnerable to human disturbance. Urgently needed are: surveys to determine status and distribution; research to assess factors causing rarity or declines; population or habitat protection and management to secure the species' status; and completion and implementation of a state recovery plan. This project will help address those needs.
Job 4: Common Loon Migration and Wintering Areas	Adirondack Park	We know very little about where common loons, a species of special concern in New York State, spend their non-breeding periods. This project will use satellite telemetry to determine migration routes, wintering areas and seasonal movements of loons that summer in New York. The results will help identify potential threats to common loons during non-breeding periods, including coastal energy developments, exposure to Type E botulism in the Great Lakes, ocean contaminants, and commercial fishing gear.
Job 5: Golden-winged Warbler Habitat and Hybridization Study	Sterling Forest State Park, Orange County	The golden-winged warbler has declined at an annual rate of 8 percent for the last 35 years in the northeastern U.S. Possible factors in its decline include reforestation and range expansion of the blue-winged warbler. This project will investigate genetics and habitat segregation among these two species. Results will help to establish whether they should be considered distinct species and provide guidance for habitat management plans to sustain golden-winged warbler populations.
Job 6: Conservation Plan for Common Terns in Upstate New York	Oneida Lake & St. Lawrence River	Nesting populations of common tern, a threatened species in New York, occur in three upstate areas (Niagara River, Oneida Lake and St. Lawrence River). Most nesting occurs on artificial structures such as piers and navigation structures, which often require annual maintenance of nesting substrate, predator deterrents, and other measures to ensure successful nesting. In order to make management efforts more effective and efficient, a long-term plan will be developed for conservation of common terns in upstate New York.
Job 17: Marshbird Conservation in New York State	Statewide, where freshwater emergent marshes are present	Baseline information on distribution and abundance is needed for many marsh-nesting species in New York State. Species of concern include pied-billed grebe, black tern, least bittern, American bittern, and king rail. This project will survey representative freshwater marsh habitats across the state during 2004-2006 to quantify abundance and habitat use of marsh birds, identify focus areas for marsh bird conservation, and develop a long-term monitoring program.

SE Lake Ontario Table 14. (continued)

State Wildlife Grant Study	Location	Description
Job 18: Coordinated Comprehensive Bird Monitoring Plan for New York State	Statewide	Comprehensive and coordinated monitoring programs are needed to reliably assess the status of all bird "species of greatest conservation need" in New York State. This project will document details of existing bird monitoring and survey programs in New York and assess their utility for monitoring various species of concern. We will form a bird monitoring partnership, involving agencies, organizations, and individuals, to recommend and help implement new or improved monitoring and survey programs for all bird species in New York State.
Job 19: Assesment of Boreal Forest Bird Habitats in the Adirondack Park	Adirondack Park	Boreal forests are recognized as critical breeding grounds for a variety of bird species that occur nowhere else in New York State. Within the state there are two relatively distinct assemblages of bird species found in "low elevation" and "high elevation" boreal forest types, each of which includes a number of New York's "species of greatest conservation need." The overall goal of this project is to better quantify the status and habitat requirements of various low and high elevation boreal forest birds.
Job 21: Use of Radar to Document Bird and Bat Migrations in New York State	Lewis, Jefferson, Oswego counties	Effective conservation of migratory birds and bats, including many species of greatest conservation need, requires better information on their migration patterns through New York State. This information is needed to help plan wind energy developments (or other tall structures) to prevent significant mortality of migratory species. This project will assess the utility of various techniques, including radar studies, acoustic monitoring, and thermal imaging for documenting timing, altitude, corridors or stopover habitats of birds and bats migrating through New York State.
Job 22: Golden-winged Warbler Habitat Restoration Investigation	Sterling Forest State Park, Orange County	The golden-winged warbler (GWWA) has declined at an annual rate of eight percent for the last 35 years in the northeastern U.S. and is a candidate for federal listing as a threatened or endangered species. Possible factors in its decline include loss of habitat due to reforestation and hybridization with the blue-winged warbler. Results of prior SWG-funded research will be used to design and conduct an experimental habitat restoration project in Sterling Forest State Park to assess the feasibility of creating or maintaining suitable habitat for GWWA in southeastern New York.
Mammal Conservation		
Job 7: Determining Winter Roost Selection of *M. leibii* and summer destination of hibernating *M. sodalis* and *M. Leibii*	Essex and Ulster counties	The small-footed bat is the least common bat encountered during winter surveys in the eastern U.S., and 75 percent occur in New York. The species may be more common than winter counts suggest because it hibernates in hidden locations (under rocks, in crevices). DEC plans to radio-tag a sample of these bats as they enter a major hibernaculum to determine how many are detected during routine surveys. We also plan to radio-tag Indiana and small-footed bats as they emerge from their hibernacula and follow them by airplane to determine summer distribution and habitat preferences.
Job 8: Feasibility of Implementing a Robust Design Mark-Recapture Study for Indiana Bats	Statewide, where Indiana bats are present	The Indiana bat, a federally endangered species, has declined from roughly 600,000 in the 1960s to about 350,000 today. Population declines in southern portions of its range, primarily Kentucky and Missouri, have far exceeded increases in the north, including New York. We hope to conduct a large scale mark-recapture study to identify causes of the decline and regional differences in population trends. The first step is a feasibility study to determine if we can adequately address assumptions of the study design.
Job 9: Determining the Feasibility of a Statewide Summer Survey of Tree Bats	Statewide, north of NYC and Long Island	Tree bats (red, hoary and silver-haired bats) are among the least understood vertebrates in the state. We do not know the current status or distribution of any of these species, and the most comprehensive surveys were conducted more than 100 years ago. Recent technical innovations have increased the reliability of field sampling while reducing costs. We plan to conduct initial surveys to determine the costs and effectiveness of conducting a statewide status survey for tree bats in New York State.
Reptile & Amphibian Conservation		
Job 10: Assessment of the Status and Abundance of High Priority Reptile and Amphibian Species	Statewide	As a group, a higher proportion of amphibian and reptile species have suffered significant declines than any other vertebrate groups in New York State. To date, much effort has been placed on documenting distribution of these endangered and threatened species. This project will focus on collecting information on the status of known populations, following standard protocols, so that conservation efforts can be prioritized on those in greatest need.
Job 12: Reducing Turtle Mortality During Nesting	Statewide	Certain turtle species experience high mortality of females when they migrate from over-wintering locations to traditional egg-laying sites. This project will investigate methods of reducing this mortality through use of subsurface tunnels for crossing roadways, creation of protected nesting sites, and predator exclusions.

SE Lake Ontario Table 14. (continued)

State Wildlife Grant Study	Location	Description
Job 25: Spiny Softshell Turtle Survey and Life History Studies	Shores of Lake Ontario and its tributaries	Little is know about the distribution, life history, seasonal movements, and habitat-use of spiny softshell turtles in New York State. NYSDEC will assess the status and distribution of spiny softshell turtles in the Finger Lakes and the bays on the southern shore line of Lake Ontario, including the streams and creeks that enter Lake Ontario, in order to make recommendations concerning the management of critical habitats for this species.
Job 26: Reptile and Amphibian Species Inventory (cont'd from Job 10, Grant T-2-1)	Statewide	Previous studies have identified many reptile and amphibian species in need of conservation, which is the first step in developing baseline information to measure changes in populations. This project will help complete surveys of other reptile and amphibian species that are listed as species of special concern by New York State. Completion of these surveys will produce a mechanism to assure continuity of surveys for this group of species, as gather well as data to determine the status of special concern reptile and amphibian species.
Invertebrate Conservation		
Job 15: Odonate Inventory	Statewide	There is a need for a comprehensive survey or inventory for odonates (dragonflies and damselflies) statewide. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state.
FISH AND MARINE CONSERVATION GRANT		
Project 1: Conservation Planning for Aquatic Resources		
Freshwater Fish Conservation		
Job 1: Adirondack Round Whitefish Investigation	Adirondack Park	Round whitefish are classified as threatened in New York and their recovery plan calls for an investigation of causes for and solutions to their decline. This project will include field studies to develop sampling protocols in Adirondack lakes, evaluate existing stocking efforts, and prioritize historic waters for likelihood of successful reestablishment.
Job 2: Conservation of Lesser Known Species of Fish	Statewide	This project involves review of DEC and New York State Museum fish records to identify information needs about the status of rare species. Findings will be used to plan new surveys that will eventually allow a complete assessment of the status and distribution of these "lesser known" freshwater fish species of New York State.

For more information on these projects visit NYSDEC website at www.dec.state.ny.us
or contact NYSDEC at:
State Wildlife Grants Program Coordinator
New York Division of Fish, Wildlife and Marine Resources
625 Broadway
Albany, NY 12233-4754
Phone: (518) 402-8924
Fax: (518) 402-8925
swgidea@gw.dec.state.ny.us

SE Lake Ontario Table 15. Existing management plans and agreements relevant to the SE Lake Ontario Basin. This is an assortment of the major planning efforts within the Basin and is not a comprehensive list. Other planning efforts may exist at both the local and landscape scale and should be consulted before implementing conservation actions.

Plan/Agreement Name	Involved Parties	Information
Cayuga Lake Watershed Preliminary Watershed Characterization (2000)	Genesee/Finger Lakes Regional Planning Council	State of the basin; sources of contamination; limnology; programmatic environment; public education; interim recommendations
Protecting the Cayuga Lake Watershed Interactive Guide (2000)	Cayuga Lake Watershed Network	Overview of the study of watersheds; planning and management process in the watershed
Cayuga Lake Watershed Restoration & Protection Plan (2001)	Genesee/Finger Lakes Regional Planning Council	Goals, description of the basin, strategies, threats, monitoring
Seneca Lake Watershed Management Plan (1999)	Genesee/Finger Lakes Regional Planning Council	Description of the basin, threats, trends
Fish Community Objectives for Lake Ontario (1999, 2003)	NYSDEC, Ontario MNR	Goals, description of the lake, habitat alterations, fish species, management actions
Twenty-five Year Plan for the Great Lakes (1991)	NYSDEC	Goals, water quality, economic development, interstate/international partnerships
Lakewide Management Plan for Lake Ontario (1998)	USEPA, Environment Canada, NYSDEC, Ontario Ministry of the Environment	Problem identification, public involvement, monitoring progress
Biodiversity Around the Great Lakes (2002)	USEPA, Purdue University	Educational software program, Great Lakes history, case studies, monitoring, species inventory, habitat restoration
Fish and Wildlife Habitat Status and Trends in the Canadian Watershed of Lake Ontario (2000)	Environment Canada, CWS Ontario Region	Current habitat conditions, threats, current habitat protection/restoration efforts, summary analysis of the status of fish and wildlife habitat, monitoring/evaluation
Strategic Plan for Wetlands of the Great Lakes Basin (1993)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Twenty-five year strategy for wetlands conservation in the Great Lakes Basin
Great Lakes Wetlands Conservation Action Plan (1994, 2002)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Long-term strategies for wetland conservation, implementation of the 25-year Strategic Plan for Wetlands of the Great Lakes Basin
Great Lakes Wetlands Conservation Action Plan Report 2000-2003	Environment Canada	Wetland conservation highlights, review of strategies, partners
Conservation Blueprint for the Great Lakes (2003)	The Nature Conservancy	Preserving biodiversity; framework for action; scientific foundation; threats
Towards a New Conservation Vision for the Great Lakes Region: A Second Iteration (2003)	The Nature Conservancy	Ecoregional planning, visions, goals, identify datagaps and core conservation areas, threats, target species
Great Lakes Strategy - A Plan for the New Millennium (2002)	US Policy Committee for the Great Lakes	Goals, chemical, physical, and biological integrity, partnerships
Final Environmental Impact Statement Double-crested Cormorant Management in the United States (2003)	U.S. Fish and Wildlife Service, USDA APHIS Wildlife Services	Cormorant population trends and impacts on wildlife and habitats, public input process, evaluation of action alternatives, selection of an alternative and justification
NYSDEC Unit Management Plans	NYSDEC	Assessment of the natural and physical resources present within a unit; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Camillus Forest Unique Area (Draft) Nelson Swamp Unique Area (1999) Rome Sand Plains Unique Area (Draft) Salmon River Falls Unique Area (Draft) Six Nations State Forest (1997)		
Bird Conservation Area Management Guidance Summaries	NYSDEC, OPRHP, Audubon	A physical description of the site, BCA criteria met, important species & habitat types, guidance for management, op/maintenance, research, education and outreach. Includes local contacts.
Eastern Lake Ontario Marshes Montezuma Wetlands Complex High Tor		
Wildlife Management Area Plans	NYSDEC	Assessment of the wildlife, habitats and physical resources present; history of the property; management, op/maintenance, research, education and outreach objectives; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Catharine Creek (1984) Cicero Swamp (1960) Connecticut Hill (1970) Deer Creek Marsh (1975) Galen Marsh (1987) Happy Valley (1970) High Tor (1982) Lake Shore Marshes (1983) Lakeview (1970) Littlejohn (1970) Northern Montezuma (2000) Stid Hill (1987) Three Mile Bay / Big Bay (1970) Three Rivers (1970) Tioughnioga (1970) Tug Hill (1970) Willard (1972)		

Description of the basin

The Southwest Lake Ontario Basin covers an area of 2.2 million acres in western and central New York. The basin stretches across the state from north to south and includes three major subwatersheds, the West Lake Ontario, Lower Genesee, and Upper Genesee. There are 13 major municipalities within the basin, including the western part of the city of Rochester, and all or part of 10 counties. The basin-wide human population estimate in 2000 was 1.2 million people, with population density varying from relatively low density in the southern portion of the basin, to moderate density in the north, to high density in the Rochester metro area. The basin is a highly diverse landscape ecologically and topographically covering several ecological zones and a wide variety of vegetative cover, wildlife habitat, and land use.

The southern half of the basin is within the High Appalachian Plateau ecozone, including portions of the Central Appalachians, Cattaraugus Highlands, and a small section of the Allegheny Hills subzones. This large area is predominantly deciduous forest cover on rolling to moderately steep topography with occasional coniferous plantations. The northern part of the basin, which lies within the Erie Ontario Plain subzone of the Great Lakes ecozone, is by contrast primarily an agricultural region with scattered and fragmented forest stands and is generally flat. A significant land form in this portion of the basin is the Niagara Escarpment which runs through southern and central Ontario, Canada and western New York. The escarpment is especially prominent in the Niagara County area of New York.

Wetland habitats in the basin include wooded swamps, emergent marshes, wet meadows, riparian and linear wetlands, shrub swamps, and open water habitats, with the majority of these wetlands being located in the central and northern portions of the basin. There are 7466.6 miles of mapped streams in the basin, which include a diversity of cold water trout streams and slow-moving rivers. The major river in the basin is the Genesee River, which originates in Pennsylvania and drains into Lake Ontario near Rochester. The Mt. Morris Dam, built by the U.S. Army Corps of Engineers in 1952 to provide flood control, splits the Genesee into two major subwatersheds (upper and lower). The Erie Canal passes through the northern part of the basin and provides water to many basin tributaries, thereby affecting water quantity and quality. Many ponds and small lakes encompassing thousands of acres of open water, and the basin contains several of the smaller, western glacial Finger Lakes (Silver, Honeoye, Canadice, Hemlock, and Conesus), which in themselves offer varied habitats. The portion of Lake Ontario in the basin includes 90 miles of shoreline and extends north into the lake to the international border with Canada.

According to the U.S. Environmental Protection Agency's Multi-Resolution Land Classification (MRLC) map information, the predominant land cover classifications are agricultural lands (row crops - 39% and pasture/hay - 16%), deciduous forest (26%) and mixed forest (12%) (Southwest Lake Ontario Table 1, Southwest Lake Ontario Figure 1). Just over 4% of the basin is classified as developed land. The MLRC national data distinguishes between natural grassland and old fields, hay, pasture, and row crops, but although there is evidence that grasslands were historically found in the basin, there are no lands in the basin currently classified by the MLRC as natural grasslands. In New York, however, our pasture/hay and row crops are sometimes referred to as grasslands by many management agencies, including the Department of Environmental Conservation (DEC).

A wide variety of different types of government-owned lands in the basin provides a diversity of habitat types. Iroquois National Wildlife Refuge, the only national wildlife refuge in the basin, straddles the municipal boundaries of Shelby in Orleans County and Alabama in Genesee County and is abutted by DEC - managed Oak Orchard Wildlife Management Area (WMA) to the east and Tonawanda WMA (partially in the basin) to the west. Lands managed by DEC in the basin include wildlife management areas (Southwest Lake Ontario Table 2) and state forest lands (Southwest Lake Ontario Table 3). The state forest lands include one unique area and many state forests for a total of more than 80,000 acres. Of the many state parks in the basin (Southwest Lake Ontario Table 4), the largest is Letchworth State Park at more than 14,000 acres. The park encompasses the Genesee River from near Mount Morris Dam to Portageville to the south. Several of the other state parks in the basin are located along the Lake Ontario shoreline. Some county, city and town properties in the basin provide significant habitat for Species of Greatest Conservation Need (SGCN). For example, the City of Rochester owns 7,100 acres of land around Hemlock and Canadice lakes which were acquired to help secure their water supply. The Tonawanda Indian Reservation, governed by the Tonawanda Band of the Seneca Nation of Indians, is largely in the basin just south of the Tonawanda WMA and also provides habitat for SGCN. Other protected areas in the basin include lands owned by non-governmental organizations (NGO). For example the Nature Conservancy owns lands in the western Finger Lakes region, and the Bergen Swamp Preservation Society owns lands in and around Bergen Swamp in Genesee County. Other areas of land in the basin are protected by means other than ownership by a government agency or NGO. For example, some privately owned lands are protected by a conservation easement or are under a formal cooperative agreement through programs offered by organizations like the U.S. Department of Agriculture, Natural Resources Conservation Service and United States Fish and Wildlife Service.

In addition, several types of specially designated areas in the basin provide important wildlife habitat and may offer some degree of protection. Bird conservation areas (BCA) (Southwest Lake Ontario Table 5) are designated by New York State at the Braddock Bay and Oak Orchard wildlife management areas. These BCAs are modeled after the National Audubon Society's Important Bird Areas Program (IBA). The basin contains 8 state-designated Critical Environmental Areas (CEA) (Southwest Lake Ontario Table 6), which are traditionally designated by DEC to protect drinking water supplies but may also be designated for a variety of other reasons and by other government agencies. Some may provide habitat for SGCN. For example, the City of Rochester designated broad categories of CEAs to protect wetlands, wooded properties in the city, steeply sloped areas, designated open space, and lands within 100 feet of major waterways. Ten areas are designated as Significant Coastal Fish and Wildlife Habitat (Southwest Lake Ontario Table 7) by the Department of State, many of which have confirmed or suspected populations of SGCN.

There are 68 state-classified inactive hazardous waste sites in the basin, 25 of which are in the City of Rochester. All the sites range in classification from Class 2 to Class 4, with the majority of them being Class 2 sites that pose a significant threat to public health or the environment and require action. Class 3 sites do not present a significant threat to the public health or the environment, and Class 4 sites are those that are properly closed but require continued management.

Critical habitats of the basin and the species that use them

There are 130 SGCN species that currently occur in the basin and 27 species that historically occurred in the basin but are now believed to be extirpated (Southwest Lake Ontario Tables 8-10). Of those 130 SGCN currently occurring in the basin, it is believed that the populations of 39 species are decreasing, 8 are increasing, 7 are stable, and 76 are of unknown status.

The Natural Heritage Program's Element Occurrence Database indicates that the Southwest Lake Ontario Basin contains important habitats for many rare mollusk, insect, bird, and herpetofauna species. For example, the Southwest Lake Ontario basin sustains important populations of grassland-breeding birds, including areas designated by the New York Natural Heritage Program as critical for preservation of grassland species biodiversity and significant ecological communities. All 11 grassland-breeding bird species that are listed as SGCN in New York appear to be experiencing declines, although some are too rare to determine a precise trend. In response to these declines, Audubon New York has gathered a consortium of the agencies and organizations active in grassland conservation in New York. This group is working to coordinate projects and identify target areas for future conservation projects. Portions of the basin have been designated by this group as priority "grassland wildlife zones" to focus conservation efforts and spending on these vital grassland bird populations and habitat. The basin also has statewide significance for a variety of other SGCN, including marshbirds, riparian tiger beetles (one of only two known cobblestone tiger beetle populations in New York State was recently discovered on the Genesee River near Letchworth State Park), Eastern massasauga rattlesnakes (one of only two known New York populations occurs in the basin), and western chorus frog (may be one of the most robust populations in the state).

Because fish are generally harder to collect and identify than many other wildlife species, there is, a tendency to give them less attention simply because we know less about them. Aquatic organisms are generally more difficult to observe, and it is more difficult to identify their habitat requirements. Further complicating this is that aquatic habitats may actually be more easily disturbed. According to the Comprehensive Wildlife Conservation Strategy species accounts, nearly 50% of the fish species of greatest conservation need that historically occurred in the Southwestern Lake Ontario Basin are no longer found there. Some fish species, such as black redhorse, are found in very limited distribution statewide, and the Southwest Lake Ontario basin is one of only two basins statewide where this species is found. In addition, a stable, remnant population of western pirate perch has been documented in Buttonwood Creek, and efforts to restore lake sturgeon to the Genesee River have begun.

The species of greatest conservation need in the basin are dependent on a wide variety of habitat types, and many of these species require multiple habitats throughout their life cycles. DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycles at the system and subsystem levels were extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The last column of the table indicates the number of species that indicated the system-subsystem as critical habitat. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger at al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers in DEC, e.g., "cold water-shallow".

Each of these systems and subsystems is further refined into a habitat category in the CWCS planning database and can be viewed in the Taxa Reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. These critical habitats are not a comprehensive listing of all the habitat associations found in the basin; rather they are a subset of the habitats deemed critical to SGCN that occur in the basin (Southwest Lake Ontario Tables 11 and 12). In addition, a single species may require multiple habitats throughout its life cycle, so the total of the final columns may exceed the 157 SGCN that presently occur or historically occurred in the basin.

Certain locations in the Southwestern Lake Ontario Basin provide especially important habitat for SGCN because of one or more of the following characteristics:

- rarity or uniqueness of the habitat type(s) present
- the presence of multiple, contiguous habitat types
- protection and/or management of wildlife, and a particularly low degree of human encroachment and development.

Examples of some of these areas are listed and described below.

Iroquois Wetland Complex

Consists of Iroquois National Wildlife Refuge (10,818 acres), Oak Orchard WMA (2,500 acres) and Tonawanda WMA (5,684 acres - a portion of which is in the basin), the Iroquois wetland complex encompasses nearly 20,000 acres of wildlife habitat in the Great Lakes plain between Buffalo and Rochester. The complex is composed primarily of wetland habitat (emergent marshes, hardwood swamps, wet meadows, and scrub/shrub), but also includes large areas of grassland and upland forest. The area, which has been identified as both an IBA and a BCA, provides important nesting habitat for a large number of bird SGCN, including freshwater marsh nesting birds (black tern, least bittern, pied billed grebe, and American bittern), grassland birds (bobolink, grasshopper sparrow, Henslow's sparrow, eastern meadowlark, northern harrier, and sedge wren), bald eagles, cerulean warblers and prothonotary warblers. In addition, the area is a significant stopover for migrating waterfowl and other species and provides habitat for several herpetofauna SGCN.

Letchworth State Park and Surrounding Area

Letchworth State park lies along the Genesee River and contains deep gorges (up to 550 feet deep), waterfalls, a 6-mile-long canyon and a variety of habitat types. The habitats include deciduous woods, shrub/scrub, riparian, coniferous and mixed woods, grasslands, and wetlands. The portion of the Genesee River that flows through the park is designated as a scenic river under the Wild, Scenic, and Recreational Rivers state legislation. This is the only river in the basin designated under the program. The Mount Morris Dam National Recreation Area is wholly contained within the park. Letchworth State Park and the surrounding area provide important habitat for many forest and grassland breeding birds of greatest conservation need and has been identified as an IBA. Of particular importance, the Letchworth area may contain the largest population of yellow-breasted chat in New York State. In addition, as mentioned above, one of just two cobblestone tiger beetle populations in the state has been located in sparsely vegetated gravel bar habitat along the Genesee River near the park.

Bergen Swamp

Located in eastern Genesee County and a remnant of glacial Lake Tonawanda, the Bergen Swamp/Black Creek area is a large wetland/riverine complex which contains a diverse assemblage of habitat types, including some very rare natural communities. The area consists of northern white cedar forest, open marl, pine-hemlock, and beech-maple deciduous forest, and contains a high diversity of flora and fauna. Bergen Swamp is designated as an IBA and provides habitat for a variety of bird SGCN (including the Canada warbler, willow flycatcher and blue-winged warbler) and herpetofauna SGCN (including Eastern massasauga, Jefferson salamander, spotted turtle, queen snake, and coal skink).

Braddock Bay Complex

Located along the shore of Lake Ontario west of the city of Rochester, the Braddock Bay Complex includes the 2,125 acre Braddock Bay WMA, 375 acres of land leased by the town of Greece, and privately owned lands (including lands owned by the Genesee Land Trust). Habitat types include lakeshore, freshwater wetlands, ponds, deciduous woods, and grasslands. These habitats are all contained within an environment with significant suburban development. Designated as both an IBA and a BCA, the area is a significant stopover site for migrating owls and songbirds and has large spring hawk flights. A number of SGCN breed in the complex, including northern harrier, sedge wren, and several freshwater marsh nesting birds such as least bittern, pied-billed grebe, American bittern, and, historically, black tern. Buttonwood Creek, immediately upstream of Braddock Bay, is an important habitat for the western pirate perch. This portion of the stream presently receives minimal protection under the ECL, where habitat disturbance is the biggest threat to this species. The Braddock Bay and Salmon Creek area is also designated as a Significant Coastal Fish and Wildlife Habitat.

Nation’s Road Grasslands

This site includes exceptional, privately owned grassland and oak-savanna habitat with a diverse community of breeding and wintering birds. The 27,000 acre site lies in the Genesee River Valley among old fields, oak-scattered savanna, and riparian habitat. Some of the SGCN found at the site, and that caused the site to be designated as an IBA by Audubon New York, include grassland birds such as northern harrier, upland sandpiper, sedge wren, vesper sparrow, grasshopper sparrow, Henslow's sparrow, and bobolink. Other SGCN that breed at the site include sharp-shinned hawk, Cooper's hawk, American woodcock, red-headed woodpecker, willow flycatcher, horned lark, wood thrush, blue-winged warbler, and yellow-breasted chat. In winter, the area supports large concentrations of northern harriers, rough-legged hawks, short-eared owls, and flocks of horned larks that can number in the hundreds.

Niagara Escarpment

The Niagara Escarpment provides unique, rocky, wooded forest habitat within the Lake Ontario plain in Niagara County. This unique habitat, with its associated vernal pools at the escarpment base, provides important habitat for a variety of flora and fauna, including SCGN herpetofauna such as hybrid blue-spotted x Jefferson salamanders.

The Western Finger Lakes: Silver, Conesus, Hemlock, Canadice, and Honeoye Lakes and the Surrounding Landscape

These lakes sit in heavily forested landscapes characterized by two lakes with undeveloped shorelines (Hemlock and Canadice), large wetland systems at the southern ends of the lakes. The silver maple/ash swamp that forms the southern shoreline of Honeoye Lake is the largest occurrence of this natural community in the state, and has the largest occurrence of Appalachian oak/hickory forest in the state. DEC, The Nature Conservancy, the Finger Lakes Land Trust, and Finger Lakes Community College have already made progress in protecting and managing important lands here, and continued focus in the western Finger Lakes is needed to realize the full conservation benefits of this public/private partnership. The unique mosaic of natural communities in this landscape shelters the timber rattlesnake and coal skink, in addition to numerous other SGCN, including interior forest nesting birds like the black-throated blue warbler. Conesus Lake Inlet harbors the blackchin shiner, a fish SGCN.

Johnson Creek near Kuckville

The redfin shiner, longear sunfish, and several species of freshwater mussel SGCN have been documented at this site in recent years. Like Buttonwood Creek, this portion of the stream presently receives minimal protection under the ECL, where habitat disturbance is the biggest threat to these species.

Genesee River below the Lower Rochester Falls

This area is included within a City of Rochester designated critical environmental area (CEA). United States Geological Survey and Fish and Wildlife Service staff have surveyed this area and have found key areas within the river suitable for lake sturgeon spawning and nursery habitat. Efforts to evaluate lake sturgeon juvenile habitat in the Genesee River via stocking hatchery-reared fish have begun.

The Niagara Bar in Western Lake Ontario

This is an area off the mouth of the Niagara River that extends out into Lake Ontario about 4 miles. The USGS has documented that naturally spawned lake trout survival is high in this area. This area should also be surveyed to determine its importance to fish SGCN. It may more properly be considered with the Niagara River in the Lake Erie portion of the CWCS document.

Overall trends in the basin

Reduction of agricultural land results in loss of grasslands used for haying and pasture. The amount of land in agriculture in this basin has been reduced from about 92% of the total land cover in 1900 to 55% in 2002.The nature of the remaining agriculture has changed as well. Cropland diversity has decreased as row crop monocultures have become the dominant agricultural land use. As smaller farms have been consolidated into larger units, monocultures have become more expansive. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fence rows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the basin.

The basin, the southern portion in particular, has experienced an increase in older-growth deciduous forest cover in the past several years. Accompanying this increase in older-age forest has been a decline in shrub and young forest habitat. Forest inventory data from the USDA Forest Service Forest Inventory and Analysis Program show that between 1968 and 2002 Niagara, Orleans, Monroe, Genesee, Livingston, Wyoming, and Alleghany counties (area roughly approximating the basin), had a 113% increase in large-diameter trees (including deciduous and coniferous trees); a 242% increase in medium diameter trees; and a 45% decline in seedling/sapling early successional habitat. These trends have accompanied an overall decline in agricultural acreage statewide.

Emergent marshes along the shores of Lake Ontario have declined significantly since the 1900s, primarily due to the effect of the altered hydrologic regime resulting from Lake Ontario water level regulation. The Lake Ontario Management Plan estimates losses of about 50% of the lake's pre-colonial wetlands throughout the entire lake basin. That loss may be as high as 60% to 90% in the intensely urban shoreline areas of the lake as found in Rochester. Wetlands in the entire Great Lakes plain increased by 17,000 acres between the 1980s and 1990s according to DEC Bureau of Habitat information on statewide wetland trends. This increase generally applies to only the eastern Lake Ontario subwatershed portion of the basin, however, the acreage of shrub swamp decreased by 18,000 acres and the acreage of emergent marsh decreased by 15,000 acres in that same period. The net gain in total acreage in that decade came from increases in open water and forested wetland, which increased by 39,000 and 11,000 acres respectively. Not surprisingly, populations of freshwater marsh nesting birds in the Southwestern Lake Ontario basin appear to be in decline. In addition, there have been major fish losses incurred in emergent wetland areas like Braddock Bay, where longear sunfish, Iowa darter and lake chubsucker are no longer found. Of the 34 species that occur in the basin and list emergent wetlands as a critical habitat, 12 are in decline, 3 have been extirpated from the basin, and 13 are of unknown status.

Dramatic changes in the Lake Ontario fish community have been underway for several decades, and several species are extirpated or extinct. The predator fish community has been supplemented with major programs stocking salmonids, but these species have also been depleted by cormorants. Fish communities are being altered by invasive species and habitat degradation. The number of fish-eating gulls and cormorants in Lake Ontario has increased dramatically in the last 20 years. This is likely related to the banning of DDT and reduction in other toxics entering the lake. The rebound of these species, especially cormorants, can cause competition with SGCN for habitat and food resources.

Water quality in inland aquatic and riparian habitats has improved due to a reduction in point-source municipal and industrial pollutants by the construction of better waste-water treatment systems. However, non-point sources (NPS) of pollution, altered hydrology from storm water management, riparian corridor degradation, and exotic species invasions are now a larger component of the threats to water and aquatic habitat quality. Recent years have seen remarkable improvements in certain commercial, residential, and agricultural storm water management techniques, which have reduced some nonpoint source pollution. A desire to improve the aesthetic values of inland lakes of the SWLO basin and to alleviate the effects of invasive submersed aquatic vegetation has resulted in the compilation of lake and watershed management plans and an increase in the use of various methods to control these plants.

Threats

General Discussion

The major environmental stressors in the basin are related to changes in human land use, such as agricultural practices and commercialization, residential development, and industrial and commercial development (Southeast Lake Ontario Table 13). he negative effects of these land uses on natural resources include loss and fragmentation of natural habitat to development; sedimentation and erosion due to altered hydrology; storm water discharges; toxic substances in water and sediment, and nutrient discharges related to municipal waste and on-site septic systems. These major stressors are mentioned in several management and restoration plans that include all or part of the Southwestern Lake Ontario Basin in their area of interest.

The stressors vary in their prominence across the subwatersheds of the basin. In the more densely populated areas of the basin, degraded water quality from nutrients and toxic substances and habitat destruction are of greater magnitude and are related to residential, commercial and industrial development. The lower Genesee River and portions of Lake Ontario near Rochester are in need of restoration related to these issues.

In areas of the basin dominated by agriculture, fertilizer and pesticide runoff and soil erosion are of greater magnitude. In these more rural areas, too, on-site septic systems leach nutrients into aquifers and surface waters. Rural areas within a short distance of urban centers are also most prone to sprawl, a driving factor in habitat fragmentation.

In parts of the southern portion of the basin (for example, around some of the Finger Lakes) there are large tracts of land that, up to this point, have had a low level of human disturbance and encroachment. Therefore, these areas may not currently face all of the same threats to the same degree as other parts of the basin.

Specific Threats to Species of Greatest Conservation Need

The most frequently cited threat to species groups occurring in the Southwestern Lake Ontario Basin was outright loss of habitat via conversion to a human dominated land use. This threat was the most frequently listed for both terrestrial and aquatic species. It includes hardening of the landscape with buildings and roads; but can also include activities like land clearing and wetland draining for agriculture and mining. Thanks to programs such as the Natural Resources Conservation Service's "Swampbusters," wetland drainage for agriculture is not presently occurring to a large extent in the basin, but the effects of past drainage are still an issue. Complicating the picture is the habitat function that is provided by much of the agricultural lands in the basin at this time. Pasture and hay lands provide a surrogate for natural grasslands in the lake plains and when managed in a certain way with the needs of wildlife in mind these agricultural uses may be very beneficial to grassland wildlife. However, when agricultural management activities like mowing of hayfields occurs at the wrong time of year, grassland nesting species may be disturbed or killed.

Fragmentation of remaining habitat is also a significant threat to terrestrial species. The overall human population of the Southwestern Lake Ontario Basin has not increased significantly in the last 50 years, and U.S. Census Bureau (n.d.) projections to 2030 show that this trend will remain unchanged. At first glance this would appear to indicate no increase in development threats in this basin. However, the humans in the watershed are, in fact, developing more and more of the landscape, creating a "sprawl" effect unrelated to population growth. According to the Brookings Institution's Center on Urban and Metropolitan Policy, overall human population increased slightly in the Rochester and Finger Lakes region between 1982 and 1997 by 56,570. In the same period, 50,000 acres of land became urbanized and population density dropped by 14.2% to 4.2 persons per acre. The result is increased fragmentation of habitats by residential and commercial developments, roads and other infrastructure and a decrease in the size of contiguous habitat blocks and interior habitats. The development of roads and utility rights-of-way can directly affect the number of species struck by cars on roads, or colliding with power-generating and transmission facilities, and communications towers. In the future, development for the production of wind energy may also become an issue in this basin.

Degradation of water quality, which may include contaminants, was the second most common threat listed to aquatic species groups in the basin. Degradation of water quality comes from increased soil erosion and runoff as a result of altered hydrology, nutrient-induced algal blooms, and reduced dissolved oxygen caused by excessive algae decay or increased temperatures. There is major damage from sedimentation in spawning and nursery areas in riffles and runs. The majority of fish species losses are likely due to this threat.

Toxic contaminants were listed as the second most common threat to terrestrial species in the basin and the third most common among aquatic species. Some persistent toxins are identified in the Lake Ontario Management Plan as impairments to reproduction and survival of several SGCN. For example, PCB contamination negatively affects reproduction and survival of river otter, and PCBs, Dioxin, and DDT compounds negatively affect reproduction and survival of bald eagles. Mercury, at levels high enough to cause concern is also found in sport fish tissues in the lake.

Levels of all of these persistent toxins in the fish communities of Lake Ontario have been declining since the 1970s, except for mercury. Fish-tissue testing for mercury has revealed no statistically significant trend. According to the Lake Ontario Management Plan, there is no indication that current PCB, dioxin, or DDT levels in the open water of the lake are degrading fish populations, but the toxins are still causing negative effects on piscivorus wildlife.

Persistent toxins are also a concern in the lower Genesee River for the same reason. Toxic contamination and sediment that is present in the Genesee River had originated from a variety of sources over time of varying severity. These sources include, but are not limited to, both industrial and municipal point and nonpoint sources (which have been discharged licitly and illicitly).

Atmospheric deposition is a significant statewide issue because New York State is downwind from major mid-western sources of airborne pollution. Though it is perhaps a larger threat in some of the other New York State watersheds, the SWLO Basin's extensive aquatic resources, limestone bedrock (particularly in the northern part of the basin) and relatively thin soils do make it susceptible to negative effects caused by airborne pollutants.

Pesticide use on agricultural lands is of concern to herpetofauna, insects, mussels and freshwater crustacea. Agricultural pesticides are generally non-specific in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Amphibians are also particularly susceptible to pesticides and other toxins.

Conversion of habitats from one natural land cover type to another was cited as the third most common threat to terrestrial species. This threat highlights the need to not only protect habitats from development and degradation, but to also effectively manage natural processes like forest succession, fire, and flooding. This is a complicated issue, because what may be excellent habitat for one suite of SGCN species may not be for other SGCN. For example, a grassland field which provides habitat for grassland birds may eventually transition into a shrub habitat which is no longer valuable for grassland species, but may provide excellent habitat for early successional/shrubland species.

Lake Ontario regulation has altered the lake's natural hydrologic regime, affecting the survival of species dependent on coastal marshes. In particular, rapidly rising or falling water levels as a result of short-term changes in flow rates through the St. Lawrence River dams may either strand or flood nests of marsh nesters such as least bittern, American bittern, black tern, and king rail. There is also the general threat of hydrologic alteration as a result of the numerous dams on tributary streams in this watershed. Extensive research has revealed the importance of the natural flow regime as the engine of biodiversity in rivers, streams, and other water bodies. The species populations that inhabit a river have adapted to the natural pattern of floods and low flows, which provide the opportunities for spawning and germination that maintain the full range of flora and fauna.

Exotic species have threatened the Great Lakes ever since Europeans settled in the region. Since the 1800s, more than 140 exotic aquatic organisms of all types-including plants, fish, algae, and mollusks have become established in the Great Lakes. As human activity has increased in the Great Lakes watershed, the rate of introduction of exotic species has increased. More than one-third of the organisms have been introduced in the past 30 years, a surge coinciding with the opening of the St. Lawrence Seaway.

Several exotic and/or invasive species are a significant concern to SGCN in the basin. In addition, diseases, in particular Type E botulism in Lake Ontario, are another potential threat to certain SGCN. Exotic/invasive species and diseases in the basin that pose a significant threat to SGCN include:

Crustacea

- Exotic zooplankton such as spiny waterflea (*Bythotrephes cederstroemi*) and fish hook waterflea (*Cercopagis pengoi*) compete with and prey on native zooplankton species. Its sharp spine makes it extremely hard for fish to eat. This has induced changes at all trophic levels in the Lake Ontario and inland lake food chains.

- Rusty crayfish (*Orconectes rusticus*) - Rusty crayfish are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations.

FISH

- Common carp (*Cyprinus carpio*) - Carp degrade shallow lakes by causing excessive turbidity, which can lead to declines in waterfowl and important native fish species.
- Ruffe (*Gymnocephalus cernuus*) - The ruffe can displace other species in newly invaded areas due to its high reproductive rate, its feeding efficiency across a wide range of environmental conditions, and characteristics such as sharp spines on their gill covers, and dorsal and anal fins that may discourage would-be predators.
- Sea lamprey (*Petromyzon marinus*) - Predaceous, eel-like fish that have contributed greatly to the decline of whitefish and lake trout in the Great Lakes. Since 1956, the governments of the United States and Canada, working jointly through the Great Lakes Fishery Commission, have implemented a successful sea lamprey control program.
- Alewife - Reduces zooplankton biomass due to grazing and competes with native forage fish, which in turn appears to induce thiamine deficiencies in salmonids. However, alewives play an important role in the Lake Ontario, Hemlock Lake, and Canadice Lake ecosystems as prey for stocked salmonid predators.
- Round gobies (*Neogobius melanostomus*) - A bottom-dwelling fish that competes for spawning sites and other habitat with native fish like mottled sculpin, logperch darters, and smallmouth bass. Round goby thrive in the Great Lakes Basin because they are aggressive, voracious feeders which can forage in total darkness. Goby can survive in degraded water conditions, and spawn more often and over a longer period than native fish. Round goby have shown a rapid range expansion through the Great Lakes.

MOLLUSKS

- Zebra mussels/quagga mussels (*Dreissena polymorpha* and *Dreissena bugensis*) - compete with native mussels and reduce phytoplankton biomass. This has induced changes at all trophic levels in the Lake Ontario and inland lake food chains.

PLANTS

- Purple Loosestrife (*Lythrum salicaria*) -This plant can form dense, impenetrable stands that are unsuitable as cover, food or nesting sites for a wide range of native wetland animals, including ducks, geese, rails, bitterns, muskrats, frogs, toads and turtles. Adults can disperse 2 million seeds annually, and there is a lack of effective predators in North America. Recently, however, several host-specific European insects have been released as a long-term biological control in North America.
- Common reed (*Phragmites australis*) - In some circumstances, particularly in disturbed areas, this plant can become invasive and out-compete other plant species, resulting in a degraded system with negative effects on some wildlife species, including several SGCN.

- Invasive Submersed Aquatic Vegetation - Eurasian Water Milfoil (*Myriophyllum spicatum*) and Curly-leaf pondweed (*Potamogeton crispus*) are exotic plants that form surface mats that interfere with aquatic recreation. In nutrient-rich lakes they can form thick underwater stands and vast mats at the water's surface. In shallow areas the plant can interfere with boating, fishing, and swimming. The plant's floating canopy can crowd out important native water plants. In the lakes of the SWLO basin, the plant appears to coexist with native flora, but little is known how these plants affect fish and other aquatic animals.
- Flowering rush (*Butomus umbellatus*) - It grows in shallow areas of lakes as an emergent, and as a submersed form in water up to 10 feet deep. Its dense stands crowd out native species like bulrush.

BIRDS

- Mute swan - Displaces other waterbirds, possibly including SGCN such as the black tern, with its aggressive behavior and reduces the amount of submerged aquatic vegetation available for native wildlife.

DISEASE

- Type E botulism - Botulism, a disease caused by *Clostridium botulinum*, has been recognized as a major cause of mortality in migratory birds since the 1900s. Although type C botulism has caused the die-off of thousands of waterfowl (especially ducks) across the western United States, type E botulism has been mainly restricted to fish-eating birds in the Great Lakes. Fish and waterbird mortality events were documented on Lake Ontario in 2002 through 2004. Type E botulism was isolated in each of these outbreaks.

Priority Issues in the Basin

None that were not discussed in prior sections.

Vision, Goals and Objectives for the Basin

Vision

The Southwest Lake Ontario Basin will be part of a healthy and sustainable ecosystem. The Southwest Lake Ontario Basin will be well understood as a habitat system. The current and historical extent of major habitat types will be understood and used to set goals for management. The status and trends of all SGCN in the basin will be monitored and understood. The stream systems in the basin will have effective riparian buffers.

Existing conservation partnerships will be strengthened and new ones formed. Public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on SGCN and their habitats within the basin. The data will be in a format that can easily be accessed and shared among conservation partners, and disseminated to the public in a meaningful way and raise awareness and support for issues surrounding SGCN.

Conservation partners will work in a coordinated fashion to manage SGCN and their habitats over large spatial and temporal scales. This will be accomplished through comprehensive planning, land protection, adaptive management, and rigorous evaluation.

No SGCN that presently exists in the basin will be extirpated and native SGCN that are no longer found in the basin will be reintroduced where appropriate. All SGCN will have adequate habitat to sustain populations with minimal intervention from conservation partners. Threats to species and their habitats will be diminished through cooperative action taken by state and federal agencies and their conservation partners. The relationships between these partners will be strengthened and communication improved. Conservation actions will be clearly outlined, understood, and supported by conservation partners and the public.

Goals and Objectives

- Determine the current and historical extent of grasslands, early successional and shrub, deciduous/mixed forest cover, and wetlands in the basin.

- Conduct habitat mosaic planning and set target goals for these habitat types (e.g., maintain X acres of wetlands, maintain Y acres of forests with larger diameter trees, increase the amount of grassland and early successional forest and shrub habitat by Z percent, etc.).

- Determine locations and monitor trends of SGCN in the basin.

- Maintain and improve stream systems by protecting and enhancing riparian buffers.

- Reduce pollution and siltation runoff into streams and tributaries.

- Improve connectivity and habitat function of protected areas in the basin.

- Restore priority habitats affected by land use practices.
- Prevent further introductions of aquatic and terrestrial non-native invasive species.
- Monitor the quality and quantity of habitats on a 10-year rotational cycle.
- Identify specific threats to SGCN in order to prioritize habitat protection and restoration efforts.
- Identify key areas for acquisition, restoration, and/or other means of protection.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data collection recommendations for Critical Species

A number of priority species and groups need population, habitat, and life-history research to address critical data gaps. In particular, an important first step is to locate and inventory key areas in the basin that are utilized by SGCN. This information will help more clearly identify threats and establish baseline information for these species.

EARLY SUCCESSIONAL FOREST/SHRUBLAND BIRDS

- Complete an inventory and analysis for high priority species that identifies core habitats within the basin.

FRESHWATER MARSH-NESTING BIRDS

- Initiate a baseline population survey to determine abundance and distribution. Refine monitoring techniques to better detect population trends.

- Inventory breeding sites and map at a coarse scale to select key monitoring locations. Analyze habitats at multiple scales to better understand characteristics important to nest-site selection.

- Investigate aspects of life history such as mate selection, coloniality, dispersal, and foraging habits.

- Monitor occurrence and nesting success of black tern, least bittern, and king rail in Lake Ontario coastal marshes. The suitability of marshes for these birds could also be tested by monitoring nesting success of the more common Virginia rail. Such a focused monitoring effort would provide a direct measure of the effect of a new Lake Ontario water regulation plan (to be adopted in 2006), and provide information needed by decision-makers to interpret the plan's effects and possibly improve it.

GRASSLAND BIRDS

- Complete an inventory of potential grassland habitat including species present, distribution, and relative abundance of priority species. Develop and implement a monitoring program to supplement the Breeding Bird Survey (BBS) for grassland bird species to determine population trends and evaluate effectiveness of conservation efforts in the basin. This effort has already been initiated by a New York grassland bird group led by Audubon New York.

Herpetofauna

Priority species are massasauga, lake and river reptiles, uncommon turtles of wetlands, vernal pool salamanders, woodland and grassland snakes, and western chorus frog.

- Document life history parameters specific to these species in New York, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Periodically resurvey areas of known occurrence to detect population trends.
- Conduct research to document the extent of upland habitat required by vernal pool breeding salamanders.
- Determine significance of specific threats to populations of vernal pool salamanders and develop management recommendations to address significant threats.
- Research and develop mitigation measures to address the adverse effects of habitat fragmentation on woodland and grassland snakes.
- Conduct surveys to determine present distribution and monitor extant populations of western chorus frog.
- Investigate reasons for the observed decline of western chorus frog.

Lake Ontario Bay And Lower River And River-Mouth Fish

Priority species are lake sturgeon, western pirate perch, longear sunfish, Iowa darter, redfin shiner, lake chubsucker, and Atlantic salmon

- Continue surveys to understand current distribution of these species.
- Determine the population status of these species in SWLO basin. Expand fishery surveys to document presence, distribution, and associated habitats for redfin shiner, Iowa darter, and lake chubsucker.
- Survey habitats to document life history requirements of these species.
- Inventory and assess losses to habitat in bays and river mouths of SWLO.
- Research threats to habitat and populations.

Lake Ontario fish

Priority species are sauger, ninespine stickle back, and deepwater ciscos

- Continue surveys to understand current distribution of these species. Determine the population status of these species in SWLO basin.
- Survey habitats to document requirements.

- Research threats to habitat and populations. Declines in Lake Ontario populations are poorly understood. They may be related to changes in lake productivity.

- Inventory and assess losses to habitat in Lake Ontario.

RIVERINE FISH

Priority species include: black redhorse, American eel, blackchin shiner, bigeye chub, and heritage strain brook trout

- Continue surveys to understand current distribution of these species. Determine the population status of these species in SWLO basin. Expand fishery surveys to document presence and distribution of black redhorse, blackchin shiner in Conesus Inlet, and bigeye chub.

- Survey habitats to document requirements in order to evaluate reintroduction potential for the basin.

- Inventory and assess losses to habitat in tributaries of SWLO.

- Research threats to habitat and populations.

RIPARIAN TIGER BEETLES

- Survey cobble bar for riparian tiger beetles to determine population status in the basin. Two species of unknown status in the basin depend on this habitat.

FRESHWATER BIVALVES

- Evaluate threats to mussels in the SWLO basin and prioritize areas within the basin for remedial action.

- Develop standard survey protocols for development projects in the basin to prevent further decline of these species.

- Investigate the best survey methods to detect rare species, and evaluate status and trends of all species that occur in the basin. High priority species within this group include: eastern pondmussel, wavyrayed mussel, and fat pocketbook.

- Determine population distribution and abundance of freshwater bivalve species-at-risk in this basin.

- Conduct research to determine the habitat parameters necessary to sustain populations of at-risk mussel species, including temperature, substrate, flow, fish hosts, and forage base.

- Determine breeding phenology necessary for successful mussel reproduction, including mussel density, abundance and diversity of fish hosts, water temperature, and flow.

DATA COLLECTION RELATED TO TOXIC SUBSTANCES

Toxics monitoring in fauna is recommended for species in 12 species groups in a number of taxa. As outlined in the "Threats to the Basin" section above, persistent toxics and pesticides are of concern in this basin. The Lake Ontario Program already monitors several of these species for PCBs, mercury, dioxin, and DDT compounds. Due to the high agricultural land use in this basin, monitoring the effects of pesticides on sensitive species is warranted, especially because many of these species are dependent upon remaining agricultural lands for habitat.

- Specific recommendations for freshwater marsh nesting birds include a recommendation to periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. The highest priority species within this group are black tern, pied-billed grebe, least bittern, American bittern, and king rail.

- Specific recommendations for freshwater bivalves include a recommendation to research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, and adults. The highest priority species within this group are eastern pondmussel, wavyrayed mussel, and fat pocketbook.

- Specific recommendations for other butterflies include a commendation to determine the sensitivity of species to chemical formulations, particularly diflubenzuron and other commonly used agricultural pesticides. In addition, determine the effect of *Bacillus thuringiensis kurstaki* (BTK) used in gypsy moth sprayings on other butterfly species. The highest priority species in this group is Persius duskywing.

Data Collection Recommendations for Critical Habitat

AGRICULTURAL FIELDS

Large row-crop monocultures and decreased crop diversity can negatively affect wildlife and their habitats in agriculturally dominated ecosystems. In addition, farm management practices such as conventional tillage, may have negative consequences such as loss of food source, like waste grain and wheat seeds from post-harvest fields, and increased soil erosion and loss of cover. Trends in modern farm operations toward increased field size and loss of adjacent edge habitat negatively affect some wildlife species, but can actually benefit some grassland songbird species that require large areas of contiguous grassland.

- Specific recommendations for grassland birds include a recommendation to evaluate the effects of specific farming and management practices on productivity of grassland birds. Specific investigations should include: timing and frequency of mowing; intensity of grazing; comparative effects of management regimes like mowing, haying, and prescribed fire; and buffer strip characteristics. All species of grassland birds that occur in this basin are considered high-priority species.

EARLY SUCCESSIONAL HABITATS

Shrubland and early successional forest species are in widespread decline in New York and throughout the Northeast as forest stands mature. Sustainable timber harvest is a way to provide more much needed quality habitat. With proper forest management, such as proper erosion control, detrimental effects on other wildlife can be minimized.

❖ Specific recommendations for early successional forest/shrubland birds include a recommendation to develop best management practices for sustainable silviculture that incorporates the critical habitat needs of this suite of species. Investigations may include: timing, size, and shape of cuts; species and structural diversity of vegetation, and soil retention techniques. All species of early successional forest/shrubland birds that occur in this basin are considered high-priority species.

Fragmentation of Habitat

Fragmentation of habitats in the basin is a common threat to several species groups. Many issues influence the effects and severity of fragmentation on given species groups. These include patch size and shape, edge effects, and connectivity of remaining habitat patches. Juxtaposition of wetland and grassland habitats has been shown to positively influence wildlife species diversity. This basin contains significant amounts of both habitat types and provides opportunity for landscape management of species that depend on these systems. The relative abundance and distribution of grasslands and wetlands in this basin highlights the importance of this area statewide.

Fragmentation is a threat to aquatic species as well. Dams in the watershed prevent migration and dispersal of a variety of aquatic species including freshwater bivalves. Isolated populations are more vulnerable to extirpation by both natural and anthropogenic events.

❖ Specific recommendations for freshwater marsh nesting birds and grassland birds include demographic studies to identify source and sink populations, metapopulation dynamics, and factors that influence reproductive success and survival. High-priority species for freshwater marsh nesting birds are black tern, pied-billed grebe, least bittern, American bittern, and king rail. All grassland birds are considered to be of high priority.

❖ Specific recommendations for freshwater bivalves include investigating the flow requirements of freshwater bivalves and modeling the effects of flow changes both in volume and timing. Additional research is needed on population dynamics of listed mussel species including connectivity and genetic distinctiveness of populations and subpopulations. The highest priority species within this group are Eastern pondmussel, wavyrayed mussel, and fat pocketbook. Invasive zebra mussels, quagga mussels, and, to a lesser extent, Asian clam species in the Great Lakes and other parts of the state compete with native bivalves.

Planning recommendations

EXISTING MANAGEMENT PLANS AND AGREEMENTS

Several existing management plans address natural resource conservation issues within the basin (Table 16). The goals and objectives of these plans vary in focus (e.g., water quality, planning and development, fish and wildlife), spatial and temporal scale, and cooperating partners; however, they all provide valuable information on conservation threats and strategies in this region of New York State and should be consulted before implementing recommended actions.

NEW PLANNING RECOMMENDATIONS

❖ There is a clear need for a habitat mosaic management plan for grassland, early successional forest, shrub habitat, mature forest stands, and wetlands in this basin. Of the 130 SGCN occurring in the basin, 41 depend on grasslands, 20 depend on barrens and woodlands, 38 depend on forested habitat, and 46 depend on wetlands. Some species depend on all four of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities. The balance and cooperative management of all of these habitat types is essential to the health and abundance of many of the SGCN currently living in this basin. It is very important to consider both public and private lands in planning efforts and to incorporate both strategies that focus on land protection and management of public lands and strategies that deal with partnerships with private landowners. It is also important to involve and facilitate cooperation between the many potential partners, including DEC, NYSOPRHP; USFWS; NPS; NRCS; NY Audubon; TNC and the Natural Heritage Program; local land trusts; New York Forest Owners Association; Ducks Unlimited, Inc; Pheasants Forever; National Wild Turkey Federation; Ruffed Grouse Association; watershed groups; private landowners; local governments, and others. Part of this mosaic habitat management planning effort should involve the development of a protected lands GIS data layer as a powerful tool for conservation planning and determining measures of success at the regional scale. Such a data layer would incorporate all the protected lands in public and private ownership and assign each site to a category reflecting its protection status (easement, fee ownership, etc.). Combining this data layer with SGCN occurrences and other landscape features would provide an excellent and unique analysis of the conservation status of each SGCN and the role played by each priority site in achieving goals at the regional watershed and statewide scales.

❖ The southern portion of the basin is dominated by deciduous forest cover. This is an opportunity to integrate the needs of early successional forest/shrubland birds, deciduous/mixed-forest breeding birds, woodland snakes, and vernal pool salamanders. These species often need heterogeneous forest structure during different life stages. Herpetofauna also need wetlands within the forest to breed.

❖ The birds mentioned above all require varying types of vertical forest structure. Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management.

- ❖ Develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for Canada warbler and golden-winged warbler and also other species such as American woodcock and brown thrasher.

- ❖ Investigate the feasibility of managing the forests in the basin with controlled burning. Draft a fire-management plan in accordance with these findings.

- ❖ The northern portions of the basin are dominated by grasslands with several large wetland complexes interspersed in the landscape. This is an opportunity to integrate the needs of wetland-and grassland-dependant species into a holistic management plan for the basin. Components of this larger picture are:

- ❖ Develop a management plan for the basin that includes land acquisition and management targets for all wetland-and grassland-dependent species of greatest conservation need. Minimum management area sizes for various animal classes should be determined, and targets for acquisition and temporal and spatial targets for management actions (mowing, water control) should be set. This should be a component of the above-mentioned mosaic management plan and incorporate basin-specific objectives from a statewide grassland-bird management plan (already being developed by a consortium of agencies and organizations active in grassland conservation in New York led by Audubon NY) and existing wetland planning efforts including the North American Waterbird Plan, Bird Conservation Regional plans, and others. Specific tasks associated with this planning include:

- ❖ Investigate the feasibility of managing grasslands in the basin with controlled burning. Draft a fire-management plan in accordance with these findings.

- ❖ Work with the USDA and other partners to develop grassland management incentives that benefit SGCN in this basin.

- ❖ Review existing planning documents and participate in ongoing planning efforts to take advantage of opportunities to protect and manage lands for SGCN in this basin.

- ❖ Review state park master plans, DEC unit management plans and wildlife management area plans for opportunities to better manage state lands for SGCN in the basin.

- ❖ Participate in the USFWS refuge Comprehensive Conservation Plan process for Iroquois Natural Wildlife Refuge scheduled for 2007 to provide information on management of wildlife refuges for the benefit of SGCN. In particular, Iroquois NWR has vast stretches of emergent marsh that could benefit freshwater marsh nesting birds, rare turtles, and other herpetofauna. This planning process incorporates human uses as well as wildlife management considerations into refuge operations.

- ❖ Continue participation in North American water bird planning. Focus on and refine recommendations for common loon, blue-winged teal, and wintering waterbirds.

- ❖ Participate in other planning efforts in the basin (such as watershed plans, lake plans, etc.). As these plans are developed and revised, incorporate information about SGCN and opportunities to benefit SGCN in the basin.

- ❖ Continue to develop recovery plans for all fish SGCN (and other aquatic species) particularly longeared sunfish, deepwater ciscos, Atlantic salmon, and lake sturgeon.

- ❖ Develop recovery plan for longeared sunfish based on SWG-funded research conducted by SUNY Brockport. The distribution of this species is limited to the Southwestern Lake Ontario and Lake Erie basins.

- ❖ Incorporate freshwater mussel goals and objectives into regional water quality and fisheries management plans and policies.

- ❖ Coordinate with other involved agencies to develop monitoring and control plans that include measures to detect invasive species and actions to control them before they become threats. Develop statewide and regional hazard analysis and critical control point (HACCP) plans.

- ❖ Develop a monitoring and control plan that includes measures to detect invasive bivalves and actions to control them before they become threats.

- ❖ Develop an avian and bat migration route map using advanced radar imaging and other methodology, and also investigate the effects of landform factors on travel routes. The development of this map and other related information for use as a planning tool is a high priority as new wind power proposals are developed for areas within the Southwestern Lake Ontario Basin.

Land Protection Recommendations

This category of actions encompasses a variety of acquisition mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of acquisition should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations.
A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation; nutrient runoff; temperature increases; toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects.

- ❖ In key locations, acquire development rights to protect water quality for listed mussel populations. The high-priority species group that will benefit from this recommendation is freshwater bivalves.

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development, dredging, wetland draining, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar or different, yet complementary habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support.

The lands owned by the state and federal government in the basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially large grasslands adjacent to other open habitat types. This will enable better management and protection of these habitats for grassland species. Acquisitions should reflect the recommendations of priority grassland focus areas from the NYS Grassland Bird Management Plan. The Nation's Road grassland area surrounding the Genesee River in the towns of York and Avon has been identified as valuable habitat by Audubon NY and The Nature Conservancy and is a good example of a potential acquisition project. Protection of some of this area has already been implemented at a local level through conservation easements. Priority species that would benefit from these acquisitions include grassland birds.

- ❖ Acquisition of forested and grassland upland tracts adjacent to wetland properties is critical to protection and restoration of amphibian, reptile, and freshwater marsh nesting bird species in this basin. Ideally these will be parcels where human development has not fragmented the two cover types. Identification of candidate parcels with these characteristics should occur immediately. Parcels within the Hemlock/Canadice Lake/Honeoye Lake watersheds could possibly fit into this category. Priority species groups that would benefit from these acquisitions are vernal pool salamanders, uncommon turtles of wetlands, freshwater marsh nesting birds, grassland birds, and breeding waterfowl.
- ❖ More than 50% of the wetlands of New York State have been lost over the past century. Emergent marsh habitat and lands with wetland restoration potential adjacent to state-owned land should be acquired through fee title or easement.

Studies have demonstrated that large emergent habitat parcels are more likely to support certain marshbird species such as black tern, bitterns and rails. Priority species groups that would benefit from these acquisitions are, uncommon turtles of wetlands, freshwater marsh nesting birds, transient shorebirds, and breeding waterfowl.

- Acquisition of upland parcels within and adjacent to the Braddock Bay wetlands complex has been identified as a priority for many migratory birds by Audubon NY and the Genesee Land Trust (Lake Ontario Habitat Priorities). Priority species groups include grassland birds, freshwater marsh nesting birds, and breeding waterfowl.

- Support the acquisition of the Rush Oak Openings property in Region 8. This acquisition priority appears in the Open Space Conservation Plan of 2002. This site expands on the DEC and Nature Conservancy owned parcels of an extremely rare Oak Opening community as described in Edinger et al. (2002). This community includes grassy savannas and wetlands that could provide habitat for a number of SGCN.

- Support the acquisition of the Great Bend property in Region 8.This acquisition priority appears in the Open Space Conservation Plan of 2002. The site contains dense woodlands and open meadows.

- The Black Creek-Bergen Swamp complex is only partially protected, and further acquisition of wetlands and buffering uplands through appropriate means is important for protecting this very diverse site.

- The Niagara escarpment holds much of Niagara County's biodiversity in terms of its herpetofauna and flora. Protection is necessary for key parcels along the escarpment which are at great risk of development and clearing for landscape views.

Management and Restoration recommendations

Overall alteration of the landscape, primarily since European settlement began has disrupted the natural cycle of habitat disturbance (e.g., fire, wind throw, flooding cycles etc.). Although some of the alterations to the landscape provide important habitat, as in the case of hay and pasture lands, in many cases management actions such as mowing, burning, silviculture, water-level manipulation, and control of exotic/invasive species are necessary to mimic natural processes and maintain or manipulate habitats to benefit SGCN. In addition, in many areas where habitat has been severely degraded or altered, habitat restoration is often needed to provide habitat for SGCN.

- Priority management recommendation for early successional forest/shrubland birds are:
  - Conduct sustainable silvicultural operations (both even-aged and uneven-aged) with a goal of producing early successional habitat for wildlife on public and private land.
  - Maintain, restore, and enhance early successional habitats through the use of prescribed fire.
  - Forest structure management; maintain various maturity stages and diverse forest structures through forest management that utilizes even aged and uneven-aged forestry in forest stands to benefit forest dwelling SGCN. Maintain understory trees for lower altitude nesters like black-crowned night heron. Try to control deer browse of understory. Create small openings with wetlands or small (~0.25 acre) ponds to benefit forest- breeding raptors and herps.

- Priority management recommendation for forest breeding raptors is:
  - Maintain appropriate breeding habitat for forest breeding raptors around occupied nest sites with emphasis on long-eared owl.

- Priority management recommendations for freshwater marsh nesting birds are:
  - In marshes that have managed water levels, manage water levels to improve nesting habitat and prevent nest loss for freshwater marsh nesting birds, and optimize water and vegetation cover for blue-winged teal and uncommon turtles of wetlands.
  - Restore emergent marsh to benefit freshwater marsh nesting birds.
  - Manage predators in nesting areas to reduce egg and chick loss.

- Priority management recommendation for grassland birds is:
  - Use mowing and/or prescribed fire to manage vegetative structure of established grasslands. This should be incorporated into Landowner Incentive and Farm Bill programs. Mowing should be delayed until after August 1.
  - Provide incentives to convert row crops to grasslands.

- The priority management recommendation for lake and river reptiles is:
  - Manage uplands adjacent to aquatic habitat to provide adequate and secure nesting sites and dispersal routes for migrating animals.

- Priority management recommendations for uncommon turtles of wetlands are:
  - Employ a variety of habitat management techniques to control vegetative succession in order to preserve wetland suitability for these turtles, especially Blanding's and spotted turtles.
  - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation.

- Priority management recommendation for woodland snakes is:
  - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation, especially timber rattlesnake.
  - Priority management recommendation for Eastern massasauga is:
  - Manage vegetative succession by prescribed burns, herbicide application, and mechanical removal. Evaluate the effectiveness of these measures for increasing habitat suitability.

- Priority management recommendation for freshwater mussels is:
  - Restore degraded habitat sites to allow for recolonization or reintroduction of listed mussels.

- Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and riverine fish are:
  - Fully develop and implement the existing Strategic and Operational Management Plan for Imperiled Fish Species (Carlson 2000a). This includes regular sampling and habitat restoration.
  - Investigate the feasibility of removing dams that may hinder success of these species. Make this part of a statewide strategy to improve fish SGCN populations by restoring passage across barriers.
  - Reassess the status of state and federally listed fish species and determine if a change in listing status is warranted.

A common threat to many SGCN, and a major threat to aquatic SGCN in this basin, is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects; however, the implementation of best management practices (BMPs) to protect water quality is a more effective and more economically feasible approach.

- Priority management recommendation for lake/river reptiles is:
  - Manage water borne pollutants that adversely affect lake and river reptiles like pathogens and toxic substances.
- Priority management recommendation for freshwater bivalves is:
  - Manage areas of important mussel populations by controlling degradation factors, including livestock access, point and nonpoint source pollution, and flow alterations.
- Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and Riverine fish are:
  - Manage areas of important populations by controlling degradation factors, including point and nonpoint source pollution, habitat alterations, and flow alterations.
  - Spawning and nursery habitats of important fish populations should be protected and managed to avoid siltation into gravel areas.

  - Fully develop and implement the existing Strategic and Operational Management Plan for Imperiled Fish Species (Carlson 2000a).

Invasive species threaten many SGCN in the Southwestern lake Ontario Basin. This threat may be through direct competition for nesting sites, prey, and other limited resources, or by alteration of the structure and quality of habitat as in the case of invasive plants like purple loosestrife. Displacement of native species by invasive species disrupts ecological processes.

- ❖ The priority management recommendation for freshwater marsh nesting birds is:
  - Control purple loosestrife where it is known to have a negative effect on marsh nesting birds. Techniques could include biological controls.
- ❖ The priority management recommendation for lake/river reptiles is:
  - Control invasive aquatic plants where they are negatively affecting lake and river reptiles. Techniques could include biological, chemical, and mechanical means.
- ❖ The priority management recommendations for vernal pool salamanders are:
  - Control invasive aquatic plants where they are negatively affecting lake and river reptiles. Techniques could include biological, chemical, and mechanical means.
  - Limit introductions of fish and other predatory species into habitats critical to vernal pool salamanders.
- ❖ Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and Riverine fish is:
  - Control invasive aquatic plants where they are negatively affecting these fish. Techniques could include biological, chemical, and mechanical means.

There is a variety of threats to SGCN in the basin from direct interactions with humans. These include vehicle and structure collisions, illegal and unregulated harvest, and unintentional entanglement. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines and roads, are a significant source of mortality. Collection of wild animals for pets and food also may contribute to species declines.

- ❖ The priority management recommendations for lake/river reptiles are:
  - Reduce excessive disturbance by watercraft in habitats critical to lake and river reptiles.
  - Reduce incidental take of lake and river reptiles by fishing gear.
  - Employ restoration techniques for queen snake at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.
  - Employ restoration techniques for spiny softshell at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.
- ❖ The priority management recommendation for vernal pool salamanders is:
  - Reduce habitat destruction and collisions by off-road vehicles in vernal pools occupied by salamanders.
- ❖ The priority management action for uncommon turtles of wetlands is:

- Employ restoration techniques for Blanding's turtle at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.

- The priority management action for woodland/grassland snakes is:
  - Employ restoration techniques for timber rattlesnake at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.
- The priority management action for eastern massasauga is:
  - Employ restoration techniques for massasauga at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.

Information Dissemination Recommendations

Sharing of data allows stakeholder groups to make informed decisions about activities that may help or harm SGCN. Sharing of information may take many forms, including best management practices, fact sheets, and educational outreach programs.

- Some agricultural and silvicultural operations may lack wildlife-based objectives, thus may be detrimental to wildlife. Providing information to public and private land managers may help mitigate detrimental practices.
  - Make information available to public and private land managers regarding the benefits and need for early successional habitat, including even-aged forest stand management and sustainable silvicultural practices. Also, develop recommendations for landowners and managers for maintaining abandoned land in early successional habitat.
  - Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrubland birds.
  - Develop an outreach program for public and private land managers to increase awareness of the benefits of grasslands and wildlife-friendly agricultural practices.
  - Promote the establishment of vegetated buffers around agricultural fields to protect wetlands and streams from runoff.
  - Provide education and outreach to forest managers regarding silvicultural practices compatible with forest breeding raptors. A high-priority species that will benefit from this action is the long-eared owl.

- Introduction and spread of exotic species can often be minimized or prevented through increased awareness of natural resource users to the negative effects of these species on native wildlife. Awareness should be accompanied by specific actions that natural resource users can employ to prevent spread of invasive and exotic species.
  - Post educational signs at boater access sites to highlight the dangers to native mussel populations posed by the spread of exotic mussels and the role of boats in their spread.
  - Develop and post educational signs in appropriate languages at markets dealing in live bivalves, fish and crustacea, explaining the dangers of releasing exotic animals into New York State.
- Human behavior can be altered by education and outreach. Providing information about negative effects of human disturbance on wildlife can help reduce detrimental interactions.
  - Enhance public education to curtail collection and translocation of turtles and snakes. This includes dispelling common myths about the dangers posed to people and pets by native snakes.
  - Develop an outreach and educational tool to highlight the possible detrimental effects of human disturbance on wetland-dependent wildlife. An example could be off-road vehicle effects on vernal pool and marsh nesting species.

Regulatory and Legislative Recommendations

Many regulatory proposals will likely be made at the statewide level, though local governments have opportunities to modify or create laws and regulations to enhance local protection of SGCN. Local zoning and taxation policies can be used to discourage sprawl and habitat fragmentation without growth, an issue of particular importance in this basin.

Habitat Loss

- Pursue expanded protection for wetlands that are smaller than 12.4 acres and that are important to SGCN in the basin through the "unique local importance" provisions of Article 24 of the Environmental Conservation Law. Priority species that will benefit from this action include Blanding's turtle, spotted turtle, Jefferson salamander, and blue-spotted salamander.
- Review the status of wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species should be protected either under existing provisions of Article 24 of the ECL or by local ordinance.
- Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN. An example is Buttonwood Creek which contains the western pirate perch.

Water Quality

- Limit the use of pesticides on publicly owned marshes to prevent reduction of insect populations and contamination of wetlands used by SGCN.
- Require testing of all new pesticides, consistent with current DEC and EPA regulations, for effects on all life stages of freshwater bivalves prior to approval for use in the state.
- Expand permit review of activities on critical stream segments that provide habitat for SGCN and enforce regulations to abate NPS pollutants, erosion, sedimentation, and hydrological alterations.
- Continue the development of an in-stream flow policy for New York State that reflects the importance of natural flow regimes. Such a policy could call for reservoirs, dams, withdrawals, and diversions to be operated in a manner that mimics the natural flow regime as closely as possible.

Human-Wildlife Interaction

- Modify the ECL to include small game protections for queen snake, eastern ribbon snake, spiny softshell turtle, eastern massasauga. Blanding's turtle, spotted turtle, blue-spotted and Jefferson salamanders, smooth greensnake, and timber rattlesnake.
- Enhance law enforcement to limit collection and translocation of wood turtles, massasauga.

Invasive Species

- Develop and implement a noxious weed law to control the introduction and distribution of exotic and invasive species such as purple loosestrife. This will benefit multiple taxa.

- Participate in international efforts to develop regulatory control of exotic invasive species via shipping in the Saint Lawrence Seaway.

Incentives

None at this time.

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Tables and Figures

Tables

Figures

SW Lake Ontario Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the SW Lake Ontario Basin.

Classification	% Cover
Row Crops	39.02
Deciduous Forest	26.31
Pasture/Hay	16.08
Mixed Forest	12.38
Low Intensity Residential	1.96
Parks, Lawns, Golf Courses	1.03
Water	0.83
High Intensity Commercial/Industrial	0.64
Evergreen Forest	0.60
Wooded Wetlands	0.49
High Intensity Residential	0.39
Emergent Wetlands	0.14
Barren; Quarries, Strip Mines, Gravel Pits	0.12

100.0000105

SW Lake Ontario Table 2. NYSDEC Wildlife Management Area (WMA) land units (n=13) within the SW Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
John White Wildlife Management Area	Genesee	8	346
Oak Orchard Wildlife Management Area	Genesee	8	2,500
Tonawanda Wildlife Management Area	Genesee/Niagara	8	5,600
Conesus Inlet Wildlife Management Area	Livingston	8	1,120
Rattlesnake Hill Wildlife Management Area	Livingston/Allegany	8	5,100
Braddock Bay Wildlife Management Area	Monroe	8	2,693
Honeoye Creek Wildlife Management Area	Ontario	8	717
Honeoye Inlet Wildlife Management Area	Ontario/Livingston	8	2,000
Hanging Bog Wildlife Management Area	Allegany	9	4,571
Keaney Swamp Wildlife Management Area	Allegany	9	708
Hartland Swamp Wildlife Management Area	Niagara	9	385
Carlton Hill Wildlife Management Area	Wyoming	9	2,580
Silver Lake Outlet Wildlife Management Area	Wyoming	9	10

SW Lake Ontario Table 3. NYSDEC State Forest and Unique Area land units (n=30) within the SW Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
Canaseraga State Forest	Livingston	8	1,282
Ossian State Forest	Livingston	8	1,300
Sonyea State Forest	Livingston	8	901
Rush Oak Openings State Unique Area	Monroe	8	229
Genesee Valley Greenway Trail	Monroe/Livingston/Wyoming/ Allegany/Cattaraugus	8, 9	458
Allen Lake State Forest	Allegany	9	2,440
Bald Mountain State Forest	Allegany	9	802
Cold Creek State Forest	Allegany	9	496
Coyle Hill State Forest	Allegany	9	2,372
Crab Hollow State Forest	Allegany	9	1,155
English Hill State Forest	Allegany	9	1,393
Gas Springs State Forest	Allegany	9	2,263
Gillies Hill State Forest	Allegany	9	2,372
Hiltonville State Forest	Allegany	9	991
Jersey Hill State Forest	Allegany	9	1,078
Karr Valley Creek State Forest	Allegany	9	1,909
Keeney Swamp State Forest	Allegany	9	2,401
Klipnocky State Forest	Allegany	9	2,585
Lost Nation State Forest	Allegany	9	1,350
Palmers Pond State Forest	Allegany	9	3,694
Phillips Creek State Forest	Allegany	9	2,713
Plumbottom State Forest	Allegany	9	1,684
Rush Creek State Forest	Allegany	9	1,410
Slader Creek State Forest	Allegany	9	1,117
Swift Valley State Forest	Allegany	9	1,634
Turnpike State Forest	Allegany	9	4,589
Vandermark State Forest	Allegany	9	2,349
Bush Hill State Forest	Cattaraugus	9	2,810
Farmersville State Forest	Cattaraugus	9	1,145
Carlton Hill State Forest	Wyoming	9	2,005

SW Lake Ontario Table 4. Office of Parks, Recreation & Historic Preservation (OPRHP) land units (n=14) within the SW Lake Ontario Basin.

Unit Name	County	DEC Region	Acres
Conesus Lake Marine Park	Livingston	8	4
Letchworth State Park	Livingston	8	14,291
Hamlin Beach State Park	Monroe	8	984
Harriet Hollister Spencer State Recreation Area	Ontario	8	690
Honeoye Marine Park	Ontario	8	10
Lakeside Beach State Park	Orleans	8	700
Oak Orchard Marine Park	Orleans	8	84
Stony Brook State Park	Steuben	8	556
Fort Niagara State Park	Niagara	9	272
Four Mile Creek State Park	Niagara	9	284
Golden Hill State Park	Niagara	9	382
Joseph Davis State Park	Niagara	9	382
Wilson-Tuscarora State Park	Niagara	9	386
Silver Lake State Park	Wyoming	9	778

SW Lake Ontario Table 5. Bird Conservation Areas (BCA) within the SW Lake Ontario Basin (n=2). NYSDEC's BCA Program, established in 1997, is modeled after the National Audubon Society's Important Bird Areas (IBA) program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to state-owned properties.

Bird Conservation Area	County	DEC Region	Acres	Description
Braddock Bay	Monroe	8	2,576	Comprised of a diverse array of habitats along the Lake Ontario shoreline. These habitats include marshes, open water, forests, grasslands, and shrub-scrub. Braddock Bay is a shallow water bay-marsh complex that includes Buck Pond, Long Pond, Cranberry Pond, Braddock Bay, and Rose Marsh. All of the ponds are connected to the lake by intermittent channels, which plug and open up as lake currents and wave action change the character of the gravel and sand barrier bars. The bay-marsh complex provides excellent nesting, resting, and feeding habitats for waterfowl, shorebirds, songbirds, raptors, and marsh birds. In addition to the marsh areas, there are wooded areas, grasslands, and shrublands. The area is a noted hawk, songbird and owl migration corridor and observation area. The grasslands support bobolink, meadowlark, sedge wren and savannah sparrow.
Oak Orchard / Tonawanda	Niagara/Orleans/Genesee	8, 9	8,116	A large complex consisting mainly of managed emergent marshes, swamps and other wetlands, as well as extensive grasslands. Large numbers of wetland dependent birds breed here, and the site is an important migratory stopover for waterfowl and wetland-dependent birds. Grasslands provide nesting habitat for waterfowl and numerous grassland bird species. These two state parcels (Oak Orchard Wildlife Management Area, Tonawanda Wildlife Management Area) are at opposite ends of the 11,000 acre Iroquois National Wildlife Refuge. As a whole these areas comprise over 19,000 acres of wetlands and grasslands, much of which have been managed to provide habitat for a variety of birds.

SW Lake Ontario Table 6. Critical Environmental Areas (CEA) within the SW Lake Ontario Basin (n=7). CEAs are traditionally designated by DEC to protect drinking water supplies; however, DEC and other government agencies may designate CEAs to protect wildlife and their habitats and other natural resource elements.

Critical Environmental Area	Location	DEC Region	Reason for Designation
Lesser Hills	City of Rochester, Monroe County	8	Unknown
Wetlands in the City of Rochester	City of Rochester, Monroe County	8	Unknown
Lands within 100 ft. of Rochester	City of Rochester, Monroe County	8	Unknown
Hotel Creek	Town of Riga, Monroe County	8	Trout habitat & may be spawning ground
Canadice Lake	Town of Canadice, Ontario County	8	Preserve open space
Hemlock Lake	Town of Canadice, Ontario County	8	Preserve open space
Valley-Fill Aquifer	Town of Wayland, Steuben County	8	Primary source of drinking water

SW Lake Ontario Table 7. Significant Coastal Fish and Wildlife Habitats (n=10) within the SW Lake Ontario Basin. DEC evaluates the significance of coastal fish and wildlife habitat areas, and following a recommendation from NYSDEC, the Department of State designates and maps specific areas.

Habitat Name	County	Acres	Significance Value [a]	Description
Braddock Bay and Salmon Creek	Monroe	3,910	171	One of the largest coastal wetland ecosystems in New York State. One of the major concentration areas for migratory birds in the Great Lakes coastal region. Northern harrier (T), black tern (SC), least bittern (SC), sedge wren (SC), spotted salamander (SC) and Jefferson salamander (SC) have been documented here. The area consists of large, shallow, open water areas (including Braddock Bay, Cranberry Pond, Long Pond, Buck Pond, and Round Pond), extensive freshwater wetlands (predominantly emergent marsh and submergent aquatic beds), forested and open upland areas, and approximately eight miles of Salmon Creek. Salmon Creek is a relatively large, medium gradient, warmwater stream, which drains approximately 70 square miles of relatively flat agricultural and rural residential lands. The habitat includes the segment of Salmon Creek from Braddock Bay to the Parma Center Road Dam, approximately two and one-half miles southwest of the Village of Hilton. The habitat includes all of the Braddock Bay Wildlife Management Area.
Oak Orchard Creek	Orleans	256	60	One of about 10 major tributaries of Lake Ontario. Concentrations of spawning salmonids are among the largest occuring in NYS's Great Lakes tributaries. Habitat extends about six miles from the mouth at Point Breeze to the Waterport Dam, and includes the entire stream channel and associated islands and wetlands. The habitat also includes an approximate two mile segment of Marsh Creek, which flows into Oak Orchard Creek about one mile south of Point Breeze. Oak Orchard Creek is a very large, low to medium gradient, warmwater stream, with a predominantly rock and gravel substrate. The creek drains approximately 270 square miles of relatively flat agricultural land, rural residential land, and extensive inland wetlands. Below Waterport Dam, which serves an active hydroelectric power plant, Oak Orchard Creek flows through a steep sided undeveloped, wooded gorge, where habitat disturbances are minimal. However, below the confluence with Marsh Creek, there has been considerable shoreline development. Sizeable areas of emergent wetland vegetation and submergent aquatic beds occur in undisturbed shoreline areas along this lower section of the creek.
Genesee River	Monroe	385	54	One of 10 major New York tributaries of Lake Ontario. Concentrations of spawning slamonids are among the largest occuring in NYS's Great Lakes tributaries. Spotted salamander (SC) and spotted turtle (SC) have been observed but the extent of use not well documented. Habitat is an approximate six and one-half mile segment of the river, extending from Lake Ontario to "Lower Falls" (located just above Driving Park Avenue), which is a natural impassable barrier to fish. The Genesee River is a large, warmwater river, with a drainage area of nearly 2,500 square miles, and an average annual discharge of approximately 2,800 cubic feet per second. Maximum water depths of up to 25 feet occur near the river mouth, and a navigation channel has been dredged upstream approximately two and one-half miles. Much of this lower segment is bordered by dense commercial, industrial, and residential development, accompanied by extensive bulkheading. Above this area, the Genesee River flows through a relatively undeveloped wooded gorge, and has a fringe of emergent wetland vegetation along much of its shoreline. This portion of the river is
Sandy Creek	Monroe	164	52	One of about 10 major New York tributaries to Lake Ontario. Concentrations of salmonids and smallmouth bass are unusual in the Lake Ontario ecological subzone. Least bittern (SC) nesting has been documented. Habitat includes the creek channel and associated wetlands and islands, extending approximately fourteen miles from the mouth of Sandy Creek (at Sandy Harbor Beach), to the confluence of the West and East Branches of Sandy Creek, just south of N.Y.S. Route 104. Sandy Creek is a relatively large, medium gradient, warmwater stream, with a predominantly sand and gravel substrate. The creek drains approximately 90 square miles of relatively flat agricultural and rural residential lands, and is bordered along most of its length by woody riparian vegetation.

SW Lake Ontario Table 7. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Eighteen Mile Creek - Lake Ontario	Niagara	64	37	One of about 10 major New York tributaries to Lake Ontario, and relatively undisturbed; rare in ecological subzone. One of the major salmonid spawning streams on Lake Ontario (ecological subzone). Fish and wildlife habitat extends approximately one and one-half miles from the N.Y.S. Route 18 bridge to the Burt Dam, and includes the entire stream channel and Associated wetlands and islands. Eighteen Mile Creek is a relatively large, meandering, warmwater stream, with predominantly silt and gravel substrates. The creek drains approximately 90 square miles of relatively flat agricultural and rural residential lands. Below the Burt Dam, Eighteen Mile Creek flows through a steep sided, undeveloped wooded gorge, where habitat disturbances are minimal.
Johnson Creek	Orleans	98	29	One of about 10 major New York tributaries to Lake Ontario; rare in ecological subzone. One of only two significant salmonid spawning streams in Orleans County. Fish and wildlife habitat extends approximately seven miles from the hamlet of Lakeside on Lake Ontario to a low dam (the first impassable barrier) at the Village of Lyndonville. Johnson Creek is a relatively large, medium gradient, warmwater stream, with a gravelly substrate. The creek drains over 100 square miles of relatively flat agricultural and rural residential lands, and is bordered along most of its length by woody riparian vegetation. Most of the land area bordering Johnson Creek is privately owned, except in the last mile of stream, which flows through undeveloped Lakeside Beach State Park. Habitat disturbances in the area are generally limited to discharges of agricultural runoff, road crossings, and cottage development near the mouth of the creek.
Fourmile Creek Bay	Niagara	27	20	Relatively small, undisturbed, emergent marsh and deep aquatic beds, unusual in Niagara County. Tributary stream is typical of the local area. One of about 4 Niagara County tributaries having significant concentrations of salmonids; also an important spawning and nursery area for resident and lake-based warmwater fish populations. An approximate 20 acre wetland estuary located north of the Robert Moses Parkway, in Fourmile Creek State Park. The habitat encompasses all of the area below mean high water, including deep aquatic beds and emergent marsh. The land area surrounding Fourmile Creek Bay is generally undeveloped, dominated by a broad band of mature deciduous forest.
Keg Creek	Niagara	39	20	Relatively small, undisturbed tributary stream and associated wetlands, unusual in Niagara County. One of about 4 Niagara County tributaries having significant concentrations of salmonids (steelhead especially) during spring and fall spawning runs. an approximate half-mile segment of the creek (up to N.Y.S. Route 18) and associated wetlands, totaling approximately 16 acres. This segment of Keg Creek is an undisturbed, low gradient, weedy channel, 10-20 feet wide. The stream is bordered by a broad, lush, band of wetland vegetation, dominated by cattails, burreed, yellow iris, sedges, dogwoods, and grasses. Above Route 18, Keg Creek is a small, medium gradient, warmwater stream, with a silt and gravel substrate.
Slater Creek	Monroe	24	18	Very small artificially-warmed, tributary stream; not a rare ecosystem type. Year-round concentrations of salmonids, smelt, and various warmwater species are unusual in the Great Lakes coastal region. A small, medium gradient, warmwater stream, which drains approximately 5 square miles of rural and suburban residential area. Warmwater discharges from a Rochester Gas and Electric power plant enter Slater Creek approximately 1000 feet above the mouth. The fish and wildlife habitat includes the creek upstream to Ling Road, and a small area of open water in Lake Ontario at the stream mouth.

SW Lake Ontario Table 7. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Tuscarora Bay Marsh	Niagara	53	16	One of the largest, undeveloped coastal wetlands in Niagara County. Concentrations of many fish and wildlife species, especially warmwater fishes and marsh-nesting birds, are unusual in Niagara County's coastal area. Approximately 40 acres of undisturbed cattail marsh and small, wooded islands. Much of this wetland area is located within Wilson-Tuscarora State Park. The only open water within the marsh is the East Branch, a narrow (10-20' wide), slow-moving, warmwater stream, which meanders through the area. Tuscarora Bay Marsh is bordered by undeveloped woodlands to the east, south, and west. To the north, Tuscarora Bay proper has been heavily developed as a residential and small craft harbor area, containing marinas, boat launches, extensive bulkheading, houses, trailers, and related businesses, resulting in some encroachment into the marsh.

[a] Significance Value = [(Ecosystem Rarity + Species Vulnerability + Human Use + Population Level) x Replaceability]

SW Lake Ontario Table 8. Species of Greatest Conservation Need currently occurring in the SW Lake Ontario Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Barn owl	Barn owl	Unknown
Bird	Breeding waterfowl	American black duck	Unknown
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Breeding waterfowl	Ruddy duck	Increasing
Bird	Colonial-nesting herons	Black-crowned night-heron	Decreasing
Bird	Common loon	Common loon	Unknown
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Kentucky warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Unknown
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Decreasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Black tern	Decreasing
Bird	Freshwater marsh nesting birds	King rail	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Freshwater marsh nesting birds	Yellow rail	Unknown
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Peregrine falcon	Peregrine falcon	Stable
Bird	Transient shorebirds	American golden-plover	Unknown
Bird	Transient shorebirds	Black-bellied plover	Unknown
Bird	Transient shorebirds	Buff-breasted sandpiper	Unknown
Bird	Transient shorebirds	Dunlin	Unknown
Bird	Transient shorebirds	Greater yellowlegs	Unknown
Bird	Transient shorebirds	Hudsonian godwit	Unknown
Bird	Transient shorebirds	Ruddy turnstone	Unknown
Bird	Transient shorebirds	Sanderling	Unknown
Bird	Transient shorebirds	Semipalmated sandpiper	Unknown
Bird	Transient shorebirds	Whimbrel	Unknown
Bird	Wintering waterbirds	Bonaparte's gull	Unknown
Bird	Wintering waterbirds	Horned grebe	Unknown
Bird	Wintering waterbirds	Lesser scaup	Stable
Bird	Wintering waterbirds	Little gull	Unknown
Bird	Wintering waterbirds	Long-tailed duck	Unknown
Bird	Wintering waterbirds	Northern pintail	Unknown
Bird	Wintering waterbirds	Red-throated loon	Unknown
Bird	Wintering waterbirds	Thayer's gull	Unknown
Crustacea/Meristomata	Freshwater crustacea	Devil crawfish	Stable
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable

SW Lake Ontario Table 8. (continued)

Taxa Group	Species Group	Species	Stability
Freshwater fish	Extirpated Fishes	Atlantic salmon	Unknown
Freshwater fish	Extirpated Fishes	Kiyi	Unknown
Freshwater fish	Extirpated Fishes	Shortjaw cisco	Unknown
Freshwater fish	Extirpated Fishes	Shortnose cisco	Unknown
Freshwater fish	Extirpated Fishes	Silver chub	Unknown
Freshwater fish	Extirpated Fishes	Spoonhead sculpin	Unknown
Freshwater fish	Iowa darter	Iowa darter	Unknown
Freshwater fish	Lake Sturgeon	Lake sturgeon	Increasing
Freshwater fish	Longear sunfish	Longear sunfish	Unknown
Freshwater fish	Mooneye	Mooneye	Unknown
Freshwater fish	Ninespine stickleback - inland	N. American ninespine stickleback	Unknown
Freshwater fish	Pugnose shiner	Pugnose shiner	Stable
Freshwater fish	Redfin shiner	Redfin shiner	Decreasing
Freshwater fish	River redhorse	River redhorse	Unknown
Freshwater fish	Round whitefish	Round whitefish	Decreasing
Freshwater fish	Sauger	Sauger	Decreasing
Freshwater fish	Western pirate perch	Western pirate perch	Decreasing
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Western chorus frog	Unknown
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Queen snake	Decreasing
Herpetofauna	Lake/river reptiles	Spiny softshell	Decreasing
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Lizards	Coal skink	Unknown
Herpetofauna	Massasauga	Eastern massasauga	Decreasing
Herpetofauna	Mudpuppy	Common mudpuppy	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Blanding's turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Arrow clubtail	Unknown
Insect	Odonates of rivers/streams	Blue-tipped dancer	Unknown
Insect	Odonates of rivers/streams	Midland clubtail	Unknown
Insect	Odonates of seeps/rivulets	Arrowhead spiketail	Unknown
Insect	Odonates of seeps/rivulets	Gray petaltail	Unknown
Insect	Other butterflies	Checkered white	Decreasing
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other moths	*Euxoa pleuritica*	Decreasing
Insect	Riparian tiger beetles	*Cicindela ancocisconensis*	Unknown
Insect	Riparian tiger beetles	Cobblestone tiger beetle	Unknown
Insect	Stoneflies/Mayflies of uncertain habitat	*Plauditus gloveri*	Unknown
Mammal	Furbearers	River otter	Unknown
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Mammal	Tree bats	Silver-haired bat	Unknown
Marine fish	American eel	American eel	Decreasing
Mollusk	Freshwater bivalves	Black sandshell	Unknown
Mollusk	Freshwater bivalves	Eastern pondmussel	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Kidneyshell	Unknown
Mollusk	Freshwater bivalves	Pink heelsplitter	Unknown
Mollusk	Freshwater bivalves	Pocketbook	Unknown
Mollusk	Freshwater bivalves	Rainbow	Unknown
Mollusk	Freshwater bivalves	Threeridge	Unknown
Mollusk	Freshwater bivalves	Wabash pigtoe	Unknown

SW Lake Ontario Table 9. SGCN that historically occurred in the SW Lake Ontario Basin, but are now believed to be extirpated from the basin (n=27).

Taxa Group	Species Group	Species
Bird	Loggerhead Shrike	Loggerhead shrike
Freshwater Fish	Bigeye chub	Bigeye chub
Freshwater Fish	Black redhorse	Black redhorse
Freshwater Fish	Blackchin shiner	Blackchin shiner
Freshwater Fish	Extirpated fishes	Bloater
Freshwater Fish	Deepwater sculpin	Deepwater sculpin
Freshwater Fish	Extirpated fishes	Lake chubsucker
Herpetofauna	Woodland/grassland snakes	Black ratsnake
Herpetofauna	Uncommon turtles of wetlands	Bog turtle
Insect	Other moths	*Papaipema aerata*
Insect	American burying beetle	American burying beetle
Insect	Odonates of bogs/fens/ponds	Black meadowhawk
Insect	Odonates of rivers/streams	Elusive clubtail
Insect	Karner blue butterfly	Karner blue
Insect	Other moths	Phyllira tiger moth
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mollusk	Freshwater gastropods	Buffalo pebblesnail
Mollusk	Freshwater bivalves	Deertoe
Mollusk	Freshwater bivalves	Fat pocketbook
Mollusk	Freshwater bivalves	Lilliput
Mollusk	Freshwater bivalves	Paper pondshell
Mollusk	Freshwater bivalves	Pimpleback
Mollusk	Freshwater bivalves	Round pigtoe
Mollusk	Freshwater bivalves	Tidewater mucket
Mollusk	Freshwater bivalves	Wavyrayed lampmussel

SW Lake Ontario Table 10. SW Lake Ontario Basin species diversity relative to the total number of SGCN statewide

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**14**	**68**	**118**	**57.6**
Bald Eagle		1		
Barn Owl		1		
Breeding Waterfowl		3	4	75.0
Colonial-Nesting Herons		1	8	12.5
Common Loon		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		8	9	88.9
Early Successional Forest/Shrub Birds		11	12	91.7
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		6	6	100.0
Grassland Birds		10	11	90.9
Peregrine Falcon		1		
Transient Shorebirds		10	14	71.4
Wintering Waterbirds		8	19	42.1
CRUSTACEA	**1**	**1**	**7**	**14.3**
Freshwater Crustacea		1	2	50.0
FRESHWATER FISH	**13**	**18**	**40**	**45.0**
Heritage-Strain Brook Trout		1		
Extirpated Fishes		6	11	54.5
Iowa Darter		1		
Lake Sturgeon		1		
Longear Sunfish		1		
Mooneye		1		
Ninespine Stickleback (inland)		1		
Pugnose Shiner		1		
Redfin Shiner		1		
River Redhorse		1		
Round Whitefish		1		
Sauger		1		
Western Pirate Perch		1		
HERPETOFAUNA	**9**	**16**	**44**	**36.4**
Freshwater Wetland Amphibian		2	5	40.0
Lake/River Reptiles		4	5	80.0
Lizards		1	3	33.3
Massasauga		1		
Mudpuppy		1		
Snapping Turtle		1		
Uncommon Turtles of Wetlands		2	5	40.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		2	8	25.0
INSECT	**6**	**13**	**197**	**6.6**
Odonates of Rivers/Streams		4	19	21.1
Odonates of Seeps/Rivulets		2	4	50.0
Other Butterflies		3	18	16.7
Other Moths		1	92	1.1
Riparian Tiger Beetles		2	2	100.0
Stoneflies/Mayflies - Uncertain Habitat		1	6	16.7
MAMMAL	**2**	**4**	**21**	**19.0**
Furbearers		1	2	50.0
Tree Bats		3	3	100.0
MARINE FISH	**1**	**1**	**51**	**2.0**
American Eel		1		
MOLLUSK	**1**	**9**	**59**	**15.3**
Freshwater Bivalves		9	39	23.1
TOTAL	**47**	**130**	**537**	**24.2**
% of All Species Groups Statewide	**36.7**			

SW Lake Ontario Table 11. Critical **aquatic** habitats found in the SW Lake Ontario Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Palustrine	mineral soil wetland	35
Riverine	warm water stream	28
Riverine	coldwater stream	27
Riverine	deepwater river	19
Lacustrine	warm water shallow	18
Lacustrine	cold water deep	17
Lacustrine	cold water shallow	11
Lacustrine	unknown	9
Lacustrine	warm water deep	7
Palustrine	peatlands	6
Riverine	unknown	5
Riverine	warm water shallow	2
Palustrine	warm water stream	1
Palustrine	unknown	1
Riverine	cultural	1
Riverine	warm water deep	1
Subterranean	natural	1

SW Lake Ontario Table 12. Critical **terrestrial** habitats found in the SW Lake Ontario Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Terrestrial	open upland	49
Terrestrial	forested	43
Terrestrial	barrens/woodlands	14
Terrestrial	coastal	9
Unknown	unknown	4
Terrestrial	unknown	3

SW Lake Ontario Table 13. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the SW Lake Ontario Basin
For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Habitat Loss - cultural (e.g., development)	29	61.7	10.6
Contaminants	22	46.8	8.0
Degradation of Water Quality	19	40.4	6.9
Human Disturbance - illegal/unregulated harvest	18	38.3	6.6
Human Disturbance - collisions	14	29.8	5.1
Disrupted Predator-Prey Cycles	14	29.8	5.1
Interspecific Competition for Resources	14	29.8	5.1
Barriers to Aquatic Movement (e.g., dams, weirs, culverts)	12	25.5	4.4
Disease	10	21.3	3.6
Habitat Loss - natural (e.g., succession)	10	21.3	3.6
Fragmentation	9	19.1	3.3
Human Disturbance - general	8	17.0	2.9
Competition from Invasive Exotics	8	17.0	2.9
Insensitive/Unsustainable Agricultural/Silvicultural Practices	7	14.9	2.6
Sedimentation/Erosion (impacts on aquatic habitats)	7	14.9	2.6
Active Alteration/Suppression of Natural Processes (e.g., fire)	6	12.8	2.2
Unknown Threats	6	12.8	2.2
Loss of Streamside Buffers	5	10.6	1.8
Altered Hydrology (water level management/extraction)	5	10.6	1.8
Reduction of Patch Size, Shape, Area	5	10.6	1.8
Human Disturbance - entanglement, entrainment, impingement	5	10.6	1.8
Detrimental Hybridization	5	10.6	1.8
Habitat Composition Altered by Terrestrial Invasive Species	4	8.5	1.5
Loss of Connectivity/Metapopulation Dynamics	4	8.5	1.5
Habitat Composition Altered by Aquatic Invasive Species	3	6.4	1.1
Susceptibility to Stochastic Events (weather, storms)	3	6.4	1.1
Susceptibility to Stochastic Events (isolated pop'ns)	3	6.4	1.1
Climate Change (change in water level, temperature)	3	6.4	1.1
Barriers to Terrestrial Movement (e.g., roads, powerlines)	2	4.3	0.7
Pollution (e.g., acid rain, soil contamination)	2	4.3	0.7
Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	4.3	0.7
Loss of Host Species	2	4.3	0.7
Susceptibility to Stochastic Events (rare species)	2	4.3	0.7
Aquatic Habitat Composition Altered by Overuse (e.g., swan, muskrat)	1	2.1	0.4
Negative Edge Effects (i.e., increased predation, "ecological traps")	1	2.1	0.4
Parasites	1	2.1	0.4
Aquatic Habitat Altered by Natural Processes (e.g., beaver)	1	2.1	0.4
Climate Change (change in species range, distb'n, migration)	1	2.1	0.4
Impacts of Erosion on Terrestrial Habitats	1	2.1	0.4

SW Lake Ontario Table 14. Approved State Wildlife Grant studies relevant to the SW Lake Ontario Basin (Coordination Grant T-1, Wildlife Grants T-2-1 and T-2-2, and Fish/Marine Grant T-3).

State Wildlife Grant Study	Location	Description
COORDINATION GRANT		
Project 1: Comprehensive Wildlife Conservation Planning & Coordinatior		
Job 1: SWG Coordination & Development of the Comprehensive Wildlife Conservation Strategy	Statewide	New York will develop a Comprehensive Wildlife Conservation Strategy by October 2005, focusing on species of greatest conservation need in the state. We will work closely with partner organizations and the public to develop the plan, which will identify management needs, goals and strategies for more than 500 animal species that are rare, declining, vulnerable, or status unknown in New York State.
WILDLIFE CONSERVATION GRANT		
Project 1: Conservation Planning for Species of Greatest Conservation Need		
Bird Conservation		
Job 1: New York State's 2nd Breeding Bird Atlas	Statewide	New York completed its first Breeding Bird Atlas during 1980-1985, and the second atlas project (2000-2004) is underway. State Wildlife Grant funding will ensure completion of the second atlas, which will document the current distribution of breeding birds in New York State and quantify changes in distributions of species between the two atlas periods. Once completed, Atlas results will be made available in book and web-based formats for use by conservation biologists, planners, and the public.
Job 2: Developing a Grassland Bird Conservation Plan for New York State	Statewide, where grassland habitats are present	Because of widespread loss and fragmentation of grassland habitat, grassland bird populations are declining in New York and throughout North America. This project will develop a comprehensive plan to guide and direct grassland bird conservation and management on public and private lands in New York State. The plan will help direct conservation efforts to the most important areas, provide guidance to grassland owners and managers, and identify monitoring and research needs for grassland birds.
Job 5: Golden-winged Warbler Habitat and Hybridization Study	Sterling Forest State Park, Orange County	The golden-winged warbler has declined at an annual rate of 8 percent for the last 35 years in the northeastern U.S. Possible factors in its decline include reforestation and range expansion of the blue-winged warbler. This project will investigate genetics and habitat segregation among these two species. Results will help to establish whether they should be considered distinct species and provide guidance for habitat management plans to sustain golden-winged warbler populations.
Job 17: Marshbird Conservation in New York State	Statewide, where freshwater emergent marshes are present	Baseline information on distribution and abundance is needed for many marsh-nesting species in New York State. Species of concern include pied-billed grebe, black tern, least bittern, American bittern, and king rail. This project will survey representative freshwater marsh habitats across the state during 2004-2006 to quantify abundance and habitat use of marsh birds, identify focus areas for marsh bird conservation, and develop a long-term monitoring program.
Job 18: Coordinated Comprehensive Bird Monitoring Plan for New York State	Statewide	Comprehensive and coordinated monitoring programs are needed to reliably assess the status of all bird "species of greatest conservation need" in New York State. This project will document details of existing bird monitoring and survey programs in New York and assess their utility for monitoring various species of concern. We will form a bird monitoring partnership, involving agencies, organizations, and individuals, to recommend and help implement new or improved monitoring and survey programs for all bird species in New York State.
Job 22: Golden-winged Warbler Habitat Restoration Investigation	Sterling Forest State Park, Orange County	The golden-winged warbler (GWWA) has declined at an annual rate of eight percent for the last 35 years in the northeastern U.S. and is a candidate for federal listing as a threatened or endangered species. Possible factors in its decline include loss of habitat due to reforestation and hybridization with the blue-winged warbler. Results of prior SWG-funded research will be used to design and conduct an experimental habitat restoration project in Sterling Forest State Park to assess the feasibility of creating or maintaining suitable habitat for GWWA in southeastern New York.
Mammal Conservation		
Job 8: Feasibility of Implementing a Robust Design Mark-Recapture Study for Indiana Bats	Statewide, where Indiana bats are present	The Indiana bat, a federally endangered species, has declined from roughly 600,000 in the 1960s to about 350,000 today. Population declines in southern portions of its range, primarily Kentucky and Missouri, have far exceeded increases in the north, including New York. We hope to conduct a large scale mark-recapture study to identify causes of the decline and regional differences in population trends. The first step is a feasibility study to determine if we can adequately address assumptions of the study design.
Job 9: Determining the Feasibility of a Statewide Summer Survey of Tree Bats	Statewide, north of NYC and Long Island	Tree bats (red, hoary and silver-haired bats) are among the least understood vertebrates in the state. We do not know the current status or distribution of any of these species, and the most comprehensive surveys were conducted more than 100 years ago. Recent technical innovations have increased the reliability of field sampling while reducing costs. We plan to conduct initial surveys to determine the costs and effectiveness of conducting a statewide status survey for tree bats in New York State.

State Wildlife Grant Study	Location	Description
Reptile & Amphibian Conservation		
Job 10: Assessment of the Status and Abundance of High Priority Reptile and Amphibian Species	Statewide	As a group, a higher proportion of amphibian and reptile species have suffered significant declines than any other vertebrate groups in New York State. To date, much effort has been placed on documenting distribution of these endangered and threatened species. This project will focus on collecting information on the status of known populations, following standard protocols, so that conservation efforts can be prioritized on those in greatest need.
Job 12: Reducing Turtle Mortality During Nesting	Statewide	Certain turtle species experience high mortality of females when they migrate from over-wintering locations to traditional egg-laying sites. This project will investigate methods of reducing this mortality through use of subsurface tunnels for crossing roadways, creation of protected nesting sites, and predator exclusions.
Job 25: Spiny Softshell Turtle Survey and Life History Studies	Shores of Lake Ontario and its tributaries	Little is know about the distribution, life history, seasonal movements, and habitat-use of spiny softshell turtles in New York State. NYSDEC will assess the status and distribution of spiny softshell turtles in the Finger Lakes and the bays on the southern shore line of Lake Ontario, including the streams and creeks that enter Lake Ontario, in order to make recommendations concerning the management of critical habitats for this species.
Job 26: Reptile and Amphibian Species Inventory (cont'd from Job 10, Grant T-2-1)	Statewide	Previous studies have identified many reptile and amphibian species in need of conservation, which is the first step in developing baseline information to measure changes in populations. This project will help complete surveys of other reptile and amphibian species that are listed as species of special concern by New York State. Completion of these surveys will produce a mechanism to assure continuity of surveys for this group of species, as gather well as data to determine the status of special concern reptile and amphibian species.
Invertebrate Conservation		
Job 15: Odonate Inventory	Statewide	There is a need for a comprehensive survey or inventory for odonates (dragonflies and damselflies) statewide. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state.
Job 27: Tiger Beetle Inventory	Western New York State	There are 26 species or subspecies of tiger beetle reported from New York State. Of the 26 species, nine are considered globally rare or rare in New York State, while another five are thought to be uncommon in the state (Gordon 1939, New York Natural Heritage Program 2004.) Nearly all of the species of concern are found in habitats that have been heavily impacted by development or other deleterious factors. DEC will conduct status assessments for nine species (including one subspecies) of tiger beetles in New York State that will clarify the need for conservation actions in order to maintain these species.
FISH AND MARINE CONSERVATION GRANT		
Project 1: Conservation Planning for Aquatic Resources		
Freshwater Fish Conservation		
Job 2: Conservation of Lesser Known Species of Fish	Statewide	This project involves review of DEC and New York State Museum fish records to identify information needs about the status of rare species. Findings will be used to plan new surveys that will eventually allow a complete assessment of the status and distribution of these "lesser known" freshwater fish species of New York State.

For more information on these projects visit NYSDEC website at www.dec.state.ny.us
or contact NYSDEC at:
State Wildlife Grants Program Coordinator
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SW Lake Ontario Table 15. Existing management plans and agreements relevant to the SW Lake Ontario Basin. This is an assortment of the major planning efforts within the Basin and is not a comprehensive list. Other planning efforts may exist at both the local and landscape scale and should be consulted before implementing conservation actions.

Plan/Agreement Name	Involved Parties	Information
Biodiversity Around the Great Lakes (2002)	USEPA, Purdue University	Educational software program, Great Lakes history, case studies, monitoring, species inventory, habitat restoration
Black Creek Watershed State of the Basin Report (2003)	Black Creek Watershed Coalition	Geography; uses of land and water; water quality; water quantity; problems;
Conesus Lake Watershed Management Plan	Livingston County Planning Department	Need for restoration and protection; subwatershed analysis; recommended actions; implementation
Conservation Blueprint for the Great Lakes (2003)	The Nature Conservancy	Preserving biodiversity; framework for action; scientific foundation; threats
County Water Quality Strategies	County Soil and Water Conservation offices	Identifying and prioritizing water quality problems; water quality goals and actions
Eighteenmile Creek Remedial Action Plan (1997)	USEPA, NYSDEC	Background; use impairments; status; schedule; progress; research; community involvement; partners
Erie Canal National Heritage Corridor Plan (in preparation)	National Park Service	Preservation and management; incorporates existing federal, state, and local plans; public partnerships and review
Fish and Wildlife Habitat Status and Trends in the Canadian Watershed of Lake Ontario (2000)	Environment Canada, CWS Ontario Region	Current habitat conditions, threats, current habitat protection/restoration efforts, summary analysis of the status of fish and wildlife habitat, monitoring/evaluation
Fish Community Objectives for Lake Ontario (1999, 2003)	NYSDEC, Ontario MNR	Goals, description of the lake, habitat alterations, fish species, management actions
Genesee River Basin Action Strategy	US ACOE, Genesee/Finger Lakes Regional Planning Council	Basin overview - land use, water quality;basinwide recommendations; watershed prioritization; natural resource and prioritization; natural resource and heritage data
Great Lakes Strategy - A Plan for the New Millennium (2002)	US Policy Committee for the Great Lakes	Goals, chemical, physical, and biological integrity, partnerships
Great Lakes Wetlands Conservation Action Plan (1994, 2002)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Long-term strategies for wetland conservation, implementation of the 25-year Strategic Plan for Wetlands of the Great Lakes Basin
Great Lakes Wetlands Conservation Action Plan Report 2000-2003	Environment Canada	Wetland conservation highlights, review of strategies, partners
Lakewide Management Plan for Lake Ontario (1998)	USEPA, Environment Canada, NYSDEC, Ontario Ministry of the Environment	Problem identification, public involvement, monitoring progress
Oak Orchard Watershed State of the Basin Report (2005)	Oak Orchard Watershed Protection Alliance	Unique features of the watershed; resources of value within the watershed; current water quality and quantity conditions; relevant land use impacts and critical issues within the basin; recommendations for improving water quality to ensure the health and sustainability of the basin's resources.
Oatka Creek Park Vegetation and Wildlife Report (2000)	Oatka Creek Watershed Committee	Agency resources; inventory methods; results; conclusions
Rochester Embayment Remedial Action Plan (1997)	USEPA, NYSDEC	Background; use impairments; status; schedule; progress; research; community involvement; partners
State of Conesus Lake: Watershed Characterization Report (2002)	Livingston County Planning Department	Various programs; watershed characteristics; tributaries; lake characterization; sources of contamination; public education; recommendations
Strategic Plan for Wetlands of the Great Lakes Basin (1993)	Ontario MNR, Environment Canada, DU Canada, Nature Conservancy of Canada, Federation of Ontario Naturalists	Twenty-five year strategy for wetlands conservation in the Great Lakes Basin
The Oatka Creek Watershed State of the Basin Report (2002)	Oatka Creek Watershed Committee	State of the basin - geology, wetlands, natural resources, regional programs; watershed; water quality; human population
Towards a New Conservation Vision for the Great Lakes Region: A Second Iteration (2003)	The Nature Conservancy	Ecoregional planning, visions, goals, identify datagaps and core conservation areas, threats, target species
Twenty-five Year Plan for the Great Lakes (1991)	NYSDEC	Goals, water quality, economic development, interstate/international partnerships
Western Erie Canal Heritage Corridor Plan (Draft 2004)	Western Erie Canal Heritage Corridor Planning Commission	Land use planning; natural resource management
NYSDEC Unit Management Plans	NYSDEC	Assessment of the natural and physical resources present within a unit; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Rush Oak Openings State Unique Area (1999)		
Bird Conservation Area Management Guidance Summaries	NYSDEC, OPRHP, Audubon	A physical description of the site, BCA criteria met, important species & habitat types, guidance for management, op/maintenance, research, education and outreach. Includes local contacts.
Braddock Bay Oak Orchard / Tonawanda		
Wildlife Management Area Plans	NYSDEC	Assessment of the wildlife, habitats and physical resources present; history of the property; management, op/maintenance, research, education and outreach objectives; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Braddock Bay Wildlife Management Area (1995) Carlton Hill Wildlife Management Area (1970) Conesus Inlet Wildlife Management Area (1973) Hanging Bog Wildlife Management Area (1970) Hartland Swamp Wildlife Management Area (1977) Honeoye Creek Wildlife Management Area (1986) Keaney Swamp Wildlife Management Area (1977) Oak Orchard Wildlife Management Area (1989) Rattlesnake Hill Wildlife Management Area (1984) Tonawanda Wildlife Management Area (1988)		

Description of the Basin

The Susquehanna Basin covers an area of 4 million acres in south-central New York. The basin is within the Appalachian Highlands, or High Allegheny Plateau ecoregion, and includes 2 major sub-watersheds, the Upper-Susquehanna and Chemung. The major municipalities within the basin are Binghamton, Cortland, Elmira, and Oneonta. The basin encompasses parts of 19 counties and there were an estimated 775,000 people basin-wide in 2000. Although only 35% of the basin's human population resides in the Chemung sub-watershed, the population density (people/square mile) is greater than that of the Upper-Susquehanna sub-watershed, which contains 65% of the total population.

The Susquehanna Basin is the second largest river basin east of the Mississippi, and the largest on the Atlantic seaboard. The 444-mile river drains 27,500 square miles including portions of New York, Pennsylvania, and Maryland before emptying into the Chesapeake Bay (NYSDEC, 2002). The New York portion of the basin drains over 6,000 square miles and includes approximately 20,000 acres of lakes and 11,000 miles of mapped streams. Land use within the watershed has changed significantly since the late 19th Century when greater than 90% of the watershed was cleared for agriculture. Today the predominant land cover classifications are deciduous, mixed, and evergreen forest (70%) and agricultural lands (27%) according to the U.S. Environmental Protection Agency's Multi-Resolution Land Classification (MRLC) map information (Susquehanna Table 1, Susquehanna Figure 1). Just over 2.5% of the basin is classified as developed land. Agricultural lands include row crops and pasture/hay lands based on MRLC interpreted data. The MLRC data distinguishes between natural grassland and old fields, hay, pasture, and row crops. There are no lands classified as natural grasslands in the basin. However, in NY, our pasture/hay lands and row crops are often referred to as grasslands by many management agencies, including DEC. The data provided above relate to the entire Susquehanna basin, but since the 2 sub-watersheds in the basin are somewhat different from each other, more detailed information is provided below.

According to the Susquehanna River Basin Commission (SRBC), most of the Upper-Susquehanna sub-watershed is steeply sloped with forested (70%) hills and ridges and large wide valleys scattered with agricultural (26%) activity (SRBC, 2002). The major river in this sub-watershed is the Susquehanna River; its major tributaries are the Chenango, Unadilla, Otselic, and Tioughnioga Rivers. These rivers drain 4,500 square miles, including most of Broome, Chenango, Cortland, Otsego, and Tioga counties; parts of Delaware, Madison, and Chemung counties; and small portions of Schuyler, Tompkins, Onondaga, Oneida, Herkimer, and Schoharie counties. Major population centers within the sub-watershed include Binghamton, Cortland, Norwich, and Oneonta. In 2000, the impervious surface of the sub-watershed was estimated to be 0.63% (Chesapeake Bay Program, 2004).

The Chemung River sub-watershed is typical of glaciated areas, and is comprised of rolling to flat-topped uplands with steep alluvial valleys in which the main rivers flow. Forests (66%) occupy the steeper hillsides bordering stream valleys, while agriculture (31%) dominates the flatter hilltops and valleys. The major tributaries of the Chemung River are the Tioga (flowing north from Pennsylvania), Cohocton, and the Canisteo Rivers. The drainage area of 1,500 square miles encompasses most of Steuben and Chemung counties, a significant portion of Schuyler County, and smaller parts of Allegany, Livingston, Ontario, and Yates counties. Major population centers in the sub-watershed include Elmira, Corning, and Hornell. Impervious surface of the Chemung in 2000 was estimated to be 0.81% (Chesapeake Bay Program, 2004). In both the Chemung and Upper-Susquehanna sub-watersheds flooding has been a major problem in low lying areas. Flood walls and levees have been constructed near many cities in these basins to confine the larger rivers and minimize flood damage. Additionally, many smaller streams have been channelized and bermed by landowners and highway departments to protect farm fields and other structures. The result of these alterations has been a significant reduction in the amount of functional flood plain in the basin, which in turn has resulted in increased stream velocities, streambank erosion, and degradation of stream habitats.

There are 9 state parks in the basin, comprising a total of 6,174 acres (Susquehanna Table 2). These parks provide upland and wetland habitats for many Species of Greatest Conservation Need (SGCN).

Four areas have been designated within the Susquehanna as draft Important Bird Areas (IBA) by Audubon (Susquehanna Table 3). Two of those areas (Pharsalia and Long Pond) are also designated as state Bird Conservation Areas. The Cannonsville/Stream Mill IBA is located in Broome, Chenango, and Delaware Counties. It was designated for species at risk (bald eagle) and forest cover, which includes Appalachian oak-pine, deciduous wetland, evergreen northern hardwood, and successional hardwoods. Protection is needed to prevent fragmentation from development and preserve habitat for the Canada warbler. The Long Pond State Forest IBA is located in Chenango County, and was designated for a species at risk (Henslow's sparrow). Within this state forest there is a diversity of habitats, including grassland, scrubland, mature hardwoods, and wetlands. Pharsalia Woods IBA is located in Chenango County, and is noted for its forest habitat which supports Canada warbler. The area is mostly hardwood forest surrounded by open farmland. Designation of the Tioughnioga River/Whitney Point Reservoir IBA, located in Broome and Cortland counties, is based primarily on its shrub/scrub habitat. It is also an important waterfowl stopover location, and host to raptors and shorebirds.

There are 5 state designated Critical Environmental Areas (CEA) in the basin (Susquehanna Table 4). CEAs are traditionally designated by DEC to protect drinking water supplies. These may be either surface waters or ground water aquifers. These sites are located in DEC Regions 7 and 8, and although they primarily serve to protect drinking water, they may also provide habitat for some SGCN. Other government bodies may designate CEAs for other reasons.

Within the basin there are approximately 290,000 acres of DEC lands (Susquehanna Table 5) located in DEC Regions 4, 7, and 8. Included are 136 state forests that total 260,395 acres which are prime areas for protection and management of multiple species. Also included are 10 wildlife management areas (WMA) and 1 unique area that range in size from 69 acres to almost 12,000 acres. These areas provide multiple habitats for fish and wildlife, including upland and wetland systems. These lands should include habitat management regimes for SCGN.

There are 77 state classified inactive hazardous waste sites in the basin. Most of those sites are in Broome, Chemung, Chenango, and Tioga counties. Site classifications range from Class 2 to Class 4, with the majority of them being Class 2 sites that pose a significant threat to the public health or environment and require action. Class 3 sites do not present a significant threat to the public health or environment, and Class 4 sites are those that are properly closed but require continued management.

Critical Habitats of the Basin and the Species That Use Them

DEC staff members who compiled the SGCN information in the State Wildlife Grants database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and subsystem level was extracted from the database. The resulting aquatic and terrestrial habitats are summarized in Susquehanna Tables 6 and 7. The last column of the table indicates the number of species that indicated the System-Subsystem as critical habitat. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger et al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by DEC fisheries managers, e.g., "cold water-shallow". There are 3 aquatic habitat systems in the Susquehanna (lacustrine, palustrine, and riverine), which are further refined into 10 subsystems. Within the terrestrial habitat system are 4 subsystems that support SGCN in this basin.

Each of these systems and subsystems are further refined into a habitat category in the SWG species database and can be viewed in the Species Group Reports in Appendix A. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. These critical habitats are not a comprehensive listing of all the habitat associations found in the basin, rather it is a subset of the habitats deemed critical to SGCN that occur in the basin (Susquehanna Tables 6 and 7). In addition, a single species may require multiple habitats throughout its life cycle, so the total of the final columns may exceed the 109 SGCN that presently or historically occurred in the basin.

Overall Trends in the Basin

As noted previously, agricultural lands make up a significant portion of the basin; 26% in the Upper-Susquehanna sub-watershed, and 31% in the Chemung sub-watershed. Not surprisingly, a majority of the Chemung, and portions of Madison and Chenango counties in the Susquehanna sub-watershed, are designated as grassland wildlife zone by the U.S. Department of Agriculture, and is considered one of the most important grassland areas of the state. Also, the NY Natural Heritage Program (NYNHP) considers portions of Steuben and Chemung counties as having high grassland related biodiversity.

According to DEC data, wetland types of the Appalachian highlands during the 1990s were 59% forested, 22% shrub, 11% emergent, and 8% open water. These wetland areas, totaling 446,000 acres, provide critical habitat for many SGCN in the basin. It must be noted that much of the wetland acreage is composed of many relatively small units (less than 12.5 acres) which are not afforded protection under DEC's regulatory wetland program.

The NYNHP database indicates the Susquehanna Basin is biologically diverse for a number of taxa groups that are tracked by the program. Susquehanna Table 8 provides a summary of species diversity in the Susquehanna Basin relative to the total number of SGCN statewide. The Upper Susquehanna sub-watershed contains a high number of mollusks and insects, and a moderate number of fish taxa, and both the Upper Susquehanna and Chemung are important for herpetofauna.

There are 90 SGCN species that currently occur in the basin and 19 species that historically occurred in the basin but are now believed to be extirpated (Susquehanna Tables 9-10). Of those 90 SGCN currently occurring in the basin, it is believed that the populations of 30 species are decreasing, 6 are increasing, 7 are stable, and 47 are of unknown status.

In order to prioritize SGCN and the actions necessary to conserve them, the species were ranked based on ecological significance and special local circumstances, as being most critical, critical, and important. Susquehanna Table 11 denotes the most critical species in the Susquehanna Basin.

According to the Species Group Reports in Appendix A, 6 bird, 4 insect, 4 mollusk, 3 mammal, 1 herpetofauna, 1 marine fish, and 1 crustacea species of greatest conservation need that historically occurred in the basin are no longer found there. There are some species, such as swallowtail shiner, subarctic darner, hellbender, coal skink, short-headed garter, cobra clubtail, and 2 species of mayfly that are found in very limited distribution statewide. A few of these species only occur in the Susquehanna Basin, and the rest are found only in 1-2 other basins statewide.

The human population of the Upper Susquehanna sub-watershed increased only 3% over the past 30 years, and will most likely continue at that rate for the near future (CBF, 2004). Meanwhile, housing densities increased 35%, and urban areas grew by 20%. Conversely, the Chemung sub-watershed saw a population decrease of 1.5% from 1970-1990; future projections indicate the human population will increase by 1.5% over the next 15 years. Interestingly, the housing densities increased 29%, and urban areas grew by 15%. The sharper increase in housing densities in both sub-watersheds is a result of an increase in second homes that have sprung up in rural areas. This trend is expected to continue.

Reduction of agricultural land results in loss of grasslands used for haying and pasture. The amount of land used for agriculture in this basin has been reduced from about 92% of the total land cover in 1900 to 27% in 2002. According to CBP, 277 square miles of agricultural lands were lost between 1970 and 1990 in the Upper Susquehanna sub-watershed; 379 square miles were lost during the same time period in the Chemung sub-watershed. The nature of the remaining agriculture has changed as well. Cropland diversity has decreased as row crop monocultures have become the dominant agricultural land-use practice. As smaller farms have been consolidated into larger units, monocultures have become more expansive. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the basin.

The Upper Susquehanna sub-watershed has become dominated by deciduous, mixed, and evergreen forest cover. Of the 277 square miles of agricultural land lost between 1970 and 1990, 82% has reverted back to forest cover. In the Chemung, 96% of the 379 square miles of agricultural land lost during the same period has reverted back to forest cover. Increases in forest cover are a direct result of the decline in agricultural acreage statewide.

Emergent marshes in the Appalachian Highlands have declined since the 1900s. Wetlands in the entire region increased by an estimated 3,000 acres between the 1980s and 1990s, according to DEC Bureau of Habitat information on statewide wetland trends. However, there were notable changes in the wetland plant communities in wetlands in this region of the state as the cover type on wetlands shifted. Shrub swamp declined as a cover type by approximately 5,000 acres and emergent marsh as a cover type declined by an estimated 16,000 acres during that same period. Open water associated wetland and forested wetland increased as cover types by an estimated 7,000 and 17,000 acres, respectively. Not surprisingly, populations of freshwater marsh nesting birds, grassland birds, lizards and salamanders in the Susquehanna Basin are generally in decline, while species associated with forest habitat are more secure.

Threats

DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate threats to SGCN and their habitats. During the analysis for the basin, a listing of threats for each species occurring in the Susquehanna Basin was extracted from the database. The threats and summary figures compiled here are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and other rationales. The information provided does not quantify the magnitude of a particular threat. The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the database. The purpose of this information is not to compare the severity of one threat against another.

General Discussion

The major environmental stressors in the Susquehanna Basin are related to agriculture, stream corridor manipulation, streambank erosion, roadside ditch maintenance, urban sprawl, and forest fragmentation. The negative effects of these stressors on natural resources include riparian buffer loss resulting in excessive nutrient and sediment loading to water bodies, reduced water quality, loss of connectivity between habitats, and loss of natural habitat to development.

Some smaller communities in the basin still face surface and groundwater contamination issues related to on-site septic systems. Both large and small communities are also faced with surface water quality degradation that is related to storm water runoff problems, but both tend to be localized problems of a small scale. These stressors are mentioned in the New York State 305(b) Water Quality Report (NYSDEC, 2002) and a joint project of the U.S.D.A. Forest Service and Society of American Foresters (SAF) ("Forest Fragmentation," 1998).

The above stressors are comparable in both sub-watersheds of the basin. In the more densely populated areas of the basin, degraded water quality from nutrients and toxic substances, and habitat destruction are of greater magnitude and are related to residential, commercial and industrial development. In areas of the basin dominated by agriculture, manure, fertilizer, pesticide, and herbicide runoff, and soil erosion are issues of greater magnitude. In these more rural areas, on-site septic systems leach nutrients into aquifers and surface waters. Rural areas within a short distance of urban centers are also most prone to sprawl, a driving factor in habitat fragmentation.

The Susquehanna Basin is one of the most flood-prone regions in the nation, with major flooding damage on the average of once every 20 years. This is attributable to topography that features short, steeply sloping tributary valleys, higher gradient streams in the lower basin, and highly erodible soils related to glaciation. The flooding and high energy of the flowing water off of the steep hill slopes are major threats directly and indirectly. The flooding re-suspends sediments that have been deposited from previous events and from historical time when land clearing was ubiquitous.

According to SAF ("Forest Fragmentation," 1998), forests once covered more than 95% of the Chesapeake Bay watershed. It was a continuous mosaic of forest types and successional stages. For nearly 2 centuries, the forest was reduced tremendously by timber harvesting and land clearing for agriculture. However, a reversal and steady increase in forest land began in the mid- to late-19th century. This reforestation continued until about the mid-1970s. Since then, increasing population, changing ownership patterns (i.e., farms being subdivided into smaller parcels), and sprawl are causing increased fragmentation of forested areas, primarily downstream of the New York portion of the Susquehanna Basin.

Specific Threats to SGCN

The most frequently cited threat to species groups occurring in the Susquehanna Basin was outright loss of habitat via conversion to a human dominated land use (Susquehanna Table 12). This threat was the most frequently listed for both terrestrial and aquatic species. For purposes of discussion, this threat includes hardening of the landscape with buildings and roads, but can also include activities like land clearing and wetland draining for agriculture and mining. Loss of habitat for some SGCN is attributable to declines in grasslands as agricultural lands revert back to forest. Management of agricultural lands for grassland species may offset shift of cover types to forest; however, when agricultural management activities like hayfield mowing conflict with the grassland nesting bird season, species may be disturbed or killed.

Although toxic contaminants were listed as the second most common threat to terrestrial and aquatic species in the basin (Susquehanna Table 12), this threat may be overstated. Degradation of water quality, which may include contaminants, was the third most common threat listed to aquatic species groups in the basin. American Rivers recently listed the Susquehanna as one of the nation's endangered rivers due to sewer pollution and dam construction. Pathogens and ammonia from municipal plant discharges and raw sewage from combined sewer overflows are impairing aquatic life in the Susquehanna River in the Binghamton-Johnson City-Endicott area (NYSDEC, 2002), but the plant is currently being upgraded and should be meeting all water quality standards in 2006.

Pesticide use on agricultural lands, particularly those that border wetlands and streams, are of concern for herpetofauna, insects, mussels and freshwater crustacea. Agricultural pesticides are generally broad in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Amphibians are particularly susceptible to some pesticides.

Degradation of water quality also comes from soil erosion and runoff, nutrient-induced algal blooms, and reduced dissolved oxygen caused by excessive algae decay or increased temperatures. Siltation negatively affects fish populations by decreasing spawning areas. In association with degradation of water quality is altered hydrology, which is the 5th most common threat to aquatic resources. Alterations to water flow can be caused by floodplain alteration, barriers (dams, weirs, culverts, bridges), and water withdrawal/management. Ultimately, loss of aquatic habitat is lost due to alterations of water flow.

Habitat fragmentation was mentioned as a significant threat to terrestrial species in this basin (Susquehanna Table 12). The overall human population of the

Susquehanna River Basin has not increased significantly in the last 30 years and projections to 2020 show that this trend will remain unchanged (CBF, 2004). At first glance this would appear to indicate no increase in development threats in this basin. However, humans in the watershed are in fact developing more and more of the landscape, creating a “sprawl” effect unrelated to population growth. The result is increased fragmentation of habitats by roads and other infrastructure. Fragmentation of forests in the basin may also be offset by the afforestation occurring, wherein large blocks of forest previously fragmented by agricultural lands are reconnected as early regrowth forest patches mature.

Human disturbance is considered a significant threat to both aquatic and terrestrial species in the Upper Susquehanna and Chemung sub-watersheds. The development of roads and utility rights-of-way directly affects the number of species struck by cars on roads and colliding with power lines, cell and radio towers, and wind towers. In the aquatic arena, what currently may be the cause of greater problems is the stream destabilization caused by a variety of issues. Included among these are “stream cleaning” after storms to remove gravel, and poor highway maintenance practices, especially relating to culverts, road ditches and bridges. Dairy and beef operations that allow cattle in the creek can cause banks to destabilize due to the removal of riparian vegetation and the tremendous erosive power of cattle hooves on steep stream banks. A lack of zoning in many towns results in buildings being placed too close to streams, which, in this basin, have a great tendency to migrate. The resulting problems of stream encroachment on roads, driveways, septic systems, and buildings often results in drastic emergency measures, which often compound the unstable stream conditions. Creation of berms along stream banks, over-widening of stream channels, removal of streamside vegetation, armoring of stream banks, straightening of stream reaches, draining road ditches directly into streams, hanging culverts, removal of gravel bars and islands, and other similar projects all lead to long-term, unstable stream conditions and effects on the aquatic community. Additionally, dams have blocked migratory paths of marine species like American shad and American eel as well as resident species in the drainage.

Priority Issues in the Basin

- Stream protection including sedimentation and nutrient reduction
- Protection and management of large forest blocks for SGCN
- Protection of contiguous forest stands
- Management, restoration, and protection of stream buffers to protect SGCN
- Improved local land use planning

Vision, Goals and Objectives for the Basin

Vision

The Susquehanna Basin will continue to have functioning habitats that support healthy biotic communities, of which SCGN are a part.

Land use practices and development in the basin will be undertaken according to current best management practices.

Goals and Objectives

- ❖ Restore natural stream geomorphology to reduce excessive erosion and to provide good quality riparian habitats.
- ❖ Protect, restore, and manage functional blocks of large contiguous, mature forest.
- ❖ Contain and/or reduce the spread of exotic invasive species and prevent the introduction of new species. Implement the recommendations of the Invasive Species Task Force.
- ❖ Monitor the quality and quantity of habitats on a 10-year rotational cycle.
- ❖ Work toward Chesapeake Bay Program nutrient and sediment reduction targets by increasing functioning wetlands and adequate riparian zones.
- ❖ Identify, manage, and maintain specific areas of high quality grasslands for use by grassland nesting species. This goal should be focused on specific agricultural areas and key grassland areas, and should not be undertaken at the expense of re-establishing native forest cover.
- ❖ Protect existing wetland habitat and increase total wetland habitat in the basin by 9,000 acres as recommended by the Upper Susquehanna Coalition and the Chesapeake Bay Program.
- ❖ Identify specific threats to and goals for SGCN in order to prioritize habitat protection and restoration efforts.

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Data Collection Recommendations for Habitats

FRAGMENTATION

Fragmentation and loss of habitats in the basin is a common threat to several species groups. There are many issues that influence the effects and severity of fragmentation on given species groups. These include patch size and shape, edge effects, and connectivity of remaining habitat patches.

Juxtaposition of wetland and grassland habitats has been shown to positively influence wildlife species diversity. This basin contains significant amounts of both habitat types and provides opportunity for landscape management of species that depend on these systems. This basin was historically forested and an emphasis should be placed on large, unfragmented forest blocks for SGCN. Development of maps delineating habitat zones of forest and grassland areas is appropriate to coordinate management of these two habitat types and reduce conflicting management goals.

Fragmentation is a threat to aquatic species as well. Altered hydrology in the watershed prevents or hinders migration and dispersal of a variety of aquatic species including freshwater bivalves and migratory fish species. Isolated populations are more vulnerable to extirpation by both natural and anthropogenic events.

- Specific recommendations for freshwater marsh nesting birds and grassland birds include controlled experiments to identify management actions effective in producing suitable habitat. Invasive species that may affect marsh birds need to be identified. High priority species for freshwater marsh nesting birds are pied-billed grebe and American bittern. High priority species for grassland birds are Henslow's sparrow, upland sandpiper, Northern harrier, short-eared owl, and sedge wren.

- Specific recommendations for freshwater bivalves include investigations into the flow requirements of freshwater bivalves and modeling the effects of flow changes both in volume and timing. Additional research is needed on population dynamics of listed mussel species (including connectivity and genetic distinctiveness of populations and subpopulations) and controlling exotic bivalve species. The highest priority species within this group are green floater and brook floater.

- Specific recommendations for other butterflies include investigations of metapopulation dynamics for those species with distinct populations. High priority species within this group are frosted elfin, Persius duskywing, regal fritillary, and southern grizzled skipper.

- A specific recommendation for early successional forest/shrubland birds is research into causes for declines of Canada warbler and potential for forestry practices to be beneficial by opening up the canopy and promoting ground growth and thickets. The effects of viburnum leaf beetle on applicable habitats and species utilizing them also needs to be determined. High priority species within this group are golden-winged warbler, whip-poor-will, and Canada warbler.

HABITAT DEGRADATION

Habitat loss and degradation in various forms is a threat to more than 20 species groups in the basin. Habitat degradation may be caused by streambank alterations and by placement of structures including communications towers and wind turbines.

- A specific recommendation for stoneflies/mayflies of lotic waters is to monitor activity for disturbance effects in the riparian zone and waters where these species (may) occur. High priority species within this group are both mayflies: *Ameletus tarteri* and *Ameletus tertius*.

- A specific recommendation for forest breeding raptors is to monitor wind farms for mortality.

- Work with the agricultural community to implement best management practices (BMP) to decrease soil erosion and minimize nutrient and pesticide runoff from farm fields and barnyards.

INTERSPECIFIC INTERACTIONS

Interspecific interactions are a common threat to 7 species groups in a number of taxa. Such interactions result in loss of host species, disrupted predator/prey cycles, competition for life support from non-natives species or species in places or numbers not historically found, detrimental hybridization, and parasites.

- Specific recommendations for other butterflies include determining the precise habitat needs of all life stages, ascertaining food plants, and determining the relationship between food availability and species numbers. Additional identification of species which negatively affect butterfly populations is also needed, along with determining the best control method for those exotic species. High priority species within this group is frosted elfin, Persius duskywing, regal fritillary, and southern grizzled skipper.

- A specific recommendation for freshwater marsh nesting birds is to investigate diet and nutrition in relation to breeding habitat quality and prey populations. High priority species within this group are pied-billed grebe and American bittern.

- ❖ A specific recommendation for lake/river reptiles, lizards, and woodland/grassland snakes is to document life history parameters, including predator/prey relationships. High priority (and only) species within the lake/river reptiles group are Eastern ribbonsnake and wood turtle. High priority (and only) species within the lizards group is coal skink. High priority species within the woodland/grassland snakes group is timber rattlesnake, Eastern hognose, and short-headed garter.

- ❖ Specific recommendations for early successional forest/shrubland birds are to monitor status and trends and develop habitat management guidelines for golden-winged warblers, including those techniques that can favor golden-winged over blue-winged.

- ❖ A specific recommendation for freshwater bivalves is to research potential interbreeding between brook floater (the high priority SGCN) and elktoe, and evaluate the potential threat to brook floater population integrity.

Data Collection Recommendations for SGCN

General Data Collection

There are a number of priority species and groups that need population, habitat, and life history research to address critical data gaps. This information will help more clearly identify threats and establish baseline information for these most critical species. Only those most critical species not yet identified in text will be listed here within each group; the reader can refer to previous sections for most critical species already identified. The research items are listed below by species group. This type of data collection will address multiple threats to many species.

- ❖ A specific recommendation for Eastern hellbenders and stream salamanders relating to susceptibility to stochastic events is to periodically evaluate the status of rare species to determine appropriate status listing. High priority species are hellbenders and longtail salamander.

Early successional forest/shrubland birds

- Complete an inventory and analysis for high priority species that identifies core habitats within the basin.
- Monitor trends of all species.
- Develop a long term monitoring program for golden-winged warblers.
- Encourage full completion of Breeding Bird Survey routes.

Freshwater marsh nesting birds

- Initiate a baseline population survey to determine abundance and distribution. Refine monitoring techniques to better detect population trends
- Inventory breeding sites and map at a coarse scale to select key monitoring locations. Analyze habitats at multiple scales to better understand characteristic important to nest site selection. Identify key migratory staging, molting, and wintering areas.

Grassland birds

- Complete an inventory of existing grassland habitat including species present, distribution, and relative abundance of priority species. Develop and implement monitoring program to supplement BBS for grassland bird species to determine population trends and evaluate effectiveness of conservation efforts in the basin.

Other butterflies

- Identify best management regimes.
- Conduct an inventory of species within historical ranges and survey all species for appropriate listing.

Lake/river reptiles

- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Periodically resurvey areas of known occurrence to detect population trends.
- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.

Uncommon turtles of wetlands *(High priority species is spotted turtle)*

- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.
- Periodically resurvey areas of known occurrence to detect population trends.
- Determine specific threats to populations.

Vernal pool salamanders *(High priority species are blue spotted salamander and Jefferson salamander)*

- Conduct research to document the extent of upland habitat required by vernal pool breeding salamanders.
- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.
- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Periodically resurvey areas of known occurrence to detect population trends.
- Determine significance of specific threats to populations of vernal pool salamanders and develop management recommendations to address significant threats.
- Determine locations of suitable but unoccupied habitat on DEC land for potential introduction of adults and/or eggs.

Woodland/grassland snakes

- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Develop standardized habitat and population survey protocols to document the character, quality, and extent of occupied habitat.

- Determine significance of specific threats to populations of species in this group and develop management recommendations to address significant threats.
- Periodically resurvey areas of known occurrence to detect population trends.

Odonates of river/streams (*High priority species is cobra clubtail)*

- Continue habitat monitoring to complete baseline assessment of habitat quality and threats, and guide future monitoring, restoration, and protection efforts.
- Conduct surveys to obtain relative abundance estimates

Odonates of bogs/fens/ponds (*High priority species is subarctic darner)*

- Define preferred habitat in order to guide future monitoring, restoration, and protection efforts.
- Conduct surveys to obtain relative abundance estimates.

Eastern hellbender

- Develop standardized habitat survey protocols to document the character, quality, and extent of occupied habitat. Document use by juveniles.
- Document life history parameters specific to this species (including juveniles) in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and stream habitat requirements.
- Develop population survey protocols to determine extent of occupied habitat.
- Periodically re-survey known sites in order to detect population trends.

Lizards ***(High priority species is coal skink)***

- Develop standardized habitat survey protocols to document the character, quality, and extent of occupied habitat.
- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, habitat requirements.
- Develop population survey protocols to determine extent of occupied habitat.
- Periodically re-survey known sites of coal skink occurrence in order to detect population trends.

Stream salamanders (*High priority species is longtail salamander)*

- Develop standardized habitat survey protocols to document the character, quality, and extent of occupied habitat.
- Document life history parameters specific to this species in NY including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Develop population survey protocols to determine extent of occupied habitat.
- Periodically re-survey known sites of longtail salamander occurrence in order to detect population trends.

Freshwater bivalves

- Evaluate threats to mussels and prioritize areas within the basin for remedial action.
- Develop standard survey protocols for development projects in the basin to prevent further decline of these species.
- Investigate the best survey methods to detect rare species and evaluate status and trends of all species that occur in the basin. Determine population distribution and abundance of freshwater bivalve species-at-risk in this basin.
- Conduct research to determine the habitat parameters necessary to sustain populations of at risk mussel species including temperature, substrate, flow, fish hosts, and forage base.
- Determine breeding phenology necessary for successful mussel reproduction including mussel density, abundance and diversity of fish hosts, water temperature, and flow.

Stoneflies/mayflies of lotic waters

- Determine the critical habitats and survey within the historical range of these species.

Swallowtail shiner, comely shiner, and blackchin shiner

- Continue sampling streams these species have historically occupied in the Susquehanna basin to determine their presence and distribution.
- Continue sampling lakes, including Otsego, Canadarago and Tully Lakes which were previously inhabited by blackchin shiners.

Tree bats (*High priority species are Eastern red, hoary, and silver-haired bats)*

- Survey migrants to determine the timing, distribution, species composition, and elevation of migrating bats.
- Conduct summer surveys.
- Research threats to critical habitats and populations.

Contaminant Monitoring

Contaminant monitoring in fauna is recommended for species in 7 species groups in a number of taxa. As outlined in the Threats section above, contaminants (pathogens, ammonia, endocrine disrupting compound discharges below waste water treatment plants, mercury) and pesticides are of concern in this basin. Due to the high agricultural land use in this basin, monitoring the effects of pesticides on sensitive species is warranted, especially since many of these species are dependent upon remaining agricultural lands for habitat.

❖ Specific recommendations for freshwater marsh nesting birds include a recommendation to periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. The highest priority (and only) species within this group are pied-billed grebe and American bittern.

❖ Specific recommendations for freshwater bivalves and the host fish species of their larvae include a recommendation to research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves:

sperm/egg, glochidia, larva, and adults. The highest priority species within this group are brook floater and green floater.

- ❖ Specific recommendations for other butterflies include a recommendation to determine the sensitivity of species to chemical formulations, particularly diflubenzuron and other commonly used agricultural pesticides. In addition, determine the effect of *Bacillus thuringiensis kurstaki* (BTK) used in Gypsy moth sprayings on other butterfly species. The highest priority species in this group are frosted elfin, Persius duskywing, regal fritillary, and southern grizzled skipper.

POPULATION RESTORATION

- ❖ A specific recommendation for American shad is monitoring the re-establishment efforts for this species.

Planning Recommendations

EXISTING PLANNING DOCUMENTS

There are several existing management plans that address natural resource conservation issues within the basin (Susquehanna Table 12). The goals and objectives of these plans vary in their focus (e.g., water quality, planning and development, fish and wildlife), spatial and temporal scale, and cooperating partners; however, they all provide valuable information on conservation threats and strategies in this region of New York State and should be consulted before implementing recommended actions.

NEW PLANNING RECOMMENDATIONS

There is a clear need for a habitat management plan for the basin that focuses on the natural restoration of large patches of mature forest and protection of existing wetlands while facilitating the management of grassland, shrublands, and early successional forests where opportunity provides and when such efforts to retard natural succession do not interfere with re-establishment of healthy forests. Of the 90 SGCN occurring in the basin, 36 depend on grasslands, 15 depend on barrens and woodlands, 38 depend on forested habitat, and 22 depend on wetlands. Some species depend on all 5 of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities. The balance and active cooperative management of all of these habitat types is vital to the health and abundance of many of the SGCN currently living in this basin.

The management of public lands needs to be carried out with the cooperation of many agencies. Key partners to include are DEC, NYS OPRHP, USFWS, NPS, NRCS, SWCDs and local governments. Private lands comprise 85% of the total land area of the state. Use of cooperative management programs like the Landowner Incentive Program, Wildlife Habitat Improvement Program, and others will be important to achieve effective habitat protection and enhancement for many SGCN. Partners in these efforts should include: Upper Susquehanna Coalition, Susquehanna River Basin Commission, Audubon NY, TNC and the Natural Heritage Program, local land trusts, New York Forest Owners Association, Ducks Unlimited, Inc., Pheasants Forever, National Wild Turkey Federation, and others.

Forest Management Planning

The basin is dominated by deciduous and mixed forest cover. Trends toward afforestation are resulting in opportunities for reducing fragmentation of the forest and this trend should be encouraged with good silvicultural practices. However, where appropriate, it may be desirable to integrate the needs of early successional forest/shrubland birds, forest breeding raptors, tree bats, woodland snakes, and vernal pool salamanders. These species often need heterogeneous forest structure during different life stages. Herpetofauna also need wetlands within the forest to breed.

The birds mentioned above all require varying types of vertical forest structure. Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by forest managers on public lands and made available to private forest owners interested in wildlife management. Specific recommendations include:

- ❖ Determine where it is most appropriate for management of these species to occur, and then develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for Canada warbler and golden-winged warbler.

Grassland and Wetland Planning

Portions of the basin are dominated by grasslands with several large wetland complexes interspersed in the landscape. This is an opportunity to integrate the needs of wetland and grassland-dependant species into a holistic management plan for the basin. Components of this larger picture are:

- ❖ Develop a management plan for the basin that includes land acquisition, cooperative working relationships with landowners and habitat management targets for all wetland and grassland-dependent SGCN. Minimum management area sizes for various animal classes should be determined, targets for acquisition, and temporal and spatial targets for management actions (mowing, water control) should be set. This should be a component of the above mentioned habitat management plan, and incorporate basin specific objectives from a statewide grassland bird management plan (already being developed by DEC staff) and existing wetland planning efforts including North American Waterbird Plan, Bird Conservation Regional Plans, and others. Specific tasks associated with this planning include:
    - Review state park master plans and DEC land unit management plans in this basin for opportunities to better manage state lands for SGCN in this basin.
    - Develop habitat management guidelines and actions for high priority grassland bird species in the Susquehanna (Henslow's sparrow, upland sandpiper, Northern harrier, and short-eared owl) for incorporation in the above management plan and the NYS Open Space Conservation Plan in order to better coordinate conservation actions. Identify opportunities in the plan for directing federal funds to grassland habitat.
    - Continue participation in North American waterbird planning. Focus on and refine recommendations for American bittern and pied-billed grebe.
    - Work with USDA and other partners to develop grassland management incentives, in appropriate areas, that benefit SGCN in this basin.

DEC Unit Management Planning

- ❖ Review DEC land unit management plans for opportunities to better manage state lands for SGCN in this basin, including control of invasive and non-native species.
- ❖ Develop a monitoring and control plan that includes measures to detect invasive bivalves and actions to control them before they become threats.
- ❖ Incorporate freshwater mussel goals and objectives into regional water quality and fish management plans and policies.
- ❖ Facilitate the development of wetlands on DEC lands where appropriate.

Land Protection Recommendations

This category of actions encompasses a variety of protection mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of protection should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations.

WATER QUALITY

A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects.

- ❖ In key locations, acquire development rights to protect water quality for listed mussel populations. The high priority species group that will benefit from this recommendation is freshwater bivalves.

HABITAT LOSS

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development, dredging, wetland draining, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar or different, yet complementary habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support. Habitats fragmented by roads and power lines increase direct mortality of animals due to collisions. Smaller dams are detrimental to SGCN by being a physical barrier to dispersal and migration of young and adults.

- ❖ The lands owned by the state and federal government in the basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially adjacent to existing public forest stands. This will enable better management and protection of these habitats for grassland species. Acquisitions should reflect the recommendations of priority grassland focus areas from the NYS grassland bird management plan. Priority species that would benefit from these acquisitions include grassland birds, early successional forest/shrubland birds, and woodland/grassland snakes.

- ❖ Acquisition of forested and grassland upland tracts adjacent to wetland properties is critical to protection and restoration of amphibian, reptile, and freshwater marsh nesting bird species in this basin. Ideally these will be parcels where road building has not fragmented the 2 cover types. Identification of candidate parcels with these characteristics should occur immediately. Priority species groups that would benefit from these acquisitions are vernal pool salamanders, uncommon turtles of wetlands, freshwater marsh nesting birds, lizards, odonates of bogs/fens/ponds, and other butterflies.

- ❖ Support acquisition of Horseheads Marsh property, which is a Class I wetland in Region 8 and the largest wetland in Chemung County. This acquisition priority appears in the Open Space Conservation Plan of 2002. The site provides habitat for many species of SGCN.

- ❖ Support acquisition of West Hill Lands property in Region 8, identified in the Open Space Conservation Plan of 2002. This site adjoins the Erwin Hollow State Forest, and includes 2 major habitat types; oak-hickory forest and Hodgman's Creek gorge. This area is considered a threatened, sensitive element, and provides habitat for timber rattlesnakes.

- ❖ Support protection of ecoregional conservation targets identified in The Nature Conservancy's High Allegheny Plateau ecoregional plan.

Management and Restoration Recommendations

HABITAT LOSS AND ALTERATION

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development, dredging, wetland draining, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar or different, yet complementary, habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support.

Habitats fragmented by roads and power lines increase direct mortality of animals due to collisions. Smaller dams are detrimental to SGCN by being a physical barrier to dispersal and migration of young and adults.

Overall alteration of the landscape since European settlement has disrupted the natural cycle of habitat disturbance (e.g. fire, wind throw, etc.); however, some of the alterations to the landscape provide important habitat, as in the case of hay and pasture lands, and early successional habitats such as old fields.

Specific recommendations to benefit SGCN include:

Early Successional Forest/Shrubland Birds

- ❖ Conduct sustainable silvicultural operations with a goal of creating or maintaining early successional habitat where it is deemed appropriate and desirable, and where such management does not jeopardize priority afforestation. Maintain, restore, and enhance early successional habitats through the use of multiple management options.
- ❖ Forest structure management; maintain various maturity stages in forest stands to benefit forest dwelling SGCN. Maintain understory trees for lower altitude nesters like black-crowned night heron. Create small openings with wetlands or small (~0.25 acre) ponds to benefit forest breeding raptors and herps.

Forest Breeding Raptors

- ❖ Maintain appropriate breeding habitat for forest breeding raptors around occupied nest sites.

Freshwater Marsh Nesting Birds

- ❖ Restore emergent marsh to benefit freshwater marsh nesting birds.

Grassland Birds

- ❖ Manage vegetative structure of established grasslands through appropriate management techniques. This should be incorporated into Landowner Incentive and Farm Bill programs.
- ❖ Resolve conflicts with issue of grassland management in vicinity of rattlesnake dens.

Lake and River Reptiles

- Manage uplands adjacent to aquatic habitat to provide adequate and secure nesting sites and dispersal routes for migrating animals.

Uncommon Turtles of Wetlands

- Employ a variety of habitat management techniques to control vegetative succession in order to preserve wetland suitability for these turtles, especially spotted turtles.
- Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation.
- Manage egg predators to increase turtle populations.

Woodland and Grassland Snakes

- Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation.
- Acquire known den sites of timber rattlesnake.

Hellbender

- Manage land use practices in riparian areas to decrease degradation of stream quality.
- Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation, including captive breeding, head starting, nest protection, and relocation strategies.

Freshwater Mussels

- Restore degraded habitat sites to allow for recolonization or reintroduction of listed mussels.

Lizards

- Manage vegetative succession to maintain habitat suitability for coal skink.

American shad

- Maintain or increase the level of shad fry stocking in NY portions of the Susquehanna Basin and advocate for improvements in fish passage facilities at Chemung and Susquehanna dams, including the Rock Bottom Dam in Binghampton.

WATER QUALITY

A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen.

- Implement Best Management Practices for forest management in riparian areas in order to maintain, enhance, and restore early successional forest/shrublands. Identify opportunities in the plan for directing federal funds into such habitats.

Lake and River Reptiles

- Manage water borne pollutants that adversely affect lake and river reptiles.

Freshwater Bivalves

- ❖ Manage or restore areas of important mussel populations by controlling degradation factors including, livestock access, point and nonpoint source pollution, and flow alterations.

Uncommon Turtles of Wetlands

- ❖ Manage contaminant inputs to preserve habitat.

Swallowtail and Comely Shiner

- ❖ Manage and protect areas with significant shiner populations like the section of Catatonk Creek at the junction of Willseyville Creek.

INVASIVE SPECIES

Invasive species threaten many SGCN in the Susquehanna Basin. This threat may be through direct competition for nesting sites, prey, and other limited resources, or by alteration of the structure and quality of habitat, as in the case of invasive plants like purple loosestrife. Displacement of native species by invasive species disrupts ecological processes.

Freshwater Marsh Nesting Birds

- ❖ Control purple loosestrife where it is known to have a negative effect on marsh nesting birds. Techniques could include biological controls.

Lake and River Reptiles

- ❖ Control invasive aquatic plants where they are negatively affecting lake and river reptiles. Techniques could include biological, chemical, and mechanical means.
- ❖ Control spread of Japanese knotweed which threatens to take over significant area of riparian corridors in the basin.

Vernal Pool Salamanders

- ❖ Limit introductions of fish and other predatory species into habitats critical to vernal pool salamanders.
- ❖ Create vernal pool habitat in suitable locations on DEC and private lands.
- ❖ Relocate adult salamanders and/or eggs to suitable but unoccupied habitats on DEC lands.

Uncommon Turtles of Wetlands

- ❖ Control invasive species to preserve suitable wetland habitat.

Swallowtail and Comely Shiner

- ❖ Control invasive species of minnows which could be detrimental to these shiners.

HUMAN-WILDLIFE INTERACTIONS

There are a variety of threats to SGCN in the basin from direct interactions with humans. These include vehicle and structure collisions, and illegal and unregulated harvest. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines, transmission towers, and roads are a significant source of mortality. Collection of wild animals for pets and food also may contribute to species declines.

Specific recommendations to benefit SGCN include:

Vernal Pool Salamanders

- ❖ Reduce habitat destruction and collisions by off-road vehicles in vernal pools occupied by salamanders.
- ❖ Limit logging activities around known breeding areas during the breeding and larval development period.

Uncommon Turtles of Wetlands

- ❖ Manage human access to preserve wetland suitability.
- ❖ Manage vehicle use in critical habitats to decrease direct effects.

Hellbender

- ❖ Manage water pollutants and sediment loading to streams in the Susquehanna.
- ❖ Research feasibility of removal of some dams blocking movement of hellbenders.

Stream Salamanders

- ❖ Restore habitat quality in degraded streams.

Information Dissemination Recommendations

Sharing of information allows stakeholder groups to make informed decisions about activities that may help or harm SGCN. Sharing of information may take many forms including best management practices, fact sheets, and educational outreach programs.

RARE SPECIES

Information about most SGCN is maintained in DEC's Master Habitat Databank. It is critical that the availability of this information be made known to land managers and decision makers. The Natural Heritage Program should have the capacity to maintain current data and to disseminate such data in a timely manner so that it is readily useable. In addition, NHP should continue to develop interpreted data products, such as maps and conservation guides, for use by decision makers so they can accommodate the conservation needs of SGCN early in project design

AGRICULTURE AND SILVICULTURE

Traditional agricultural and silvicultural operations may lack wildlife based objectives, thus may have detrimental effects to some species of wildlife. Providing information to public and private land managers may help mitigate detrimental practices. Specific recommendations include:

- Make information available to public and private land managers regarding the benefits and need for early successional habitat, including even-aged forest stand management and sustainable silvicultural practices.
- Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrubland birds.
- Develop an outreach program for public and private land managers to increase awareness of the benefits of grasslands and wildlife-friendly agricultural practices. Species groups that will benefit include freshwater marsh nesting birds and grassland birds.
- Promote the establishment of vegetated buffers around agricultural fields to protect wetlands and streams from runoff and benefit freshwater marsh nesting birds.
- Provide education and outreach to forest managers regarding silvicultural practices compatible with forest breeding raptors and early successional forest/shrubland birds.
- Provide education and outreach to local governments about the effects of stream channel alterations.

EXOTIC SPECIES

Introduction and spread of exotic species can often be minimized or prevented through increased awareness of natural resource users to the negative effects of these species on native wildlife. Awareness should be accompanied by specific actions that natural resource users can employ to prevent spread of invasive and exotic species. Specific recommendations include:

- ❖ Implement outreach recommendations of the Governor's Invasive Species Task Force.
- ❖ Post educational signs at boater access sites to highlight the dangers to native mussel populations posed by spread of exotic mussels, and the role of boats in their spread.

HUMAN-WILDLIFE INTERACTIONS

Human behavior can be altered by education and outreach. Providing information about negative effects of human disturbance on wildlife can help reduce detrimental interactions. Specific recommendations include:

- ❖ Enhance public education to curtail collection and translocation of turtles and snakes. This includes dispelling common myths about the dangers posed to people and pets by native snakes. Provide information about hellbenders to anglers to encourage them to release any animals caught on fishing lines.
- ❖ Develop an outreach and education tool to highlight the possible detrimental effects of human disturbance on wetland dependant wildlife. An example could be off-road vehicle effects on vernal pool and marsh nesting species.

OTHER RECOMMENDATIONS

- ❖ Develop outreach material to educate the public about the benefits of grasslands, freshwater mussel life history, American shad, and at-risk Lepidoptera.
- ❖ Review and respond to projects involving tall structures that may adversely affect tree bats.

Regulatory and Legislative Recommendations

Regulatory proposals will likely be made at the statewide level,though local governments have opportunities to modify or create laws and regulations to enhance local protection of SGCN. Local zoning and taxation policies can be used to discourage sprawl and habitat fragmentation without growth, an issue of particular importance in this basin.

HABITAT LOSS

- ❖ Pursue protection of wetlands less than 12.4 acres that provide habitat for SGCN under the 'unusual local significance' provisions of Article 24 of the ECL. In addition, enhance the protection of upland buffers around all wetlands used by herpetofauna SGCN to provide quality foraging habitat. High priority species that will benefit are spotted turtle, blue spotted salamander, and Jefferson salamander.
- ❖ Review the protection status of all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species could receive expanded protection either under existing provisions of Article 24 of the ECL or by local ordinance.
- ❖ Enhance regional permit review of development and highway projects that may affect freshwater bivalves and other aquatic species. Utillize existing authority (where it exists) to specify permit conditions such as:
  - Creation or retention of a minimum 30' buffer area along both banks of all streams.
  - Minimize disturbance to the bed and banks of all streams.
  - Protect all aquatic sites with known populations of SGCN such as Tully Lake where blackchin shiners have been found.
  - Provide all State/Town/County/City machine operators and supervisors a stream alteration education session prior to issuance of a Memorandum of Understanding for work in lakes and streams.

WATER QUALITY

- ❖ Limit the use of pesticides on publicly-owned marshes to prevent reduction of insect populations and contamination of wetlands used by SGCN, including freshwater marsh nesting birds. Explore replacing manufactured pesticides with integrated pest management techniques.
- ❖ Require testing of all new pesticides, consistent with existing DEC and EPA guidelines, for effects on all life stages of freshwater bivalves prior to approval for use in the state. Enhance testing as new information about sensitivity of these species is learned.
- ❖ Afford protected stream status under §608.2 of the ECL to Class D non-navigable streams in the basin.

UNCONTROLLED COLLECTION AND/OR HARVEST OF SGCN

- ❖ Enforce pending state legislation providing small game protections for hellbender, coal skink, longtail salamander, spotted turtle, timber rattlesnake, short-headed garter. Protection should also be extended to freshwater bivalves.

- Enhance law enforcement to limit collection and translocation of wood turtles, and coal skink.
- Review the status of odonate SGCN in the basin and recommend imperiled odonates of bogs/ponds/fens and rivers/streams for state listing if warranted.

Incentives

- Explore an amendment of §480a of the Real Property Tax Law that may provide for wide-ranging holistic stewardship on eligible tracts of private property. Consider the establishment of a Habitat Reserve component to encourage land owners to voluntarily conserve and manage significant habitats for wildlife and fish located on their lands through Real Property Tax exemptions.

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Tables and Figures

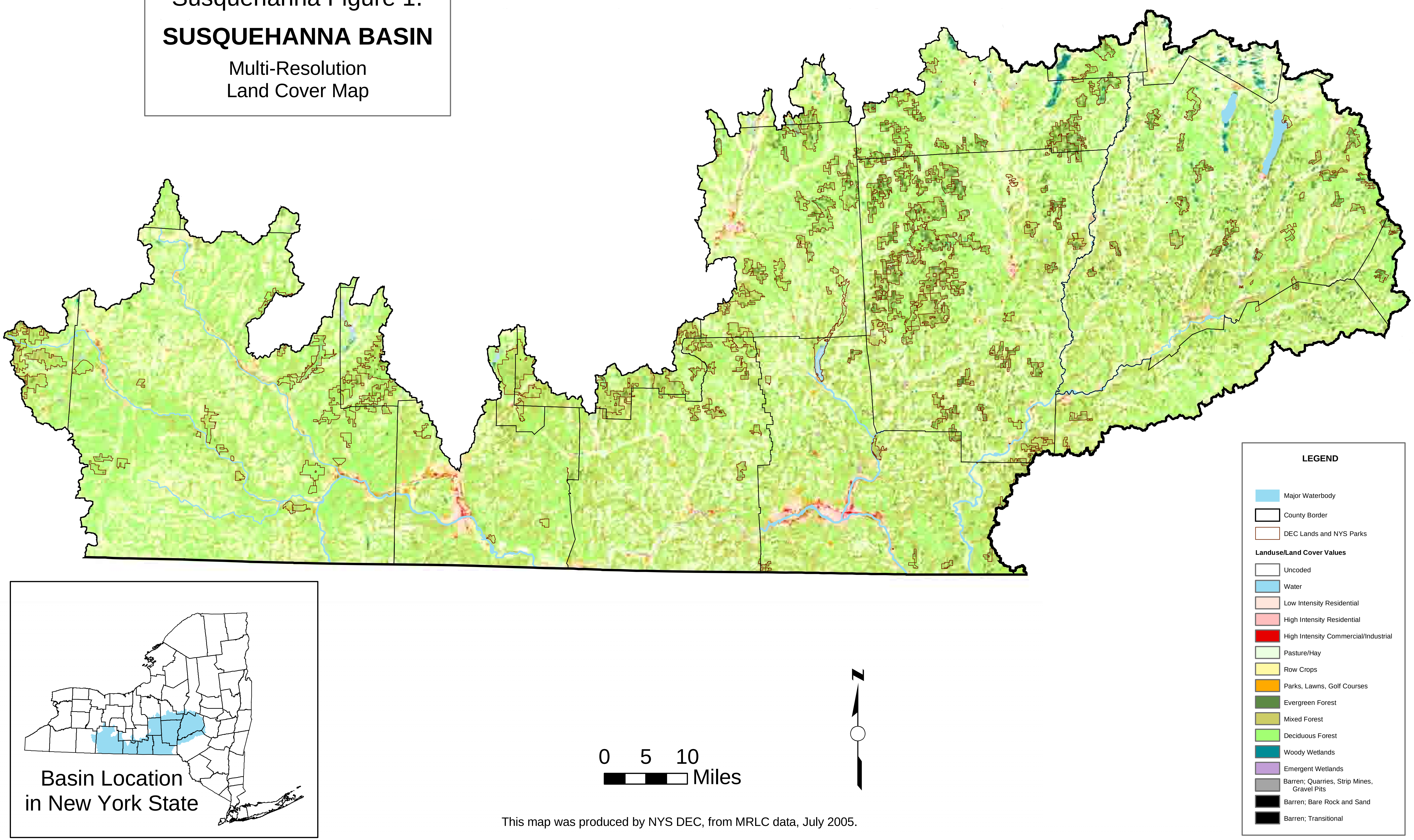
Tables

Figures

Susquehanna Figure 1.

SUSQUEHANNA BASIN

Multi-Resolution
Land Cover Map



Susquehanna Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Susquehanna Basin.

Classification	% Cover
Deciduous Forest	37.97
Mixed Forest	27.07
Row Crops	14.24
Pasture/Hay	12.69
Evergreen Forest	4.16
Low Intensity Residential	1.19
Water	0.82
Parks, Lawns, Golf Courses	0.58
Woody Wetlands	0.5
High Intensity Commercial/Industrial	0.44
High Intensity Residential	0.26
Barren; Quarries, Strip Mines, Gravel Pits	0.05
Emergent Wetlands	0.04

Susquehanna Table 2. State Parks within the Susquehanna Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
BETTY & WILBUR DAVIS (7)	200	X
BOWMAN LAKE (7)	702	UPLAND
BUTTERMILK FALLS (8)	733	UPLAND/WETLAND
CHENANGO VALLEY (7)	1,098	UPLAND
GILBERT LAKE (7)	1,572	UPLAND
GLIMMERGLASS (7)	587	UPLAND
HUNTS POND (7)	239	X
NEWTOWN BATTLEFIELD (8)	339	X
PINNACLE (8)	704	UPLAND

Susquehanna Table 3. Draft Audubon Important Bird Areas within the Susquehanna Basin.

Unit Name (DEC Region)	Acres	Approved Criteria
LONG POND STATE FOREST (7)	3,100	SPECIES AT RISK
PHARSALIA WOODS (7)	23,000	FOREST
TIOUGHNIOGA RIVER/WHITNEY POINT (7)	17,600	SHRUB/SCRUB
CANNONSVILLE/STREAM MILL AREA (7)	65,000	FOREST/SPECIES AT RISK

Susquehanna Table 4. Critical Environmental Areas within the Susquehanna Basin.

Unit Name (DEC Region)	Location	Approved Criteria
FRENCH TRACT (7)	VESTAL	NONE GIVEN
WELL FIELD (7)	VESTAL	PRIMARY RECHARGE FOR WELL FIELDS
WATER BOARD (7)	CORTLAND	SOLE SOURCE AQUIFER PROTECTION
GROUNDWATER PROTECTION	MCGRAW	GROUNDWATER PROTECTION
VALLEY-FILL AQUIFER (8)	WAYLAND	PRIMARY SOURCE OF DRINKING WATER

Susquehanna Table 5. NYSDEC land units within the Susquehanna Basin.

Unit Name (DEC Region)	Acres	Primary Natural Habitats
STATE FORESTS (approximately 136)	260,395	MULTIPLE
LABRADOR HOLLOW UNIQUE AREA	1,487	X
CONNECTICUT HILL WMA (7)	11,645	UPLAND
CRUMHORN MOUNTAIN WMA (4)	69	X
ERWIN WMA (8)	2490	UPLAND
HELMER CREEK WMA (8)	113	UPLAND
HOOKER MOUNTAIN WMA (4)	83	X
PHARSALIA WMA (7)	4699	UPLAND/WETLAND
TIOUGHNIOGA WMA (7)	3705	UPLAND
WANETA LAMOKA WMA (8)	165	WETLAND
WEST CAMERON WMA (8)	170	UPLAND
WHITNEY POINT MUA (7)	4,645	UPLAND/WETLAND

Susquehanna Table 6. Critical **aquatic** habitats found in Susquehanna basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	# of Species
Lacustrine	cold water deep	3
Lacustrine	cold water shallow	3
Lacustrine	unknown	1
Lacustrine	warm water deep	2
Lacustrine	warm water shallow	6
Palustrine	mineral soil wetland	16
Palustrine	peatlands	6
Riverine	coldwater stream	17
Riverine	deepwater river	4
Riverine	warm water stream	11

Susquehanna Table7. Critical **terrestrial** habitats found in Susquehanna basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	# of Species
Terrestrial	barrens/woodlands	15
Terrestrial	forested	38
Terrestrial	open upland	36
Unknown	unknown	1

Susquehanna Table 8. Susquehanna species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN	% of Total SGCN for this Group
BIRDS	**8**	**39**	**118**	**33.1**
Bald Eagle		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		7	9	77.8
Early Successional Forest Birds		11	12	91.7
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		2	6	33.3
Grassland Birds		10	11	90.9
Peregrine Falcon		1		
FRESHWATER FISH	**4**	**4**	**40**	**10.0**
Blackchin Shiner		1		
Heritage-Strain Brook Trout		1		
Comely Shiner		1		
Swallowtail Shiner		1		
HERPETOFAUNA	**9**	**17**	**44**	**38.6**
Freshwater Wetland Amphibians		1	5	20.0
Hellbender		1		
Lake/River Reptiles		2	5	40.0
Lizards		1	3	33.3
Snapping Turtle		1		
Stream Salamanders		2	2	100.0
Uncommon Turtles of Wetlands		1	5	20.0
Vernal Pool Salamanders		2	4	50.0
Woodland/Grassland Snakes		6	8	75.0
INSECT	**7**	**21**	**197**	**10.7**
Odonates of Bogs/Fens/Ponds		1	10	10.0
Odonates of Lakes/Ponds		2	5	40.0
Odonates of Rivers/Streams		5	19	26.3
Odonates of Seeps/Rivulets		1	4	25.0
Other Butterflies		8	18	44.4
Other Moths		1	92	1.1
Stoneflies/Mayflies of Lotic Waters		3	20	15.0
MAMMAL	**2**	**4**	**21**	**19.0**
Furbearers		1	2	50.0
Tree Bats		3	3	100.0
MARINE FISH	**2**	**2**	**51**	**3.9**
American Eel		1		
American Shad		1		
MOLLUSK	**1**	**3**	**59**	**5.1**
Freshwater Bivalves		9	39	7.7
TOTAL	**33**	**90**	**530**	**17.0**

% of All Species Groups Statewide **25.80%**

Susquehanna Table 9. Species of Greatest Conservation Need currently occurring in the Susquehanna Basin. Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Kentucky warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Prothonotary warbler	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet Tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Deciduous/mixed forest breeding birds	Worm-eating warbler	Unknown
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Early successional forest/shrubland birds	Yellow-breasted chat	Stable
Bird	Forest breeding raptors	Cooper's hawk	Stable
Bird	Forest breeding raptors	Golden eagle	Unknown
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Henslow's sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Short-eared owl	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	Peregrine falcon	Peregrine falcon	Stable
Freshwater fish	Blackchin shiner	Blackchin shiner	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Comely shiner	Comely shiner	Unknown
Freshwater fish	Swallowtail shiner	Swallowtail shiner	Unknown
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Hellbender	Hellbender	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Lizards	Coal skink	Unknown
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Stream salamanders	Longtail salamander	Decreasing
Herpetofauna	Stream salamanders	Northern red salamander	Unknown
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Eastern hognose snake	Unknown
Herpetofauna	Woodland/grassland snakes	Northern black racer	Unknown
Herpetofauna	Woodland/grassland snakes	Short-headed gartersnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Unknown
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Insect	Odonates of bogs/fens/ponds	Subarctic darner	Unknown
Insect	Odonates of lakes/ponds	Comet darner	Unknown
Insect	Odonates of lakes/ponds	Spatterdock darner	Unknown
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Arrow clubtail	Unknown
Insect	Odonates of rivers/streams	Cobra clubtail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Odonates of rivers/streams	Spine-crowned clubtail	Unknown
Insect	Odonates of seeps/rivulets	Arrowhead spiketail	Unknown
Insect	Other butterflies	Frosted elfin	Decreasing
Insect	Other butterflies	Henry's elfin	Unknown
Insect	Other butterflies	Mottled duskywing	Decreasing

Susquehanna Table 9. (continued)

Taxa Group	Species Group	Species	Stability
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Regal fritillary	Unknown
Insect	Other butterflies	Silvery blue	Decreasing
Insect	Other butterflies	Southern grizzled skipper	Unknown
Insect	Other butterflies	Tawny crescent	Decreasing
Insect	Other moths	Ostrich fern borer moth	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Ameletus tertius*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Ameletus tarteri*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Heptagenia culacantha*	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Mammal	Tree bats	Silver-haired bat	Unknown
Marine fish	American eel	American eel	Unknown
Marine fish	American shad	American shad	Unknown
Mollusk	Freshwater bivalves	Brook floater	Unknown
Mollusk	Freshwater bivalves	Green floater	Unknown
Mollusk	Freshwater bivalves	Yellow lamp mussel	Stable

Susquehanna Table 10. SGCN that historically occurred in Susquehanna Basin, but are now believed to be extirpated from the basin.

Taxa Group	Species Group	Species
Bird	Barn owl	Barn owl
Bird	Breeding waterfowl	American black duck
Bird	Breeding waterfowl	Blue-winged teal
Bird	Loggerhead Shrike	Loggerhead shrike
Crustacea/Meristomata	Freshwater crustacea	Piedmont groundwater amphipod
Herpetofauna	Uncommon turtles of wetlands	Bog turtle
Insect	Odonates of bogs/fens/ponds	Ebony boghaunter
Insect	Odonates of rivers/streams	Pygmy snaketail
Insect	Other moths	*Lambdina canitiaria*
Insect	Stoneflies/Mayflies of uncertain/questionable habitat	*Leucrocuta thetis*
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mammal	Small mammals of uncertain/questionable residency	Least shrew
Mollusk	Freshwater bivalves	Elktoe
Mollusk	Freshwater bivalves	Tidewater mucket
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater gastropods	Spindle lymnaea

Susquehanna Table 11. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats to SGCN in the Susquehanna Basin. For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Multiple [a]	33	100	13.8
Habitat loss - conversion to cultural	20	60.6	8.3
Contaminants	16	48.5	6.7
Degradation of water quality	15	45.5	6.3
Human disturbance - illegal/unreg. Harvest	13	39.4	5.4
Altered hydrology (loss of aquatic habitat quantity)	12	36.4	5
Habitat fragmentation	10	30.3	4.2
Human disturbance - collisions	10	30.3	4.2
Disturbed predator/prey cycles	10	30.3	4.2
Habitat loss - natural	8	24.2	3.3
Disease	7	21.2	2.9
Competition for life support	7	21.2	2.9
Competition from exotics	6	18.2	2.5
Unsustainable Ag/Silvicultural Practices	6	18.2	2.5
Sedimentation/Erosion	6	18.2	2.5
Human disturbance - general	5	15.2	2.1
Active alteration of natural processes	5	15.2	2.1
Loss of streamside buffers	4	12.1	1.7
Altered hydrology (loss of aquatic habitat quality)	4	12.1	1.7
Reduction of patch size, shape, area	4	12.1	1.7
Loss of habitat connectivity	4	12.1	1.7
Habitat composition altered by invasives	3	9.1	1.3
Human disturbance - entanglement/entrainment	3	9.1	1.3
Detrimental hybridization	3	9.1	1.3
Susceptibility to stochastic events (isolated populations)	3	9.1	1.3
Susceptibility to stochastic events (rare species)	3	9.1	1.3
Unknown threats	3	9.1	1.3
Barriers (roads; development; curbs)	2	6.1	0.8
Pollution (acid rain; soil contamination)	2	6.1	0.8
Habitat composition altered by invasives	2	6.1	0.8
Habitat composition altered by overuse (deer browse)	2	6.1	0.8
Loss of host species	2	6.1	0.8
Susceptibility to stochastic events (weather; storm events)	2	6.1	0.8
Habitat composition altered by overuse (beaver, geese, etc)	1	3	0.4
Human created abrupt edges	1	3	0.4
Parasites	1	3	0.4
Climate change (sea level rise; temp changes)	1	3	0.4
Climate change (range restriction; changes in distribution)	1	3	0.4

a Multiple = recommended action addresses multiple threats rather than one specific threat

Susquehanna Table 12. Existing management plans and agreements within the Susquehanna Basin

Plan/Agreement Name	Involved Parties	Information
River Basins - March 2002	NYSDEC	Basin overview; recommendations for restoring water quality
Forest Fragmentation in the Chesapeake Bay Watershed - Ecological, Economic, Policy and Law Impacts - 1998	Society of American Foresters	Ecological, economic, policy and law impacts from fragmentation
Susquehanna River Basin Commission 2001 Annual Report	Susquehanna River Basin Commission	Basin highlights; hydrologic conditions; flood events, achievements
Upper Susquehanna Coalition Strategic Planning Session - January 2003	Upper Susquehanna Coalition	
Academic Institutions	GIS capabilities, sediment fingerprinting; stream flows; wetlands	

Description of the Basin

The Upper Hudson Basin is the largest in New York State (NYS) in terms of size, covering all or part of 20 counties and about 7.5 million acres (11,700 square miles) from central Essex County in the northeastern part of the State, southwest to central Oneida County in north central NYS, southeast down the Hudson River corridor to the State's eastern border, and finally terminating in Orange and Putnam Counties. The Basin includes four major hydrologic units: the Upper Hudson, the Mohawk Valley, the Lower Hudson, and the Housatonic. There are about 23,000 miles of mapped rivers and streams in this Basin (USGS Watershed Index). Major water bodies include Ashokan Reservoir, Esopus Creek, Rondout Creek, and Wallkill River (Ulster and Orange Counties) in the southern part of the Basin, Schoharie Creek (Montgomery, Greene, and Schoharie Counties) and the Mohawk River (from Oneida County to the Hudson River) in the central part of the Basin, and Great Sacandaga Lake (Fulton and Saratoga Counties), Saratoga Lake (Saratoga County), and Schroon Lake (Warren and Essex Counties) in the northern part of the Basin. This region also contains many smaller lakes, ponds, creeks, and streams encompassing thousands of acres of lentic and lotic habitat. And, of course, the landscape is dominated by one of the most culturally, economically, and ecologically important water bodies in the State of New York - the Hudson River.

For hundreds of years the Hudson River has helped bolster New York State's economy by sustaining a robust commercial fishery, by providing high value residential and commercial development, and by acting as a critical transportation link between upstate New York/New England and the ports of New York City. The Hudson has provided consumptive and non-consumptive recreational benefits in the form of fishing, hunting, trapping, boating, and wildlife viewing, and serves as an invaluable connection to the Nation's history and culture. Finally, the Hudson River provides crucial fish and wildlife habitat such as nursery and spawning grounds for a diverse array of fish species. It functions as an important migratory corridor for passerine birds, raptors, and waterfowl, and it contains estuarine marshes and tidal flats teeming with biodiversity.

From a terrestrial perspective, the Upper Hudson Basin is comprised of four ecoregions (as defined by The Nature Conservancy). The Northern Appalachian Boreal Forest ecoregion in the northern part of the Basin is primarily made up of the Adirondack Mountains, a six-million-acre park, a large part of which falls within this basin. The Great Lakes ecoregion represents the Mohawk Valley, which runs from west to east, cutting across the center of the basin and ending at the northern terminus of the Taconic Highlands. The Lower New England/Northern Piedmont ecoregion includes all of the Taconic Highlands in far eastern NYS from Washington County south through Putnam County, and almost all of the Hudson River Valley from Warren County south. Finally, the High Allegheny Plateau covers the mountainous regions west of the Hudson River, from the Mohawk Valley south, including the Helderbergs, Catskills, Shawangunks, and Hudson Highlands.

With about 2.3 million people, the Upper Hudson Basin is second in human population only to the Lower Hudson River/Long Island Bays basin (U.S. Census Bureau, 2002). There are three main population centers in the basin: Newburgh (population 28,259; Orange County) and Poughkeepsie (population 29,871; Dutchess County) in the lower Hudson Valley, Albany (population 95,658; Albany County), Schenectady (population 61,821, Schenectady County), Troy (population 49,170; Rensselaer County), and Saratoga Springs (population 26, 286, Saratoga County) in the central part of the watershed, and Utica (60,651; Oneida County) in the Mohawk Valley. Mean population density in the Upper Hudson is 206 people per square mile, but density varies widely from 3.1 people per square mile in Hamilton County in the Adirondacks, to 715 people per square mile in Schenectady County in the central part of the Basin (U.S. Census Bureau, 2002).

Even though the population centers are spread throughout the region, the majority of the human population in this Basin is condensed between Albany County and Putnam County. This area is one of the most densely populated areas in the country and is the fastest growing region of the State (U.S. Census Bureau, 2002) for several reasons, including its proximity to major metropolitan areas, economically and aesthetically desirable residential and commercial real estate, and easy access to the River and rail lines for industrial businesses. As a result, tremendous pressures have been placed on the health and sustainability of the region's natural resources. These pressures are likely to continue. Most new housing units in the Hudson Valley are expected to be outside of traditional population centers and future growth could have a disproportionate effect on reptile, amphibian, and mammal diversity (Smith et al., 2004).

Despite these stresses, the Upper Hudson Basin remains an ecologically vital area with high plant and wildlife diversity across a landscape that ranges from the extensive hardwood and boreal forests of the Adirondacks and Catskills to the grasslands and agricultural habitats of the Mohawk and Hudson River valleys to the fens and bogs of the Taconic Highlands and lower Hudson Valley. The predominant habitat type within the watershed is forest (about 70%), including deciduous, coniferous, and mixed forest habitats (Upper Hudson Figure 1, Upper Hudson Table 1). Anthropogenic uses dominate about 25% of the Basin (Figure 1, Table 1). This includes residential and commercial/industrial development (5%), agriculture (row crops 7%, pasture, hay land 10.7%), lawns and golf courses (0.7%), and barren areas (quarries, strip mines, gravel pits 0.1%). The remaining land cover (5%) is classified as emergent wetlands, wooded wetlands, and open water (Upper Hudson Figure 1, Upper Hudson Table 1). These habitats accommodate 158 Species of Greatest Conservation Need (SGCN; Upper Hudson Table 2). This is about 1/3 of the 537 species designated as SGCN in New York State (Upper Hudson Table 3), and includes 52 bird species, 51 insect species, 27 amphibian and reptile species, 11 marine fish species, 7 mammal species, 5 mollusk species, 4 freshwater fish species, and 1 species of crustacean. There are 53 species that historically occurred in the Basin, but are now believed to be extirpated (Upper Hudson Table 4).

Critical Habitats of the Basin and the Species That Use Them

DEC staff members who compiled the SGCN information in the State Wildlife Grants (SWG) database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycle at the system and sub-system level was extracted from the database (Upper Hudson Tables 12 and 13). The habitat classifications in the database were adapted from the New York Natural Heritage Program's Ecological Communities of New York State, Second Edition. In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of the Lacustrine and Riverine systems, the subsystems were modified to reflect the classifications most often used by DEC fisheries managers (e.g., cold water - shallow). These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather it is a subset of the habitats deemed critical to SGCN that occur in the basin.

Each of these systems and subsystems are further refined into a habitat category in the SWG species database and can be viewed in the taxa reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can also be found in Appendix B.

The habitats of the Upper Hudson Basin are as diverse as any other basin in New York State. This diversity is due to factors such as the range in elevation from lowlands to high peaks, a diversity of soils and bedrock geology, and gradients of fresh to salt water (Penhollow et al.,2002).

Forested Habitats

Forested habitats are found throughout the Upper Hudson Basin in varying degrees of health and contiguity. For the purposes of this document, the forested habitats will be broken up into six general regions: the Adirondack Mountains in the north, the Catskill and Shawangunk Mountains in the southwest, the Pine Bush in the central part of the Basin, the Hudson River Valley (including the Helderbergs and the Hudson Highlands) running from north to south down the center of the Basin, and the Taconic Mountains stretching from north to south in the far eastern part of the Basin. The Hudson River Estuary Program compiled much of the information that follows (Upper Hudson Table 5; Penhollow, et al., 2002).

The Adirondack Mountains in the north and the Catskill Mountains in the southwest part of the Basin are comprised of the largest, intact stretches of forest (including some first growth) in the State. Predominant vegetation types in these two regions are beech-maple forests, hemlock-northern hardwood forest, and spruce-fir forests. The habitats found in the six-million acre matrix of public and private lands of the Adirondack Park support boreal forest birds such as spruce grouse and Bicknell's thrush, early successional birds such as Canada warbler, raptors such as long-eared owl, northern harrier, and peregrine falcon. Abandoned mines and natural caves provide bat habitat and support listed species such as the Indiana bat and small-footed bat. The Catskill Mountains support regionally significant populations of forest interior nesting birds including Bicknell's thrush in high altitude spruce-fir forests, bald eagle, timber rattlesnake, and rare plant communities.

The Shawangunks, located south of the Catskills and west of the Hudson River, contain a forest matrix of chestnut-oak forest (chestnut oak, red oak), hemlock-northern hardwood forest, and pitch pine-oak heath rocky summit interspersed with vernal pool and wetland habitat. The forest habitats are important migratory corridors for raptors and other migratory birds. Timber rattlesnake, northern copperhead, eastern hognose snake, and five lined skink occur at several locations.

The Albany Pine Bush in the central part of the Basin is the largest remaining inland pine barrens in the State and is one of the most endangered landscapes in the northeastern United States. This area was created 15,000 years ago as the glacier receded and deposited large amounts of fine glacial sand into a massive lake covering the capital region. Today, this area is referred to as Glacial Lake Albany and covers an expanse from Albany County north through portions of Warren County. The Albany Pine Bush contains globally rare pitch pine-scrub oak barrens and pine barrens interspersed with grass and sedge communities. This area supports the endangered Karner blue butterfly and its host plant blue lupine, as well as other rare butterflies and moths, as well as rare reptiles and amphibians.

The north-central part of the Hudson River Valley (south of the Mohawk Valley, Albany through Ulster Counties) is comprised of a diverse array of forest types including red maple-black gum swamp, chestnut-oak forest, Appalachian oak-hickory forest, and pitch pine-oak heath rocky summit. The area includes the Helderberg escarpment to the north and the Potic Mountain ridge to the south. This area contains hardwood and conifer (plantation) forests, young regenerating forests, old fields, shrublands, and reverting farmland. Some of the species of interest include American woodcock, brown thrasher, prairie warbler, blue winged warbler, and northern goshawk. Limestone caves on the Helderberg Escarpment provide habitat for bat species including Indiana bat. The Hudson Highlands in the southern part of the Hudson River Valley (Orange, Dutchess, and Putnam Counties) are a relatively undeveloped corridor of forests, wetlands, and grasslands of regional importance to breeding and migratory birds, resident herps, and rare plant communities. Important habitats include Appalachian oak-hickory forest, chestnut-oak forest, and oak-tulip tree forest. Species indicative of large, contiguous areas of undisturbed forests include timber rattlesnake and warblers and thrushes such as cerulean warbler. The area also contains mines used as bat hibernacula, including for the Indiana bat and small footed bat.

The Taconic Mountains encompass large areas of contiguous, high quality, northern hardwood forest, and it serves as a recharge area for numerous rich fens. The far northern extent of this region in Rensselaer County contains a diverse mix of wetland and upland communities including spruce-fir swamp, hemlock-northern hardwood forest, and spruce flats. The high quality, large, contiguous nature of this area provides habitat for forest interior bird species and large mammals (e.g., fisher, river otter). Important habitats in the Taconics from Rensselaer County southwards include hemlock-northern hardwood forest and

Appalachian-oak hickory forest. This area supports a diverse population of resident and migratory bird species as wintering and breeding habitat, and as a migratory corridor for passerine birds and raptors. Rare herptile species found here include bog turtle and timber rattlesnake.

Wetland and Other Aquatic Habitats

Much of the wetland, river, stream and lake habitat in the Basin is embedded in a forested matrix and is distributed through the Basin. There are over 270 miles of low-gradient river habitat that is deep and wide. High-gradient coldwater streams are also prevalent in the basin. The following descriptions attempt to provide a general feel for the wetlands and other aquatic habitats in the watershed.

The Adirondack region contains an estimated 2,800 ponds and lakes, miles of pristine headwater streams, and a diverse mix of wetland communities including spruce fir swamp, shallow emergent marsh, sedge meadow, and boreal wetlands. Over 1/3 of New York State’s wetlands are found in the Adirondacks. This region also has unique habitats such as the ice meadows found along the Hudson River and vernal pools dotted across the landscape. These habitats support wetland birds such as American bittern, least bittern, and pied-billed grebe. Marsh and vernal pool habitats support herpetofauna such as blue-spotted and Jefferson salamanders. The ponds and lakes in the Adirondacks provide habitat for rare fish species such as round whitefish and heritage strain brook trout, reptiles such as the wood turtle, foraging sites for raptors such as osprey, and are the stronghold for nesting common loons in the State.

The central and south central portions of the basin have diverse wetland communities from high elevation marshes such as spruce fir swamp and boreal wetland communities to vernal pools to shallow emergent marsh at lower elevations. All are of regional importance to breeding and migratory birds, resident herps, and rare plant communities. Where wetland complexes are still relatively intact species that require large, contiguous areas of undisturbed wetland and upland habitats such as wood turtle and river otter can be found. The Hudson River estuary at Troy provides the only riverine spawning areas for shortnose sturgeon, while Cohoes Falls might have been important 150 years earlier. Other rare wildlife found here includes sedge wren, least bittern, Jefferson salamander, and blue spotted salamander.

The wetland complexes of Columbia, Dutchess, Putnam, and Ulster Counties in the lower Hudson Valley are a hot spot for amphibian and reptile biodiversity in New York State. A network of four major wetland complexes in Dutchess County (Milan Window, Stissing Mountain, La Grange/East Fishkill, East Park/Hyde Park) provide important habitat for the most diverse turtle community in the State including Blanding's turtle, bog turtle, spotted turtle, wood turtle, and box turtle. Northern cricket frog, blue spotted salamander, marbled salamander, four toed salamander, and Eastern ribbonsnake are also found here, as well as the only consistent overwintering site by golden eagles. Important habitats include red maple-hardwood swamps, floodplain forest, deep emergent marsh, rich sloping fen, and medium fen communities. The Black Creek and Swarte Kill watersheds contain wetland and upland habitat complexes important to amphibians and breeding waterfowl, including northern cricket frog. Important habitats include mature hemlock-northern hardwood forest, red maple hardwood swamp, Appalachian oak-hickory forest, beech-maple mesic forest, and one of the largest dwarf shrub bogs in the Hudson River Valley. Finally, the Harlem Valley calcareous wetlands found in the valleys and adjacent ridges of the Taconic Highlands contain high quality habitat for wetland dependent species and some of the best bog turtle habitat in the Hudson River Valley. Important habitats include red maple-hardwood swamp, floodplain forest, fens, and shallow emergent marsh. The area is comprised of two wetland complexes, the Northeast Ancram fen complex to the north, and the Great Swamp area to the south.

There are 30 areas within the Basin designated as Significant Coastal Fish and Wildlife Habitat by the Department of State in consultation with DEC (Upper Hudson Table 6). These areas encompass over 25,000 acres and are primarily concerned with marshes and tributaries of the Hudson River from Albany County southward. Highlights include North and South Tivoli Bays in Dutchess County, Hudson River Miles 44-56 in Putnam County, and Ramshorn Marsh in Greene County. Tivoli Bays is the largest undeveloped, tidal freshwater wetland complex on the Hudson River, and supports species such as osprey, least bittern, wood turtle, and spotted turtle. This area is of statewide significance for research and regional significance for recreational and educational uses. The stretch of the Hudson River in Putnam County (miles 44-56) is an extensive area of deep, turbulent river channel with strong currents and rocky substrates. This expanse supports a bald eagle wintering area and is part of the important nursery for shortnose sturgeon. Ramshorn Marsh is one of the largest freshwater tidal, forested wetlands in the Hudson Valley, a rare ecosystem type in New York State and the world. The marsh supports such species as least bittern and wood turtle, and a commercial shad fishery of regional significance. Tributaries that drain into these significant coastal habitats are critical nursery areas for very high numbers of American eel.

The Hudson River begins as a small mountain lake on the side of Mt. Marcy and travels 315 miles to New York Harbor. Halfway along its course (at the federal dam at Troy) it becomes an estuary providing spawning and nursery grounds for commercially valuable fish, crabs, and shellfish. About 100 miles of the upper estuary are fresh water. The entire estuarine portion of the Hudson River watershed straddles the Upper Basin and Lower Hudson-Long Island Bays Basin and is 5,300 square miles, has 65 tributaries, encompasses 14 counties, 242 municipalities, and is home to more than 8 million people. The entire estuary supports more than 200 species of fish. SGCN include Atlantic sturgeon, shortnose sturgeon, American eel, American shad, alewife, blueback herring, rainbow smelt, tomcod, and associates of estuarine submerged aquatic vegetation (SAV) the common pipefish, threespine stickleback, and fourspine stickleback. Current Hudson River Estuary Program funded studies are looking at blue crab and American eel habitat use in the Hudson. Recently, wild fish and hatchery raised sturgeon were outfitted with sonic tags to track their movements and study their use of Hudson River habitats. Atlantic sturgeon was once so plentiful and commercially popular it was known as “Albany Beef”. Since then, declines have lead to a moratorium on fishing sturgeon adopted in New York in 1996 and coast-wide soon after.

Grassland and Shrubland Habitats

Conservationists often think of areas in the St. Lawrence Valley and the Lake Plains when considering management actions for grassland-dependent wildlife in New York State; however, the Upper Hudson Basin contains natural and human-created (i.e., pasture, hay land) grassland habitats that support grassland species of conservation concern. Work done by DEC and New York Natural Heritage Program (NYNHP) for the Grassland Reserve Program (USDA Farm Bill) indicates that there are significant grassland habitats and associated plant and animal communities (e.g., butterflies, birds) throughout the Hudson River corridor. An example is the Shawangunk grasslands in Orange and Ulster Counties. This area is important for grassland birds including northern harrier, upland sandpiper, and short eared owl. Furthermore, areas with significant amounts of agriculture in the Hudson (e.g., Dutchess, Columbia, Rensselaer, and Washington Counties) and Mohawk (e.g., Montgomery County) valleys can provide habitat for grassland-dependent species, although agricultural practices incompatible with wildlife may reduce the value of these habitats. Old fields and upland meadows in these agricultural areas can be winter roosting habitat for northern harrier and short-eared owl. Bobolink and eastern meadowlark will breed in hayfields, while upland sandpiper, vesper sparrow, and grasshopper sparrow breed spottily in larger tracts. Shrub-dominated fields in agricultural landscapes are important for rare shrubland-nesting birds. According to the Audubon Society, the Upper Hudson Basin falls within a “responsibility” zone for conservation of shrubland nesting birds. These species have less stringent area requirements and conservation is compatible with agricultural preservation and grassland conservation efforts.

Publicly Held or Designated Lands - Opportunities to Develop Conservation Partnerships

Many of the critical habitats in the Basin have unique ecological (wildlife and plant communities, geological formations) or cultural (recreational, historical value) characteristics and have been designated with some protective status by State agencies such as the Office of Parks, Recreation and Historic Preservation (OPRHP) and DEC. These areas include State Parks, State Forests and Forest Preserve Lands, Wildlife Management Areas (WMA), and Bird Conservation Areas (BCA), and total over 1.9 million acres distributed throughout the Upper Hudson. The majority of protected land is in large forest tracts (primarily State Forests, Wilderness Areas, Wild Forests, and Primitive Areas) located in the Adirondack and Catskill mountain ranges. The Upper Hudson Basin contains more protected habitat in the form of public lands than any basin in the State.

Lists of public land holdings have been provided here (Upper Hudson Tables 7-10) to provide a spatial context (i.e., location, size) for these large pieces of habitat, and to recognize their importance in the implementation of the conservation recommendations that follow. The species and habitats found on these parcels provide an excellent opportunity for research, survey, and inventory efforts. In addition, forest preserve lands and state park preserves, due to their protected status, can act as intact blocks of relatively healthy habitat where conservation partners can observe ecological processes over long time scales and gain insight into how to address conservation dilemmas in landscapes that have been heavily altered by human activity. Public lands can serve as the nexus for regional conservation efforts and act as population source areas. Finally, these properties provide opportunities for partnerships that help to deliver habitat and population management actions designed to benefit SGCN.

There are 29 state designated Critical Environmental Areas (CEA) in the Basin, over half of which are in Dutchess County (Upper Hudson Table 11). CEAs are traditionally designated by DEC to protect drinking water supplies (surface waters or ground water aquifers), but other government agencies may designate CEAs for reasons such as preservation of farmland, wetland, and mountain habitat (Buttercup Farm Sanctuary, Dutchess County), protection of waterfowl (Ryder Pond and Cagney Marsh, Dutchess County), protection of migratory & nesting birds (Bontecou Lake, Dutchess County), and protection of rare plant and animal communities (Snake Hill, Dutchess County). As with the State parks, State forests, WMAs, and BCAs mentioned above, CEAs may be important areas to focus management actions. These actions can take the form of population and habitat surveys, land protection initiatives (e.g., conservation easements), or habitat management/restoration efforts, and offer an excellent opportunity to for local governments and land use groups to get involved.

These lists are not meant to be a comprehensive catalogue of all publicly held or designated lands in the Upper Hudson Basin. There are many parcels owned by local governments that provide benefits to SGCN (e.g., town and county parks, green belts), and there are many privately held parcels that have been designated as protected through perpetual conservation easements, fee acquisitions, and other methods (e.g., Audubon's Important Bird Areas). These private lands are usually acquired because of their unique biological character and/or highly imperiled status, and should not be overlooked during more targeted conservation planning efforts. Local land trusts and private groups such as The Nature Conservancy that own and/or administer these lands are important partners in the conservation of fish and wildlife species of concern.

Overall trends in the basin

Biodiversity Trends

The Hudson River Estuary Program states that the "Hudson River Estuary Area of Biological Concern", a region stretching from Albany County in the north through New York City in the south (about 6,400 square miles), has higher biodiversity than can be expected by chance alone for a land area of similar size within the State of New York (Smith et al., 2001). The habitats of the Mohawk Valley and Adirondacks are outside the scope of their program, but the diverse habitats and species found in these northern regions as well, reinforce the importance of the Upper Hudson Basin to Species of Greatest Conservation Need. NYNHP database records indicate that the Upper Hudson Basin is of critical importance to reptile and amphibian diversity in New York State. Almost 2/3 of all reptiles and amphibians of greatest conservation need are found within this Basin (Upper Hudson Table 3). Additionally, NYNHP data indicate that the Hudson River Valley and extensive forests of the Catskills and Adirondacks are of vital importance to rare birds and mammals. The region's extensive rivers, tributaries, and marshes support giant fish like sturgeon, and rare insects such as odonates, stoneflies, and tiger beetles.

While this biodiversity is impressive, trends in land use that are incompatible with wildlife have taken their toll on populations of SGCN. Of the 156 SGCN in this Basin, 34% are declining (Upper Hudson Table 2). The majority (53%) of these are birds, with early successional forest/shrubland birds (32%) and grassland birds (21%) making up the largest shares of declining avifauna. Twenty-five percent of the reptiles and amphibians designated as SGCN are declining, and almost half (46%) of these are woodland/grassland snakes. Insects make up 15% of declining species of concern, about 75% of which are rare butterflies. Many of these declining species specialize in a few select habitats or foraging guilds, and as a result, their population sizes readily diminish with declining habitat quantity and quality. Yet other SGCN depend upon the habitats increasing in occurrence throughout the Basin (e.g., deciduous/mixed forest breeding birds, boreal forest birds, forest breeding raptors). An important step for this plan will be to define a goal for how extensive each habitat type should be in this basin.

More troublesome still is the 54% of SGCN whose status we do not know (Upper Hudson Table 2). Most of these are insects, over half of which are odonates. Reptiles and amphibian species of concern make up about 17% of species of unknown status, and the majority of these are lake/river reptiles. Anecdotal evidence and preliminary data suggest that these species may be rare and/or declining, but without sufficient data on their distribution, abundance, and habitat requirements it is exceedingly difficult to try to combat threats to their populations and habitats.

Changing Human Population, Land Use, and Habitat Quality

As described in the description of the Basin and its critical habitats, this region contains an extraordinary diversity of ecosystems that are still in relatively good health. But, the Upper Hudson Basin also contains some of the fastest developing communities in New York State. From 1990-2000, the fastest growing counties in the Basin were Putnam County (14%), Orange County (11%), and Dutchess County (8%) in the southern part of the region, and Saratoga County (11%) and Greene County (8%) in the north-central Upper Hudson (U.S. Census Bureau, 2002). These areas of high human population growth coincide with locations of some of the most sensitive habitats and the rare species that depend upon them (e.g., bog turtles in fens in Dutchess and Putnam Counties). Between 2000 and 2015, it is estimated that the greatest increases in human populations will be in the lower Hudson River corridor; specifically, in the increasingly suburban Orange (13% by 2015) and Putnam (12% by 2015) counties, as well as the relatively rural Ulster (11% by 2015) and Sullivan (12% by 2015) counties (New York Statistics Information System, Cornell Institute for Social and Economic Research, 2002). Saratoga County, in the foothills of the Adirondacks, is not far behind with an estimated population increase of 9% by 2015.

Historically, land use in the Basin resembles that of New York State overall-forested followed by intense agriculture, and now a return to forested land (Stanton and Bills, 1996). Records indicate that in 1910, on average, over 70% of the Upper Hudson Basin was classified as farmland (i.e., row crops, pasture, hay land; Stanton and Bills, 1996). By the 1990s this trend had completely reversed itself, and today over 70% of the watershed is classified as forest (Stanton and Bills, 1996; MRLC data, 2005). The nature of the remaining agricultural land has changed as well. Cropland diversity has decreased and smaller farms have been consolidated into larger units. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fencerows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the basin.

Wetlands habitats declined dramatically from 1900 until the 1970s. It was common practice to drain marshes for agriculture and other land use practices. Hudson River marshes, in particular, were often used as municipal landfills (Hudson River Estuary Action Plan, 2001). State and federal laws passed in the 1970s protected these habitats, and wetland losses have been slowed dramatically. Results of the New York Freshwater Wetlands Status and Trends Study (2000) are that from the 1980s through the 1990s the Adirondacks experienced a small net gain in wetlands, whereas a net loss of about 2% was observed in the Hudson Valley. Wetland losses were the result of conversions to agriculture and development (residential, commercial, roads). While wetland quantity has remained relatively steady over the past 20 years, siltation, runoff from agriculture and development, and introduction of invasive species has degraded many wetland systems.

Water quality for humans and wildlife in the Basin ranges from pristine, such as the headwaters of streams in the Catskills, to poor in some urban centers. The most prominent case is the contamination of the Hudson River with polychlorinated biphenyls (PCB). PCBs entered the river system through direct discharge from factory sites from the 1940s until 1977 (Baker et al., 2001). These compounds are persistent in the environment, attach strongly to soils and river sediments, and readily accumulate in fish, wildlife, and humans (National Research Council, 2001). PCB contamination negatively affects reproduction and survival of mammals such as river otter and raptors such as bald eagles. Levels of PCBs in the Hudson River are among the highest in the United States (Baker et al., 2001), so in an attempt to correct this problem, the Environmental Protection Agency will begin dredging the Hudson River in 2007 to remove contaminated sediments.

Another significant trend in the Upper Hudson Basin with negative consequences for wildlife is the declining pH of Adirondack and Catskill water bodies due to acid rain. Air pollution laden with nitric and sulfuric acid from coal-fired electrical generating plants in the Midwestern United States (Ohio, Illinois, Indiana, Pennsylvania) is carried northeast via wind currents, and deposited in the form of precipitation onto the Adirondack and Catskill mountain ranges. The thin, acidic soils and the nutrient-poor water bodies in these areas make them particularly susceptible to acidification. Despite the reductions in emissions that have resulted from the Clean Air Act, the Adirondacks and other affected areas are now more sensitive to acid deposition due to the accumulation of acids and the loss of buffering capacity in the soil (Schoch, 2002). The effects of acid rain can be seen in the damaged spruce-fir forests of the high peaks of the Adirondacks, reduced heritage strain brook trout numbers and reproductive success in ponds with a pH of <5, and decreased foraging and reproductive success of nesting common loons (Environmental Protection Agency, 2004; Schoch, 2002).

DEC has engaged in extensive surveys of macroinvertebrate communities in rivers and streams in the State in an effort to assess 30-year trends in water quality. Within the Upper Hudson Basin, about 90% of the streams and rivers sampled were classified as non-impacted or slightly impacted (very good water quality or good water quality, respectively). About 10% of streams and rivers sampled were classified as moderately or severely impacted (poor or very poor water quality, respectively). Over 80% of the sites classified as moderately or severely impacted were from the lower Hudson watershed including sites on the Hudson River (from Albany/Troy south), lower Esopus Creek, and the Wallkill River. Overall, researchers have observed improvements in the health of the upper stretches of the Hudson River (upstream of Albany and Troy) and the Mohawk River over the past 30 years as shown by increased macroinvertebrate diversity; however, both river systems have locations that continue to be classified as moderate to severely impacted due to non-point nutrient enrichment, runoff from residential and commercial development, and invasive species such as zebra mussels. Most freshwater mussel species are adapted to specific flow regimes in streams and rivers and the effects of recreational rafting water releases in the Indian River and Hudson River on macroinvertebrate communities are unknown.

Threats

DEC staff members who compiled the SGCN information in the SWG database were asked to indicate threats to SGCN and their habitats. During the analysis for the Basin, a listing of threats for each species occurring in the Upper Hudson was extracted from the database. The threats and summary figures compiled here (Upper Hudson Table 14) are not listed in order of importance. The magnitude of a threat is measured by several variables including the species life history traits (i.e., its vulnerability), population trends, specific habitat type and geographic locale, and other rationales. The information provided does not quantify the magnitude of a particular threat. The information provided is intended only to paint a broad picture of the proportion of species/species groups to which a particular threat applies, and the frequency with which a particular threat was mentioned in the database. The purpose of this information is not to compare the severity of one threat against another.

The most significant threats were determined by reviewing information from the CWCS database, the scientific literature, and conservation plans for the Basin. Prominent threats to species of greatest conservation need in the Upper Hudson Basin include:

Habitat Loss and Fragmentation

Anthropogenic changes like development (residential and commercial, roads, power lines), dredging, and wetland draining, and natural changes such as succession reduce not only habitat quantity, but the quality of habitat as well by disrupting the function of remaining habitat patches. Examples of the loss of habitat function include loss of connectivity to patches of similar habitat (or different yet complementary habitats), loss of metapopulation dynamics in small, isolated patches ("sink" habitats), increased negative edge effects (increased susceptibility to predation), and reduction in the types of species a patch or landscape can support ("area sensitive" species).

Almost 25% of the Upper Hudson Basin is currently comprised of habitats that are significantly altered by humans. Many of these habitats are maintained by suppressing ecological processes such as vegetative succession and fire; however, the reverse is also true. Mature and early successional forest habitats may suffer because of public reluctance or ability to engage in active management of these habitats.

Degraded Water Quality

Many of the SGCN in this Basin rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites). Conservation partners have identified the degradation of water quality and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. Degraded water quality includes siltation (from in stream and upland erosion), nutrient runoff, temperature increases, toxics (e.g., pesticides, heavy metals), lowered dissolved oxygen, altered hydrology (e.g., water withdrawal, ground water extraction), and physical modifications (e.g., channelization, riparian removal, berms). Potential new threats from dioxin, polycyclic aromatic hydrocarbons

(PAH), and endocrine disruptors require more study to determine their effects on wildlife.

Some of the significant water quality issues in this basin include PCBs in the Hudson River and Schroon Lake, and mercury pollution in the Adirondacks. PCB contamination negatively affects reproduction and survival of tomcod, river otter, and bald eagle. Mercury is released from anthropogenic sources (such as coal burning plants) and is carried via wind currents from sources in the Midwest and deposited onto terrestrial and aquatic habitats through rain, snow, or dust. There may also be local sources of naturally occurring mercury. If mercury is converted to methylmercury it can be consumed by organisms, and increase in concentration as it moves up the food chain (Evers, 2005). Traditionally, high levels of mercury were correlated with decreased productivity and survivorship of common loons (Schoch and Evers, 2002), but recent findings suggest that mercury contamination is a much larger threat to human and ecological health. A recent report by Evers (2005) compiling data from 21 peer-reviewed journal articles shows elevated mercury levels in almost every taxa including fish (e.g., brook trout, yellow perch), crayfish, salamanders, waterbirds (e.g., common loon), forest songbirds (e.g., Bicknell's thrush), and furbearers (mink and otter). According to the report, mercury also poses a threat to wildlife living in habitats as diverse as mountain tops and small headwater streams. Particularly high mercury levels were observed in the Adirondack Mountains. Mercury can have adverse effects on individual animals living in this region, as well as population-level effects through changes in behavior, reproduction, and body chemistry (Evers, 2005).

Incompatible Silvicultural and Agricultural Practices

Farming and forestry practices may lack ecologically based objectives, and can be detrimental to wildlife. Trends in modern farm operations (increased field size, loss of edge habitats, erosion due to conventional tillage, intensive grazing, poorly timed mowing/haying of fields) can have negative consequences for wildlife and their habitats in regions where agriculture (e.g., row crops, pasture/hay land) makes up a significant portion of the landscape as seen in parts of Orange and Ulster Counties west of the Hudson River, east of the Hudson River in portions of Dutchess County north through Washington County, and throughout the Mohawk Valley (Oneida, Herkimer, and Montgomery Counties). In the forested landscapes that predominate the Upper Hudson Basin, forestry operations that do not comply with best management practices and that are poorly planned and executed can damage habitat function and reduce habitat quality for SGCN that reside there.

Invasive Species

Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout the Basin. In wetlands and other aquatic habitats, large patches of species like purple loosestrife and common reed with limited value to wildlife, displace native plant species and disrupt ecological processes. Numerous non-indigenous aquatic species have been introduced into the waters of New York State, but so far only a relatively small number could be classified as aquatic nuisance species (ANS). Many introduced species have become naturalized, and show relatively few adverse effects. Others are present in very small numbers, and it is not clear if introduced populations will survive or result in detectable adverse effects. Marine species are probably under-represented, because marine ANS have not been studied as much in New York as freshwater ANS. Those species recognized as candidates for ANS designation are listed in Table 18.

In upland habitats, invasive exotic plants and insects introduced through human activity threaten to reduce biodiversity. For example, exotic insects like Hemlock wooly adelgid and Asian longhorn beetle lack any natural predators and threaten to alter the composition of forest stands. In the Hudson River, zebra mussels have caused a 57% reduction in the biomass of other benthic animals (Bode et al., 2004). From Yonkers to Troy, zebra mussels have consumed more oxygen from the Hudson River (from their respiration) than was added back to the river as a result of the post-Clean Water Act improvements in sewage treatment plants (Strayer et al., 1996, D.L. Strayer pers. comm., May 2005). Although this oxygen depletion probably does not impair water quality (unlike sewage discharges), it demonstrates the magnitude of effects that can be posed by some invasive species. In all habitat types, new residential and commercial development increases the risk of new occurrences of invasive exotic plants and animals.

Native species present in locations or numbers not historically found can be detrimental to some SGCN. These invasive or overabundant native species can out compete the species of concern for forage or nest sites (e.g., sand shiner vs. comely shiner, or blue-winged vs. golden-winged warblers), can pose a predation threat (e.g., perch preying upon round whitefish), or can reduce habitat quality by altering vegetative composition and structure (e.g., black locust invading Karner blue butterfly habitat, deer overbrowse limiting forest regeneration).

Human-Wildlife Interactions

There are a variety of threats to SGCN in the basin from direct interactions with humans. These include vehicle and structure collisions, and illegal and unregulated harvest. Species that are most susceptible to these threats are those that disperse across the landscape like migrating birds and bats, and herpetofauna traversing from the upland to wetlands. Often fragmentation of habitats by structures, such as power lines and roads and the entrainment of fish in power plant cooling intakes, are a significant source of mortality. There have been critical population losses to American eel and blueback herring from barriers to fish migration as locks and dams, and from deaths due to hydropower turbine blades.

Anecdotal evidence and preliminary survey data have suggested that wildlife collisions with human-created structures (e.g., wind turbines, communications towers, and power lines) can have significant population-level effects. As human populations within the Basin continue to increase, these structures will likely become a more significant hazard to SGCN.

Many of the amphibian and reptile species of conservation concern have no protected status. Killing, collection/translocation, and the illegal sale of herpetofauna in the pet trade pose a significant threat to rare and declining reptile and amphibian species. Furthermore, public misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals.

The best estimate of Atlantic sturgeon stock size in the Hudson at the start of records during the late 1800s was around 6,000 mature females. Current estimates are around 300 mature females. The Atlantic sturgeon fishery was closed in all U.S. Atlantic coastal states and in Federal waters, but losses continue as a bycatch in other ocean fisheries. NY State ended harvest in 1996 and stock recovery in the Hudson since then has been slow. Management action has also been taken to decrease ocean harvest of American shad. American shad stocks are at a historic low, both in the Hudson River and in many other Atlantic coastal rivers. Alewife abundance has declined substantially throughout the estuary and the species is becoming relatively rare. It is an important prey species and a popular recreational and commercial fish. Threats include over harvesting of adults on the spawning grounds for bait in the recreational and commercial fisheries, loss of access to historic spawning grounds, and degradation of spawning and juvenile habitat, primarily in inshore areas. More information is needed for these species to document stock response and identify continued problems.

Climate Change

The greatest potential to affect fish and wildlife on a scale much larger than this Basin is climate change. Large quantities of carbon released into the atmosphere by human activities have increased the amount of carbon dioxide in the air and trapped the Sun's heat. This has resulted in an increase in the global temperature at a rate faster than observed for at least 10,000 years (Millennium Ecosystem Assessment Board, 2005). In the Upper Hudson basin, where boreal ecosystems are at the southern edge of their range, this threat places entire forest communities and their flora and fauna at risk of extirpation within management time frames; however, researchers studying this issue in the Adirondacks have not been able to reach consensus on the methods used to study climate change at a local scale, thus making predictions about future effects difficult (Jenkins, in review; Stager and Martin, 2002). Warming trends may affect the distribution patterns of plants and animals that inhabit boreal habitats and may extirpate some plants and animals that cannot adapt or move to more suitable areas. Climate change is likely to affect local hydrologic cycles that support the world-renowned amphibian and reptile diversity of the Hudson Valley, particularly as human demands for water supply increase in this region. The effects of climate change also include changes in the timing of natural processes and the frequency of natural discturbances.

Priority Issues in the Basin

The Upper Hudson Basin is geographically diverse and there are varying priority stressors in different areas within the basin. The prominent hazards for six different regions within the basin are listed here:

ADIRONDACKS:
Atmospheric deposition (i.e., acid rain and mercury)
Incompatible residential and commercial development
Incompatible forestry practices
Invasive and overabundant species
Human disturbance (collection, recreation)
Climate Change*

HUDSON VALLEY:
Habitat loss and fragmentation
Degraded water quality & altered hydrology (dams)
Incompatible commercial & residential development
Incompatible forestry and agricultural practices
Invasive and overabundant species
Human disturbance (poaching, collection)
Climate change*

CATSKILLS/SHAWANGUNKS:
Atmospheric deposition (i.e., acid rain and mercury)
Incompatible residential and commercial development
Incompatible forestry practices
Invasive and overabundant species
Human disturbance (collection, recreation)

MOHAWK VALLEY:
Habitat loss and fragmentation
Degraded water quality
Incompatible commercial & residential development
Incompatible forestry and agricultural practices
Invasive and overabundant species

ALBANY PINE BUSH:
Habitat loss and fragmentation
Incompatible residential and commercial development
Succession
Invasive and overabundant species

TACONICS:
Habitat loss and fragmentation
Incompatible residential development
Incompatible agricultural & forestry practices
Invasive and overabundant species
Human disturbance (poaching, collection)

Climate change is listed here only for the Adirondacks and Hudson Valley, but will likely affect all areas

Vision, Goals and Objectives for the Basin

Vision

The Upper Hudson Basin will be part of a connected, healthy and sustainable ecosystem.

Public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on Species of Greatest Conservation Need and their habitats within the Basin in a format that can easily be shared among natural resource managers and disseminated to the public to raise awareness of the issues facing species of concern and their habitats.

These conservation partners will work in a coordinated manner to manage populations and habitats over large spatial and temporal scales. This will be done through comprehensive planning, land protection, adaptive management, and rigorous evaluation.

The result of these efforts will be healthier and secure animal populations, habitats, and communities. Loss of Species of Greatest Conservation Need to extinction will be slowed or halted. Species that are currently common will remain common and populations of threatened/endangered/special concern species will improve to the point where they can eventually be de-listed.

Goals and Objectives

- ❖ Study and evaluate the appropriate balance of habitat types within the Upper Hudson Basin. Once a set of target acreages for each habitat type is agreed upon, set priority actions for SGCN and their habitats based upon these targets.

- ❖ Establish a conservation framework within the Upper Hudson Basin through which public and private stakeholder interested in wildlife conservation can work cooperatively towards the management, enhancement, and protection of the Basin's at-risk biodiversity.

- ❖ Ensure that no at-risk (threatened/endangered, rare, or declining) species becomes extirpated from the Basin. Furthermore, ensure that common species remain common.

- ❖ Manage animals, habitats, and land use practices to produce sustainable benefits for species of conservation concern.

- ❖ Maintain knowledge of species and their habitats in sufficient detail to recognize long-term population shifts.

- ❖ Fill "data gaps" for those habitats/natural communities used by SGCN where the habitat vulnerability and factors influencing habitat quality are not fully understood.

- Develop a "stepped down", more targeted plan for the Basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented "on the ground".

Priority Strategies/Actions for Basin-wide Implementation

The following recommendations do not appear in any priority order. All of these recommendations are intended to be of high priority to implement in this basin in the coming 5 to 10 years for the benefit of the most critical SGCN in the state. See the discussion of "*Development of Conservation Recommendations for Species of Greatest Conservation Need and their Habitats*" and their prioritization in the Introduction. All of the recommendations for SGCN found in this basin can be viewed in Appendix A.

Some of the following recommendations refer to work that has already been initiated under the first two rounds of State Wildlife Grant funding (2003 and 2004; Upper Hudson Table 15). Those interested in implementing one of the actions below should be sure to consult the data generated by these studies before engaging in their own conservation endeavors.

There are several existing management plans that address natural resource conservation issues within the basin (Upper Hudson Table 17). The goals and objectives of the plans catalogued here vary in their focus (e.g., water quality, planning and development, fish and wildlife), spatial and temporal scale, and cooperating partners; however, they all provide valuable information on conservation threats and strategies in this region of New York State and should be consulted before implementing recommended actions.

Data Collection Recommendations

Data collection (research, surveys, and inventories) is a crucial first step for the majority of SGCN in the Upper Hudson Basin (Upper Hudson Table 16). Many of the conservation actions in the following categories (e.g., Planning, Land Protection, etc.) should not or cannot be done until critical data gaps are addressed for particular species and their habitats. Once we know more about a species' abundance, distribution, life history, and habitat needs we can begin to decide where, when, and how conservation actions can be implemented.

Most of the species in the taxa listed below are tracked by the New York Natural Heritage Program and recorded in the State's comprehensive database of rare species and significant natural communities. Any new information derived from SWG funded activities involving Heritage-tracked species be submitted to the Heritage Program and integrated into their database.

DATA COLLECTION RECOMMENDATIONS FOR CRITICAL SPECIES

There are a number of priority species and groups that need population, habitat, and life history research to address critical data gaps. This information will help to more clearly identify threats and establish baseline information for these species. This type of data collection will address multiple threats to many species. Detailed recommendations for the following species and species group are listed in Upper Hudson Table 16:

- Barn owl
- Boreal forest birds
- Breeding waterfowl
- Common loon

- Deciduous/mixed forest breeding birds
- Early successional forest/shrubland birds
- Forest breeding raptors
- Freshwater marsh nesting birds
- Grassland birds
- High Altitude Conifer Forest Birds
- Osprey
- Peregrine Falcon
- Amphibians and Reptiles
- Box Turtle
- Freshwater wetland amphibians
- Lake/river reptiles
- Stream salamanders
- Uncommon turtles of wetlands
- Vernal pool salamanders
- Woodland/grassland snakes
- Insects
- Karner blue butterfly
- Other Butterflies
- Other moths
- Odonates
- Riparian tiger beetles
- Stoneflies/Mayflies of lotic waters
- Mammals
- Game species of concern
- Indiana bat
- Tree bats
- Marine Fish
  - Fourspine stickleback
  - Atlantic sturgeon
  - American shad
  - Alewife
- Freshwater Fish
  - Round whitefish
  - Heritage strain brook trout

DATA COLLECTION RECOMMENDATIONS FOR CRITICAL HABITATS

❖ Before other conservation actions can be taken to combat the harmful effects of habitat loss and fragmentation, data need to be collected on specific habitat requirements of SGCN (e.g., landscape scale characteristics like patch size and juxtaposition, microhabitat characteristics like stem density and ground cover), population processes (e.g., minimum viable population, metapopulation dynamics, source/sink dynamics), and how, when, and where habitat management and/or restoration should occur. Specific recommendations for the following species and species groups are found in Upper Hudson Table 16:

- Deciduous/mixed forest breeding birds
- Early successional forest/shrubland birds
- Freshwater marsh nesting birds
- Grassland birds
- High Altitude Conifer Forest Birds
- Box Turtle
- Marine Fish
- Atlantic sturgeon

❖ Strongly human-altered landscapes may have disrupted predator-prey cycles. Anthropogenic activities such as development and pesticide application may serve to directly reduce predator or prey populations. Additionally, human-altered habitats may favor generalist predators by creating long, linear edge habitats and small habitat patches (with a high edge to interior ratio) that allow predators to hunt in a more efficient fashion. Changes in prey abundance and predator communities can affect survivorship of both young and adult animals (i.e., increased predation, poor nutrition increasing susceptibility to disease, predation, etc.), thus contributing to species declines. Investigating predator-prey dynamics in relatively large blocks of contiguous habitat (e.g., large forest tracts in the Catskills or Adirondacks, large grassland or wetland complexes) provides insight into how to repair ecological processes in human-altered habitats. Specific data collection recommendations for the following species and species groups can be found in Upper Hudson Table 16.

- Barn owl
- Freshwater marsh nesting birds
- Osprey

❖ Many of the SGCN in this Basin rely upon aquatic habitats during some stage of their life cycle (e.g., natal sites, foraging sites). Conservation partners have identified the degradation of water quality, habitat quality, and the acute and chronic effects of contaminants in aquatic habitats as a significant threat to wildlife. It is important to quantify the effects of these threats on the survival of SGCN. Specific recommendations for the following species and species groups listed below are found in Upper Hudson Table 16:

- Common loon
- Freshwater marsh nesting birds
- Peregrine Falcon
- Round whitefish

- American eel
- Riparian tiger beetles
- Marine Fish
- American shad

❖ Invasive exotic plants and animals diminish the quality of upland and aquatic habitats throughout the Basin. It is important to engage in early detection for these exotic species, to quantify their effects on SGCN and critical habitats, and to develop guidance on minimizing the potential detrimental effects of exotic species on species survival and habitat quantity and quality. Specific recommendations for the following species and species groups are included in Upper Hudson Table 16:

- Early successional forest/shrubland bird
- Round whitefish
- Riparian tiger beetles

❖ Some farming and forestry practices that lack ecologically based objectives can be detrimental to wildlife. Conversely, the existence of agriculture and some agricultural practices can effectively maintain habitat for some species in the Upper Hudson Basin. A needed first step is to determine the relative proportions of farming practices (mowing frequency, timing of mowing, etc.) and forest management practices (partial harvest, clear cut, etc.) in the basin. Then, evaluate the preferences and compatibilities of each SGCN in relation to these existing management practices. Existing management practices can be matched to the vision of the relative proportion of habitat types set forth in the initial stages of this plan. It will then be appropriate to act on the specific recommendations shown on Upper Hudson Table 16 within this vision for habitat types for the following species groups:

- Deciduous/mixed forest breeding birds
- Early successional forest/shrubland birds
- Forest breeding raptors
- Grassland birds

❖ Anecdotal evidence and preliminary survey efforts have suggested that wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) can have significant population-level effects. The U.S. Fish and Wildlife Service (USFWS) is currently investigating the effects of these types of structures on wildlife populations (specifically, migratory birds), but a more targeted effort should be made in the unique landscapes of the Upper Hudson Basin. Species of Greatest Conservation Need that should be included in this action include migratory birds (early successional forest/shrubland birds, deciduous forest birds, forest breeding raptors) and bats (tree bats). The effects of human-created structures on SGCN should be evaluated from a basin- and state-wide perspective. Siting of human-created structures should also be evaluated from a basin- and state-wide perspective.

Planning Recommendations

- Analyze and apply all of the information generated by the State Wildlife Grant research, survey, and inventory efforts and incorporate them into plans at varying spatial and temporal scales.

- Incorporate many of the on-going planning efforts being conducted by government agencies at all scales (e.g., local open space plans, Unit Management Plans, New York State Grassland Bird Management Plan, North American Waterbird Conservation Plan, various endangered and threatened species recovery plans) and NGOs.

- Coordinate the diverse array of stakeholder groups that will need to be involved in land use planning for SGCN, particularly groups that may not have been traditionally involved in a large-scale conservation planning process (e.g., economic development groups, town boards, local land trusts).

- Develop and integrate a "coarse-filter" approach to compliment the "fine-filter" approach utilized in this CWCS. The "coarse-filter" approach emphasizes the conservation of ecosystems that adequately support the vast majority of species and the full array of natural communities. It is thought to be an efficient approach, because it protects guilds of species that include many SGCN (e.g., the "fine-filter"). While the goals for SGCN are to provide for their recovery and maintain potential for their survival, goals for ecosystems will be to maintain (or restore) ecological processes to prevent additional species from imperilment.

- There is a clear need for a habitat mosaic management plan for early successional forests/shrub habitat, mature forest stands, grasslands, and wetlands in this basin. Of the 156 SGCN occurring in the basin, 26 depend on barrens and woodlands, 55 depend on forested habitat, 44 depend on grasslands, and 29 depend on mineral soil wetlands. Some species depend on all four of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities among both wildlife (habitat quality and quantity) and people (timber, agriculture, residential and commercial development, water). The balance and active cooperative management of all of these habitat types among a diverse array of stakeholders is the key to the health and abundance of many of the SGCN currently living in this basin.

- Over 70% of the Upper Hudson Basin is forested. There is an opportunity to integrate the needs of many SGCN that rely on a variety of forested habitat types in both large scale management plans and smaller plans that may address only one species, habitat type, or geographic area (e.g., Wildlife Management Area, a private forest tract, or municipality). Some specific planning recommendations for species in forested habitats include:

    - Develop a management plan that provides guidance on maintaining and enhancing early successional forest/shrub habitat for the suite of early successional forest/shrubland birds.

    - Public and private partners should coordinate development of local conservation programs that specifically address forested landscapes. These plans should incorporate the needs of deciduous forest birds, early successional forest/shrubland birds, and forest breeding raptors.

- Investigate the feasibility to manage fields, existing early successional forests, and mature forests in the basin with controlled burning. Draft a fire management plan in accordance with these findings. This would benefit many SGCN, including deciduous forest birds, early successional forest/shrubland birds, grassland birds, and forest breeding raptors.

- Develop a management plan for high elevation birds, including high altitude conifer forest birds (i.e., Bicknell's thrush). The results of the 2004 State Wildlife Grant study on boreal forest birds should be incorporated into this work.

- Conservation planners should revise the Federal Karner Blue Butterfly Recovery Plan and complete the New York Karner Blue Butterfly Recovery Plan to identify protection/management strategies for sustaining Karner blue metapopulations over the long term.

❖ Only about 5% of the Upper Hudson Basin is classified as wetland or some other aquatic habitat (scattered throughout the Basin), yet many SGCN within this watershed rely on these critical habitats during some stage in their life cycle. It is important that these habitats and the species that depend upon them be incorporated into land use planning on both the landscape and local scale for conservation efforts to succeed. Some specific planning recommendations for species in stream and wetland habitats include:

- Continue participation in the North American Waterbird Plan, Bird Conservation Regional Plan, and other regional planning efforts. Focus on and refine recommendations for common loon and freshwater marsh nesting birds.

- Public and private conservation partners should coordinate the development of a monitoring and control plan for invasive exotic species in wetlands (i.e., purple loosestrife, *Phragmites australis*) and along streams (i.e., knotweed) including guidelines for various control methods (e.g., mechanical control, chemical control, biological control), and the compatibility of these control measures with SGCN life history and habitat requirements.

- Watershed management plans should consider the connectivity of aquatic systems, particularly with regard to the needs of migratory fish.

❖ Public and private partners should coordinate development of stream and watershed management plans, and/or local wetland conservation programs that specifically address aquatic biodiversity conservation. Measures to reduce water quality degradation, increase riparian habitat, and connections between aquatic and upland habitats should be included. These plans should incorporate the specific needs of:

- Freshwater Marsh Nesting birds - American bittern, least bittern, pied-billed grebe, king rail
- Freshwater Wetland Amphibians - Northern cricket frog, Fowler's toad
- Lake/River Reptiles - Eastern ribbon snake, wood turtle
- Stream Salamanders - long-tailed salamander
- Uncommon Turtles of Wetlands - Blanding's turtle, spotted turtle, bog turtle
- Vernal Pool Salamanders - blue spotted salamander, Jefferson salamander
- Odonates of Rivers/Streams - Common sanddragon, extra striped snaketail, pygmy snaketail, Septima's clubtail
- Odonates of Bogs/Fens/Ponds
- Odonates of Lakes/Ponds

❖ About 10% of the Upper Hudson Basin is grassland. Planning efforts should focus on both public and private lands and include the benefits of this habitat to grassland birds. Specifically:

- Complete the New York State Grassland Bird Management Plan currently being developed by DEC and others (State Wildlife Grant, 2003).

- Work with public land managers, including NRCS, USFWS, DEC and others, to better direct funding and other resources to the highest priority areas and projects for grassland habitat management. The ability to focus funding sources in core priority grasslands is critical.

❖ A statewide strategy on atmospheric deposition is needed, particularly for benefit of the Upper Hudson Basin where the issue originally came to national attention with the acidification of Adirondack lakes. The recently implemented Acid Deposition Reduction Program addresses threats of acidification and nitrogen compound deposition. An emerging and critical threat to much of New York's fish and wildlife, including SGCN, is mercury. While DEC already regulates mercury emissions originating in New York, a plan is needed for sustained and increased efforts in monitoring, and to lead a regional approach that galvanizes other states to address the threat of atmospheric deposition. An atmospheric deposition plan should specifically address monitoring of mercury deposition and presence in water bodies and wildlife (e.g., forest birds, mink, otter, etc.). A multi-state approach, like the existing Regional Greenhouse Gas Initiative should address the ecosystem effects of mercury deposition on SGCN.

❖ Develop land use planning guidelines for all SGCN species to encourage the incorporation of appropriate conservation measures by all land use planners.

Land Protection Recommendations

This category of actions encompasses a variety of acquisition mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of acquisition should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations. For many of the following species and species groups, the first step will be to gather accurate information on where species are located within the Basin, and the location and status of the critical habitats upon which they rely.

Acquisition should address reduction or protection from threats to the targeted species and their habitats. A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development (residential and commercial, roads, power lines), dredging, wetland draining, and the suppression of natural disturbance regimes such as fire and flood.

Forested Habitats

Since much of the forested habitat in the Adirondack Mountains is protected by the rules governing development in the Adirondack Park and by large tracts of public land administered by DEC and others, public and private entities interested in acquiring habitat for SGCN should direct their limited resources to the southern portion of the Upper Hudson Basin (from the Mohawk Valley south) where development pressures pose a relatively greater threat to species of concern and their habitats than in other parts of the Basin. This includes the Helderbergs, the eastern portion of the Catskill Mountains, the Shawangunk Ridge, Hudson River Valley, and the Taconics. Acquisition should focus on unprotected forest buffers around streams and wetlands supporting SGCN and large, intact forests that provide benefits to multiple SGCN. Specific species and groups are described below:

- Deciduous/Mixed Forest Breeding Birds - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. Target species include:

  - Cerulean Warbler - large, unfragmented forest tracts where available. Breeding Bird Atlas (BBA; 2000-04) data indicate concentrations in Orange, Putnam, Dutchess, and Ulster Counties, central Schoharie County, and southeast Albany County.
  - Red-headed Woodpecker - open deciduous woodlands where available. BBA (2000-04) data indicate concentrations in southern Ulster, northern Orange, and southwest Dutchess Counties. The previous BBA effort (1908-85) indicates several confirmed and probable breeding sites throughout the Mohawk Valley. Further investigations should occur to determine the value of acquiring habitat here.
  - Worm-eating Warbler - large, unfragmented forest tracts containing ravines and hillsides in thick deciduous woods where available. BBA (2000-04) data indicate that the range for this species in New York State is concentrated in the southern part of the Upper Hudson Basin - most of Orange and Ulster Counties east to the Hudson River, and Putnam, Dutchess, and Columbia Counties from the Hudson River east to the Taconic Highlands.

- Early Successional Forest/Shrubland Birds - Implement a Landowner Incentive Project for early successional birds for conserving and creating habitat for early successional forest/shrub birds. Target species include:
  - Golden-winged warbler - primarily second growth, but also brushy hillsides, old fields, and stream edges. Much of the focus on this species has centered on the possible negative consequences for golden-winged warblers when they interact with the more numerous blue-winged warblers (hybridization, competition). The results of the 2003 and 2004 State Wildlife Grant studies investigating this issue should guide where and when habitat acquisition and/or restoration activities occur for this species. BBA data (2000-04) indicate confirmed and probable breeding sites for golden-wings throughout the Basin, with concentrations in northwest Schoharie County/southern Montgomery County, southwest Ulster County/southeast Sullivan County, and Orange County.
  - Canada Warbler - deciduous woodlands and riparian thickets. BBA (2000-04) data indicate that this species is found from the Adirondack Park south through the Hudson River corridor, with many observations in the hills to the west (Helderbergs, Shawangunks) and east (Taconics) of the Hudson River.
  - Whip-poor-will - open woodlands, from moist lowland deciduous forests to montane forests and pine-oak woodlands. BBA data (200-04) indicate that the largest concentrations of this species are in Ulster County in the southern portion of the Basin, and Warren and Essex Counties in the northern portion of the Basin.

- Forest Breeding Raptors - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. Target species include:
  - Long-Eared Owl - coniferous and mixed coniferous-deciduous forests, especially near water. BBA (2000-04) data show breeding records for this species in Dutchess County in the southern part of the Basin, Schoharie, Albany, and Rensselaer Counties in the central part of the Basin, and Essex County in the northern part of the Basin.

- High-Altitude Conifer Forest Birds - the sole SGCN in this group is Bicknell's thrush. This relatively rare, forest interior species is found in high elevation habitats of the Adirondack and Catskill Mountains. Since most or all of the required spruce-fir stands on peaks of the Adirondacks and Catskills are in public ownership, acquisition should focus on the surrounding mosaic of northern hardwood forest types.

- Karner Blue Butterfly - this species is in the "forested habitat" category here, but it is reliant upon open habitats (containing its host plant, blue lupine) within a forested landscape, like that seen in the Glacial Lake Albany Recovery Unit. Those interesting in securing habitat for this species should acquire easements, where appropriate, to create habitat and to establish a buffer from human development in all Karner blue recovery units as described in the draft New York State Karner Blue Butterfly Recovery Plan. Along with the Recovery Plan, the results of the work funded under the 2003 and 2004 State Wildlife Grants should also be used to help guide where habitat protection efforts should take place within the Recovery Unit.

- Woodland/Grassland Snakes - many of the den sites for snakes of conservation concern are on private lands. Secure habitats critical to species survival by acquisition or easements, or by other land protection mechanisms. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target species include:

  - Timber rattlesnake - relatively undisturbed forested habitats (mixed coniferous/deciduous), and open woodlands with talus/rocky outcrops. New York State Herpetile Atlas (1990-99) data report the occurrence of this species in several blocks in Orange and Ulster Counties, as well as Schoharie, Montgomery, Columbia and Dutchess Counties.
  - Eastern hognose snake - barrens/woodlands with coniferous components, open uplands with sandy soils and/or dunes. New York State Herpetile Atlas (1990-99) data report the occurrence of this species in several blocks in Orange, Ulster, and Putnam Counties in the southern portion of the Basin, and Albany, Schenectady, and Saratoga Counties in the north-central portion of the Basin.

- Box Turtle - As one of the biggest threats to this species in this Basin is habitat loss and fragmentation of habitat by roads (resulting in a significant road mortality), it is important to secure large tracts of intact habitat relatively free from development. This can be done through the acquisition of easements or by other land protection mechanisms. New York State Herpetile Atlas (1990-99) data show records for this species throughout the Hudson River corridor from Saratoga County southwards, with the largest concentration of observations in Ulster, Dutchess, Putnam, and Orange Counties.

- Vernal Pool Salamanders - vernal pools, dotted across the forested landscape, form an extensive system of small, unregulated wetlands that provide critical wildlife habitat. Vernal pool salamanders use both forested and wetland habitat types –(i.e., vernal pools within forest stands and mineral soil wetlands). Securing habitats in large blocks that contain both forests and wetlands will be critical to the survival of this species group and many other SGCN. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help guide acquisition projects. Target vernal pool salamanders include:

  - Blue-spotted Salamander & Jefferson Salamander - New York State Herpetile Atlas (1990-99) data show records for these species primarily south of the Mohawk Valley, with concentrations in Schoharie and Albany Counties in the north, and Ulster, Dutchess, Orange, and Putnam Counties to the south.

FRESHWATER WETLANDS AND OTHER AQUATIC HABITATS

Aquatic habitats are scattered throughout the Upper Hudson Basin. Conservation partners interested in acquiring aquatic habitats should focus their resources on areas that support high biodiversity, provide habitat for one or more rare or declining species, are under immediate threat of development/conversion, or have some other unique ecological characteristics. An example of a rare ecotype within this Basin that faces multiple threats is the calcareous seepage wetland mosaic in the Taconics (southeastern portion of the watershed), which includes a variety of fens and seepage swamp communities. In addition, areas of existing or restorable emergent marsh habitat adjacent to state-owned emergent marshes should be acquired to create larger marsh complexes under state protection.

- Freshwater Marsh Nesting Birds - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. The results of the 2004 State Wildlife Grant work on marsh birds should help to guide acquisition projects. Target species include:
  - American Bittern - freshwater and brackish marshes with emergent vegetation. BBA (2000-04) data show concentrations of observations of this species in the Adirondacks with focus on Warren, Hamilton, and Essex Counties.
  - Least Bittern - freshwater wetlands with emergent vegetation. BBA (2000-04) data show concentrations of observations of this species closely tied to wetland habitats along the Hudson River, with additional observations in Albany and Warren Counties.
  - Pied-Billed Grebe - well vegetated lakes, ponds, and marshes. BBA (2000-04) observations for this species are spread throughout the Basin.

- Freshwater Wetland Amphibians - Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help to guide acquisition projects. Target species include:
  - Northern Cricket Frog - sunny, shallow ponds with abundant vegetation and/or slow-moving algae-filled water courses with sunny banks. The Hudson Highlands-Shawangunk region of New York State is the northern limit of this species range. During the New York State Herpetile Atlas (1990-99), this rare species was observed in only eight survey blocks statewide, almost all of which are within this Basin (Dutchess, Ulster, and Orange Counties).
  - Fowler's Toad - wetlands in both wooded and grassland landscapes. New York State Herpetile Atlas (1990-99) data show records for this species closely tied to wetland habitats along the Hudson River from Warren County southward.

- Uncommon Turtles of Wetlands - Secure habitats critical to species survival by acquisition of conservation easements for wetlands and adjacent uplands. The results of the 2003 and 2004 State Wildlife Grant work on high priority reptile and amphibian species should help to guide acquisition projects. Target species include:
  - Blanding's Turtle - shallow marshy waters and ponds. New York State Herpetile Atlas (1990-99) effort observed this species in only 24 survey blocks statewide, six of which are within this Basin - one in southwest Hamilton County and five in Dutchess County.
  - Bog Turtle - early successional wetlands such as wet meadows, calcareous fens dominated by sedges or sphagnum moss, and other tussock-forming herbaceous vegetation. In New York State, bog turtle populations are found primarily in a few key sites in Columbia, Dutchess, and Putnam Counties.

- Spotted Turtle - marshy meadows, small bogs and swamps. New York State Herpetile Atlas (1990-99) data show records for this species from Schenectady County southwards, with the concentration of the population in the Hudson River valley in Greene, Ulster, and Orange counties west of the Hudson River, and Columbia, Dutchess and Putnam counties east of the Hudson River.

RIVERS AND STREAMS

Secure habitats critical to species survival by fee acquisition or conservation easements for streams and adjacent uplands. SGCN that depend upon healthy riparian and floodplain habitats to maintain necessary channel condition include mollusks and brook trout. The wood turtle and eastern ribbonsnake require the availability of adjacent upland habitats for completion of their life cycle. Stream segments that contain large cobble bar habitat in the Esopus Creek and Hudson River are critical for riparian tiger beetles. Stream salamanders would benefit from acquisition of riparian buffers that stabilize banks and filter sediment from runoff, thus preventing sedimentation of breeding habitat. Acquisition should focus on riparian and floodplain forest, wetland, and meadow complexes that support the life cycle needs of SGCN and contribute to in-stream habitat quality (e.g., undercut banks, supply of coarse particulate organic matter, geomorphic structure, shading). Acquisition targets might include entire segments of stream, floodplain or shoreline that support high biodiversity, including rare or declining species or other important ecological characteristics.

GRASSLANDS

The lands owned by public agencies in the Basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially adjacent to existing protected grasslands. This will enable better management and protection of these habitats for grassland birds and barn owls. Acquisitions should reflect the recommendations of priority grassland focus areas being developed by the New York State Grassland Bird Management Plan (State Wildlife Grant, 2003). Acquisition of grasslands should focus on the needs of these critical species:

- Grassland Birds - Acquisitions focusing on grassland bird habitat should be directed toward protecting existing grasslands or acquiring and restoring grassland habitats within relatively close proximity to existing grasslands to avoid creating sink habitats. These efforts should focus on the regions within the basin with the highest concentrations of grasslands. (Figure 1).
- Barn Owl - Acquisitions for barn owls should concentrate on areas where they are already known to breed. BBA (2000-04) data indicate that this is in areas of south central Sullivan and northern Orange Counties and central Washington County. As more barn owl breeding sites are observed, this effort should be expanded.

Management and Restoration Recommendations

Successful management and restoration efforts will require large-scale cooperation among public and private stakeholders, where each organization contributes its strength to the management system. These contributions must range from coordination to data collection, implementation, and monitoring/evaluation so that habitat and species management goals can be achieved at the Basin level. DEC, the government entity tasked with conservation of the State's fish and wildlife resources, should take the lead in coordinating such an endeavor.

Vehicle Collisions

- Box Turtle - one of the biggest threats to this species in this Basin is habitat fragmentation by roads resulting in significant road mortality. Develop and implement mitigation strategies to manage adverse effects of habitat fragmentation including the establishment of safe travel corridors under roadways. The results of the 2003 State Wildlife Grant study on reducing turtle mortality during migration should be consulted when implementing this recommendation.

- Lake/river reptiles - manage the variety of adverse influences that might reduce lake/river habitat suitability for the eastern ribbonsnake and wood turtle, including excessive disturbance by watercraft and fishing practices which incidentally take lake/river reptiles in significant numbers.

- Uncommon turtles of wetlands - conduct a variety of habitat management activities where needed, including management of human access in order to preserve wetland suitability for Blanding's spotted, and bog turtles. Also, similar to box turtles, these species experience significant road mortality when migrating from over-wintering to egg-laying locations. Develop and implement mitigation measures to manage turtle population losses to vehicular road kill.

- Vernal pool salamanders - Develop and implement measures to manage reductions of wetland habitat quality caused by off road vehicles by restricting or prohibiting their use in sensitive habitats. High-priority species include blue-spotted and Jefferson salamanders.

- Riparian tiger beetles - suitable, large river cobble bar habitat in the Upper Hudson Basin may be of particular importance for the riparian tiger beetle, *Cicindela ancocisconensis* (Hudson River, Esopus Creek). Reduce or eliminate detrimental ATV use on cobble bars where this species occurs or could occur if such activity was lacking or reduced.

Forested Habitats

- Boreal forest birds - work with private landowners to implement land management strategies that favor spruce grouse, olive sided flycatcher, and other species dependent on early successional boreal forests. Within this basin this action should focus on high elevation areas of the Adirondack Mountains (portions of Essex and Hamilton counties). Explore creation of wildfire management guidelines for Forest Preserve Lands. Determine if these guidelines can be applied to other lands. If they can, work with public and private land managers to execute fire management for boreal forest bird species such as spruce grouse, olive sided flycatcher, and other species dependent on early successional boreal forests.

- Deciduous/mixed forest breeding birds - implement population control of whitetail deer in areas where deer populations are affecting forest regeneration and species composition, and where traditional hunting programs are unable to reduce the deer population to levels compatible with breeding bird population objectives. High priority species include cerulean warbler, worm-eating warbler, and red-headed woodpecker.

- Early successional forest/shrubland birds - increase the amount of early successional forest and shrub habitat on public and private land throughout the Basin through sound planned timber and abandoned agricultural field management. High priority species include golden-winged and blue-winged warblers, Canada warbler, whip-poor-will, and American woodcock. Maintain, restore, and enhance fire-adapted early successional ecosystems through the use of prescribed fire.

- Forest breeding raptors - maintain appropriate breeding habitat for long-eared owls around occupied nest sites.

- Box Turtle - manage vegetative succession by means of prescribed burns, herbicide applications, and/or by timber harvest, and evaluate the effectiveness of such measures in enhancing habitat suitability for the species.

- Karner blue butterfly - this species is in the “forested habitat” category here, but it is reliant upon open habitats (containing its host plant, blue lupine) within a forested landscape, like that seen in the Glacial Lake Albany Recovery Unit. To combat conversion of land for human uses and loss of habitat to succession, create new Karner blue habitat adjacent to existing habitat patches where possible. In addition, create dispersal corridors between population sites and to buffer areas against human encroachment. The results of the 2003 and 2004 State Wildlife grants studies should be applied to these management efforts (lupine restoration study, adaptive habitat management study).

Freshwater Wetlands

- Breeding waterfowl - install nest boxes to increase populations or productivity of common goldeneye in appropriate locations in the Adirondacks. Also, maintain or increase abundance and suitability of emergent marsh habitats for breeding American black ducks in the Adirondack region.

- Common loon - use artificial nesting platforms, where feasible and appropriate, to improve nesting success on lakes that lack natural islands and have poor shoreline nesting habitat, fluctuating water levels, or a history of low productivity. Where water-level control structures exist (typically on publicly owned lands), maintain constant water levels during peak nesting period except where it would be detrimental to species dependent upon water flows below the structure. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities. This should focus on nesting locations in the Adirondack Park.

- ❖ Freshwater marsh nesting birds - use incentive and cost-share programs to manage and restore marsh habitats on private lands. It is crucial to adapt wetland management practices throughout the Basin so they can simultaneously benefit waterfowl (blue-winged teal, American black duck), marsh birds (American and least bitterns, pied-billed grebe, king rail), and other water birds. Also, where water-level control structures exist (typically on publicly owned lands), maintain constant water levels during peak nesting period except where it would be detrimental to species dependent upon water flows below the structure. Where they do not exist, prohibit water extraction from critical nesting habitats for anthropogenic activities.

- ❖ Osprey - nest platforms should be maintained and new ones placed on nesting locations in the Adirondack Park.

- ❖ Freshwater wetland amphibians - manage the variety of factors that might be limiting wetland habitat suitability for high priority amphibian species (Northern cricket frog, Fowler's toad). As with marsh birds, use cost-share and incentive programs to manage and restore marsh habitats on private lands in the southern part of the Basin with the highest amphibian diversity and the direst threats (Ulster, Dutchess, Putnam, and Orange Counties).

- ❖ Lake/river reptiles - manage uplands adjacent to aquatic habitat in order to provide adequate and secure nesting habitat sites and to provide dispersal routes for migrating animals. High priority species include Eastern ribbonsnake and wood turtle.

- ❖ Uncommon turtles of wetlands - Develop and implement mitigation strategies to manage adverse effects of habitat fragmentation. This includes conducting a variety of habitat management activities where needed, including management of vegetation succession in order to preserve wetland suitability for Blanding's, bog, and spotted turtles. Management actions should focus on occupied (and adjacent) habitats in the southern portion of the Basin (wetlands and fens in the Hudson Highlands and Taconics in Columbia, Dutchess, Putnam, and Ulster counties).

- ❖ Identify suitable waters for management of Heritage brook trout strains such as Little Tupper, Windfall, and Horn Lake strains. If there are insufficient ponds in watersheds of origin for these Heritage strain fish, then expand populations into suitable waters within the same watershed to continue protection of the strain.

- ❖ Examine the use of and need for protective barriers on outlets of Heritage brook trout waters to prevent invasive species such as sea lamprey and other predatory fish.

- ❖ Reclaim degraded waters in the watersheds of origin of Heritage brook trout in order to restore populations of these fish to their historic range.

- ❖ Restore round whitefish to additional waters on public lands in the basin.

- Management activities should consider natural form and function as much as possible in order to maintain natural ranges of habitat disturbance. The Coastal Nonpoint Pollution Control Program (CZARA section 6217) provides a process for improving in-stream and riparian habitat, and water quality associated with maintenance and operation of existing modified channels. The management measures offered by this program and others can be used to maintain and improve in-stream habitat structure for SGCN.

Grasslands

- Grassland birds - restore habitat function and manipulate habitat structure and composition through mowing and prescribed fire. Most of the grasslands in the Upper Hudson Basin are in private ownership. Incentive and cost sharing programs are required if management of this habitat type is to be successful. Public and private agencies are going to have to work closely with private landowners to protect, restore and manage grassland habitats. As mentioned above for other habitat types, conservation partners should be cognizant of how a particular grassland fits in to the landscape (e.g., patch size and shape, distance to other grasslands and the quality of those grasslands, etc.), species and habitat diversity, the scope of the threats facing a particular grassland tract (e.g., development pressures), and logistics (e.g., funding, cooperating partners). Knowing this information will help to guide where and when management and/or restoration takes place. Finally, management and restoration actions should reflect the recommendations of priority grassland focus areas being developed by the New York State Grassland Bird Management Plan (State Wildlife Grant, 2003).

Invasive Species

- Reduce the spread and colonization of new sites by invasive exotic species (e.g., purple loosestrife), and where feasible, control invasive species which are known to have detrimental effects on wildlife through biological, chemical, or mechanical means. The location and method (biological vs. chemical vs. mechanical) will depend upon the exotic species being targeted, life history traits and management objectives for the SGCN to benefit from the action, scale of the infestation, and logistics (funding, cooperating partners, feasibility of using a particular method in a specific locale). The Nature Conservancy’s Adirondack Park Invasive Plant Program is currently working to control the spread of invasive plants in the Adirondacks.

Interspecific Interactions

- Common loon - reduce predator-caused breeding failure, where problematic, by increasing hunting or trapping opportunities. Evaluate the extent to which management actions can reduce nest and chick losses. This will depend upon the ability of people to access important loon habitats, many of which may be on private lands.

- Deciduous/Mixed Forest Breeding Birds – manipulate habitat structure and composition through restoration and/or management (e.g., forest patch size, shape) to reduce nest losses to predators. Evaluate the extent to which management actions can reduce nest and chick losses.

- Grassland Birds – manipulate habitat structure and composition through restoration and/or management (e.g., grassland patch size, shape) to reduce nest losses to predators. Evaluate the extent to which management actions can reduce nest and chick losses.

- Freshwater marsh nesting birds – reduce predator-caused breeding failure, where problematic, by increasing hunting or trapping opportunities and by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape). Evaluate the extent to which management actions can reduce nest and chick losses. This action may be most easily accomplished on publicly owned wetlands, but if successful, should be expanded to private lands throughout the Basin.

- Uncommon turtles of wetlands - reduce predator-caused breeding failure, where problematic, by manipulating habitat structure and composition through restoration and/or management (e.g., wetland size, shape). Evaluate the extent to which management actions can reduce egg losses. This action may be most easily accomplished on protected wetlands.

- Vernal pool salamanders – develop and implement measures to manage reductions of wetland habitat quality and increased predation on adults, young, and eggs caused by introductions of fish and other predatory species.

Water Quality Degradation

- Freshwater marsh nesting birds – improve the quality of existing wetlands by minimizing draw downs during peak nesting periods and by installing vegetated buffers between developed sites (housing, commercial, agriculture, etc.) and adjacent marsh habitats to minimize the effects of runoff from these sites.

- Freshwater wetland amphibians – Manage the variety of factors that might be limiting wetland habitat suitability for resident amphibian species including management of toxicants, adverse hydrological alterations, and anthropogenic inputs of sediments.

- Lake/river reptiles - Manage the variety of adverse influences that might reduce lake/river habitat suitability for reptiles of concern including management of toxicants and adverse hydrological alterations.

- Stream salamanders - undertake remedial actions as needed to restore habitat quality in degraded streams. During the New York State Herpetile Atlas Project (1990-99), the high priority species in this group, long-tailed salamander, was observed in only eight survey blocks statewide. Two of these were in this Basin in southern Sullivan and northern Orange counties. Stream restoration techniques for this species within this Basin should focus on these areas.

- ❖ Uncommon turtles of wetlands – Conduct a variety of habitat management activities where needed, including maintenance of hydrological regimes and curtailment of contaminant inputs in order to preserve wetland suitability for these species.

Population Restoration

- ❖ Freshwater wetland amphibians – employ restoration techniques for the Northern cricket frog at selected sites as needed, including captive breeding and repatriation/relocation strategies.

- ❖ Game species of concern – Recent records of the New England cottontail are from only a small portion of its historic range. If significant areas of suitable or potentially suitable habitat are identified, reintroduction of the species may be possible to larger portions of its historic range.

- ❖ Karner blue butterfly - Where natural colonization will not suffice, reintroduce Karner blue to new habitat areas made in the Glacial Lake Albany Recovery Units.

- ❖ Round whitefish – pending the results of the 2003 State Wildlife Grant study on round whitefish in the Adirondacks, enhance remnant stocks of this species through artificial propagation to be sure that there is at least one water in the Mohawk sub-drainage with this species.

- ❖ Uncommon turtles of wetlands – employ restoration techniques for bog turtle and Blanding's turtle at selected sites as needed, including captive breeding, head starting, nest protection, and repatriation/relocation strategies.

- ❖ Woodland/grassland snakes - Employ restoration techniques for timber rattlesnakes at selected sites as needed including head starting and repatriation/relocation strategies.

Adaptive Management

The ability to measure the success or failure of conservation actions requires information feedback loops that allow managers to know if actions received the desired results and to adapt under changing circumstances. Adaptive management requires an effective evaluation program that will over time help to inform us if our collective conservation efforts are succeeding. Any evaluation strategy should be founded in the principles of conservation biology and include direct assessment of the species of interest and their habitats. We should also know if management actions have successfully addressed threats to SGCN and their habitats. A monitoring plan should be developed for the Upper Hudson Basin that utilizes measures calibrated to the region and that incorporates data collected under the SWG program and other programs within DEC and by conservation partners, where possible.

Regulatory and Legislative Recommendations

Most of the regulatory and legislative proposals below are suggested at the statewide level, however New York's home rule law gives local governments the opportunity to modify or create laws and regulations to enhance local protection of SGCN. For example, local zoning and land use policies can be used to discourage sprawl and habitat fragmentation, an issue of particular importance in large portions of this basin (e.g., Putnam, Orange, and Dutchess Counties in the south and Saratoga County in the north).

REGULATORY PROPOSALS RELATED TO THE PREVENTION OF HABITAT LOSS AND DEGRADATION INCLUDE:

- Pursue protection of wetlands less than 12.4 acres that provide habitat for SGCN under the 'unusual local significance' provisions of Article 24 of the Environmental Conservation Law (ECL) and enhance protection of upland buffer adjoining these wetlands. Include review of all wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh-nesting birds, regardless of wetland size. Priority species that will benefit from this action include freshwater wetland amphibians (i.e., northern cricket frog, Fowler's toad), uncommon turtles of wetlands (i.e., Blanding's, spotted, and bog turtles), vernal pool salamanders (i.e., Jefferson and blue-spotted salamanders), and pied-billed grebe, king rail, least bittern, and American bittern.

- Identify and protect known common loon nesting areas with focus on the Adirondacks. On most public lands, however, directing human traffic and use away from sensitive loon habitats by redirecting trails may be more effective than "advertising" the location of these areas with prohibitive signs.

- Provide regulatory review and comment on commercial, residential, and other development plans to ensure that any proposed actions would not be detrimental to occupied peregrine falcon habitat. Breeding bird atlas data indicate that the majority of peregrine falcon nesting activity occurs along the Hudson River corridor from Westchester County north through the Adirondack Park. Local and State agencies concerned with planning and development should be aware of this when considering development plans in this basin.

- Protect existing Karner blue butterfly sites and potential habitat areas through regulatory review of development projects in the Glacial Lake Albany Recovery Unit (Albany, Schenectady, Saratoga, and Warren counties).

- Implement the regulatory recommendations of the Regional Greenhouse Gas Initiative and Acid Deposition Reduction Program.

REGULATORY PROPOSALS RELATED TO HUMAN-WILDLIFE INTERACTIONS INCLUDE:

- Establish 150-meter buffer zones on either side of mainland common loon nests. Shoreline areas adjacent to known nursery sites should be protected, and 150-meter buffers established in order to reduce human disturbance near nest sites and nursery areas during the nesting and chick rearing period. Through State regulation or local ordinance, limit boat engine horsepower and establish speed limits on smaller breeding lakes or in designated areas of larger lakes.

- The best strategy for minimizing illegal collection of herpetofauna of conservation concern may be to designate them as protected species. Adopt into New York's Environmental Conservation Law provisions that designate the following as protected game species:

  - Freshwater Wetland Amphibians - four toed salamander, Fowler's toad
  - Lake/River Reptiles - Eastern ribbonsnake, Northern map turtle, spiny softshell
  - Stream Salamanders - long-tailed salamander, Northern red salamander
  - Uncommon Turtles of Wetlands - Blanding's turtle, Spotted turtle, Stinkpot
  - Vernal Pool Salamanders - blue spotted salamander, Jefferson salamander, marbled salamander
  - Woodland/Grassland Snakes - Black ratsnake, Eastern hognose snake, Northern black racer, Northern copperhead, Smooth greensnake, Timber rattlesnake, Worm snake

- Through State regulation or local ordinance protect riparian tiger beetles (*Cicindela ancocisconensis*) and their habitat by reducing or eliminating detrimental all-terrain vehicle (ATV) use on cobble bars where these species occur or could occur if such activity was prohibited (suitable, large river cobble bar habitat like that found in portions of the Hudson River and Esopus Creek).

REGULATORY PROPOSALS RELATED TO PROTECTION OF WATER QUALITY INCLUDE:

- Maintain water quality in marshes by minimizing the use of pesticides on public lands. This would prevent the reduction of insect populations and the contamination of wetlands. Species that would benefit from this action include freshwater wetland amphibians (i.e., northern cricket frog, Fowler's toad), freshwater marsh nesting birds (i.e., pied-billed grebe, king rail, least bittern, and American bittern), and odonates of bogs, fens, and ponds.

- Establish water use standards, applicable to both significant water withdrawals and reservoir operations, that explicitly protect in stream flows and thus benefit both water quality and SGCN, particularly mollusk (i.e., alewife floater, eastern pondmussel, elktoe, yellow lamp mussel), odonates of rivers/streams, and marine and freshwater fish (i.e., American eel). In stream flow protections should be designed to maintain the natural variability of stream flows to the greatest extent possible. A statewide commitment to natural flow regimes will particularly benefit the Upper Hudson Basin, where rapid development is changing watershed hydrology and altering habitat quality for all of the SGCN that utilize aquatic habitats.

- For many SGCN, particularly invertebrate species, there is a lack of information on abundance, distribution, and population trends; however, preliminary data suggest that these species may warrant protective status. It is important to complete more thorough investigations into the population status, trends, and threats to these species to determine if regulatory action is needed.

- A comprehensive statewide inventory of odonates (dragonflies and damselflies) was selected for State Wildlife Grant funding in 2003. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state. Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. High priority species include:

    - Common sanddragon
    - Extra striped snaketail
    - Pygmy snaketail
    - Septima's clubtail

- The 2004 State Wildlife Grant will provide for status assessments for nine species of tiger beetles in New York State that will clarify the need for conservation actions in order to maintain these species. Nearly all of the species of concern are found in habitats that have been heavily affected by development or other deleterious factors. Recommendations for official state endangered, threatened, or special concern listing are an anticipated result of the statewide inventory.

Information Dissemination Recommendations

The sharing of information between natural resource managers and public and private groups is one of the most powerful tools in wildlife conservation. It allows people to make informed decisions about activities that may help or harm SGCN. For example, land use objectives may conflict with the needs of wildlife. By providing accurate, complete information to stakeholders on a species (or a species group) and its critical habitats, we can begin to institute land use practices that have ecological objectives that are compatible with traditional economic and social objectives.

Information dissemination may take many forms including education and outreach programs, development of fact sheets and maps, web site design and delivery, development and dissemination of best management practices, and technical guidance for land managers.

Human Behavior That Directly Affects Wildlife

- To reduce the detrimental effects of human disturbance on SGCN, develop signs and/or displays informing the public of the presence of these species, their respective threats and critical conservation issues, and the need for protection, and post where appropriate.

- Improve public understanding of SGCN conservation issues, including the effect of human disturbance. Post interpretive signs at public access points,. Produce and distribute informational brochures, posters, press releases and other educational materials. Provide educational programs to schools, lake associations and other groups.

- Provide technical guidance to state and private entities planning the siting and installation of tall structures (e.g., wind turbines, communications towers, and power lines) that are likely to adversely effect populations of migrating birds and bats. USFWS and others are currently investigating the effects of these types of structures on wildlife. Final guidelines developed by USFWS should be consulted when considering the placement and installation of wind towers, cell towers, etc. In addition, a pilot study funded by the 2004 State Wildlife Program will focus on landscape scale pathways of migratory birds and bats. This study currently focuses on western and central New York State, but when completed, could be expanded throughout the State. Ultimately, when key migratory pathways are discovered, this information should be disseminated to State and private planning groups and incorporated into the siting and installation of tall structures. Species of Greatest Conservation need that will benefit from this action include various migratory birds (early successional forest/shrubland birds, deciduous forest birds) and bats (tree bats, Indiana bat).

- Enhance public education to limit killing, collection/translocation, and the (illegal) sale of herpetofauna in the pet trade. High priority species include:
  - Box Turtle
  - Uncommon Turtles of Wetlands – Bog turtle, Blanding's turtle, Spotted turtle, Stinkpot

- Woodland/Grassland Snakes - black ratsnake, Eastern hognose snake, Northern black racer, Northern copperhead, smooth greensnake, timber rattlesnake, worm snake

❖ Public misconceptions about reptiles, particularly snakes, may drive the killing and/or collection of these animals. Develop an educational campaign about the ecological benefits of snakes in an effort to encourage the public to abandon misconceptions about the menace/threat of woodland/grassland snakes. This could take the form of fact sheets, web-based educational modules geared to both adults and children, and popular magazine articles (e.g., DEC's *Conservationist* magazine). High priority species include black ratsnake, Eastern hognose snake, Northern black racer, Northern copperhead, smooth greensnake, timber rattlesnake, and worm snake.

Habitat Loss and Fragmentation

❖ In an effort to reduce habitat loss, develop a series of geographic information system (GIS) based maps and guides that will help to provide the public with the knowledge to appreciate and understand species of greatest conservation need and their habitats. The interactive maps embedded in appropriate sections of text, would focus on the fish, wildlife and natural resources associated with the diverse landscapes and water bodies of the Upper Hudson Basin and the opportunities to observe and learn about them at the network of public lands owned and managed for natural resource conservation. Information on the natural history and ecology of SGCN and on management concerns for these species and their habitats should be included along with an efficient means to identify specific lands where New York State residents could participate in wildlife conservation opportunities.

❖ Municipalities of the Upper Hudson Basin require technical assistance and outreach if they are to successfully interpret and use state wildlife information. This assistance may come in the form of training programs, fact sheets, maps, workshops, field identification experience, short-courses, and access to information on model standards, ordinances, curricula, and other types of local programs. Public-private partnerships have been highly successful in implementing outreach and technical assistance to Hudson Valley municipalities. The first ever inter-municipal agreement focused on biodiversity conservation in New York State was recently approved by local governments in Westchester County. The DEC Hudson River Estuary Program's biodiversity outreach and technical assistance program should serve as a model for other regions of the state and be expanded and applied to the entire Upper Hudson Basin.

❖ A key component to conserving biodiversity in the Upper Hudson Basin is the sound management of natural resources on state-owned public lands. New York State owns a significant amount of land in the basin and has the authority to make land-use decisions that could potentially influence populations of SGCN present on these lands. These lands are especially important because they represent areas where management activities can be planned and implemented to meet regional conservation objectives. Maps, reports, and guides should be prepared to transfer information and guide public land managers in preparing broad-based management plans that will consider all the biological resources of a land unit and its regional contribution to biodiversity conservation.

- Public misconceptions about agricultural practices may result in a homogenous agricultural landscape with relatively little structural and vegetative species diversity. It is important to educate the public about the benefits and need for early successional old field and forest management and restoration, including the development of multiple seral stages across an agricultural landscape. This educational program should focus on both public and private lands and include the benefits of these habitats to early successional forest/shrubland birds such as golden-winged warbler, blue-winged warbler, Canada warbler, whip-poor-will, and American woodcock.

- Forests in New York are now predominantly even-aged northern hardwoods. Public reluctance to practice forestry, coupled with the absence of natural disturbances, may result in a homogenous forested landscape with relatively little structural and vegetative species diversity. It is important to educate the public about the benefits and need for early and late successional forest management and restoration including the development of coarse woody debris, standing dead wood, structural variability, and multiple seral stages across the forested landscape. This educational program would focus on both public and private lands and include the benefits of this habitat to deciduous/mixed forest breeding birds, forest breeding raptors, vernal pool salamanders, odonates of rivers/streams, tree bats, Indiana bats, and odonates of small forest streams.

- Provide information and technical guidance to utilities agencies to manage rights-of-way in a manner that will provide maximum benefit to early successional forest/shrubland birds such as those mentioned above.

- Rivers, streams, and associated wetland habitats can suffer significant modification and degradation due to altered watershed hydrology. Water use decision makers and managers should receive information and education regarding surface and ground water interactions and effects caused by hydrologic modification. Training that addresses the effects of altered hydrology on the structure, dynamics, connectivity, and quality of aquatic habitats will benefit lake/river reptiles, stream salamanders, odonates of rivers/streams, uncommon turtles of wetlands, riparian tiger beetles, and freshwater bivalves .

- Public agencies should make an effort to contact all landowners with threatened and endangered species on their property to alert them to the presence and legal protection of the site and how to co-exist with the species. Parties interested in the conservation of SGCN should help to develop a network of volunteers to "adopt" sites for management and/or assist in monitoring activities. Finally, State agencies and their private conservation partners should develop an outreach effort to municipalities to increase the effectiveness of project review in terms of protection and enhancement of sites and to further the overall recovery strategies for the species.

AGRICULTURAL AND SILVICULTURAL PRACTICES

- ❖ Promote the establishment of buffer areas around agricultural fields and developments adjacent to marsh habitats. Species that would benefit from this action include freshwater wetland amphibians (i.e., northern cricket frog, Fowler's toad), freshwater marsh nesting birds (i.e., pied-billed grebe, king rail, least bittern, and American bittern), and odonates of bogs, fens, and ponds.

- ❖ There are several SGCN that reside in forested habitats. When selecting a forest management regime (e.g., light thinning, partial harvest, clear cut, etc.) it may be difficult for public and private forest managers to coordinate the wide array of habitat needs of these species with their timber management goals. It is important that informational materials be developed for forest managers that explain the habitat needs of species that rely on various forested habitats (i.e., varying seral stages, vertical structure, tree and shrub species composition, etc.) and how to accommodate SGCN with seemingly competing habitat requirements. This information should then be available to land management partners developing/modifying best management practices (BMPs) in an effort to minimize the potential negative effects of traditional forestry practices on wildlife. This should be accomplished for the following high-priority species:

    - Deciduous/Mixed Forest Breeding Birds - cerulean warbler, red-headed woodpecker, worm-eating warbler
    - Forest Breeding Raptors - long-eared owl
    - Stream Salamanders - long-tailed salamander
    - Vernal Pool Salamanders - blue-spotted salamander, Jefferson=s salamander
    - Woodland Snakes - Eastern hognose snake, timber rattlesnake
    - Tree Bats - Eastern red bat, hoary bat, silver-haired bat

- ❖ Provide information to farmers and grassland owners about the benefits of grasslands, threats to this habitat type, and species of conservation concern that use grasslands. Furthermore, provide information and technical guidance on how to incorporate wildlife management objectives into farming practices to maximize the benefits for wildlife (e.g., timing and frequency of mowing/haying, use of prescribed fire, integrated pest management, etc.) while still allowing farmers to accomplish their harvest goals.

Incentives-Disincentives Recommendations

An incentive program geared towards private landowners will be a key first step in engaging the public about the importance of their lands to SGCN. So much of the critical habitats for these species exists on private lands that landowner cooperation will be the ultimate deciding factor on whether species declines can be halted. Their cooperation at the level needed for meaningful change will probably hinge on some form of enrollment process and financial and/or logistical support similar to that used in Farm Bill programs coordinated by USDA and NRCS, USFWS, DEC, and various conservation programs administered by non-governmental organizations (e.g., local land trusts, The Nature Conservancy, Ducks Unlimited, Inc.).

❖ Cooperate with NYS farmers and grassland owners to establish the best possible nesting and foraging opportunities for grassland birds (i.e., northern harrier, sedge wren, upland sandpiper) and barn owls. Incentives focusing on grassland bird habitat should be directed toward protecting existing grasslands or restoring grassland habitats within relatively close proximity to existing grasslands to avoid creating sink habitats.

❖ Enroll partners in Karner blue butterfly management within the Glacial Lake Albany Recovery Unit via the Landowner Incentive Program.

❖ Where appropriate, assist private entities to protect and manage land for moth protection and conservation, particularly coastal barrens buckmoth.

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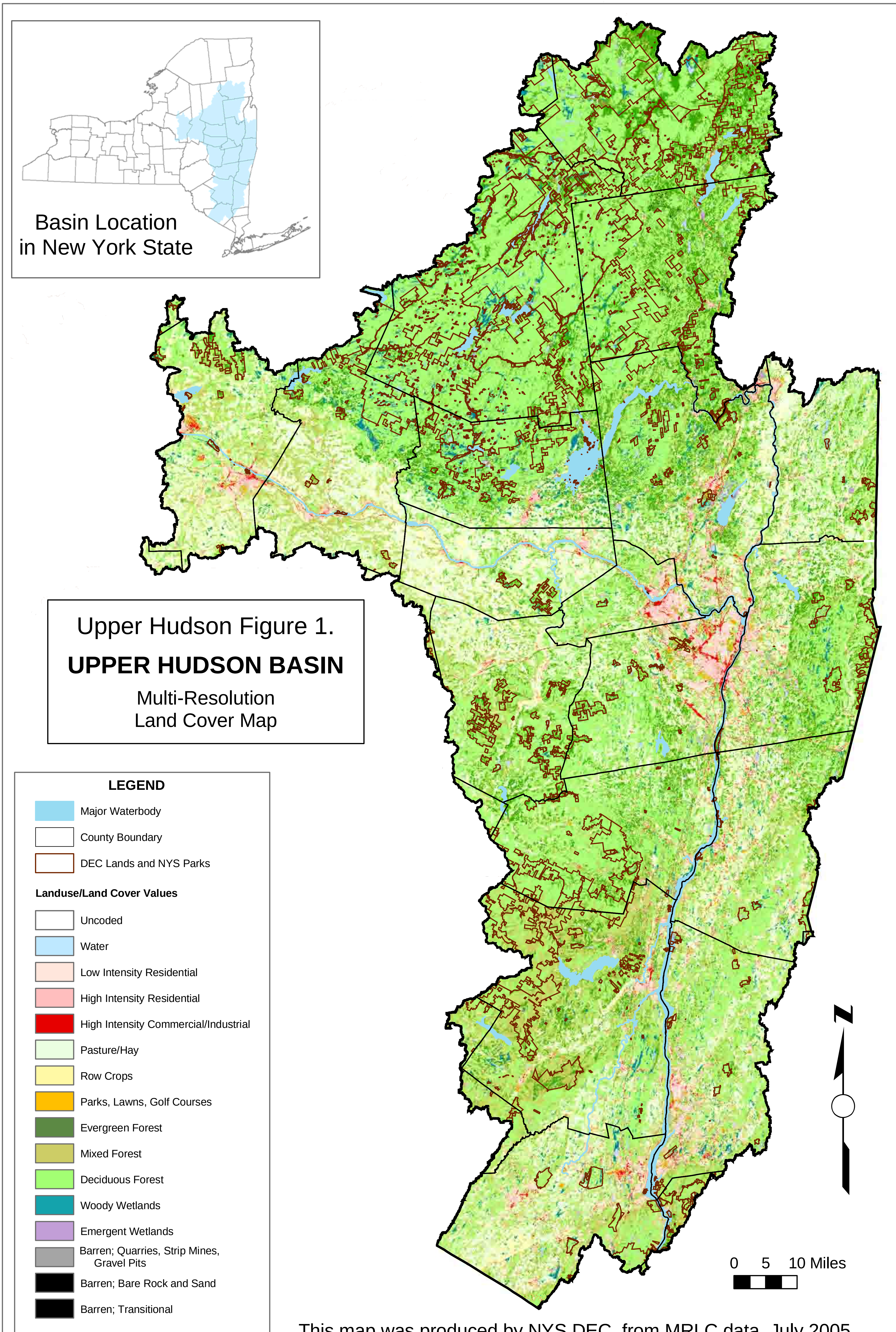
Tables and Figures

Tables

Figures


Basin Location
in New York State
Upper Hudson Figure 1.
UPPER HUDSON BASIN
Multi-Resolution
Land Cover Map
LEGEND
Major Waterbody
County Boundary
DEC Lands and NYS Parks
Landuse/Land Cover Values
Uncoded
Water
Low Intensity Residential
High Intensity Residential
High Intensity Commercial/Industrial
Pasture/Hay
Row Crops
Parks, Lawns, Golf Courses
Evergreen Forest
Mixed Forest
Deciduous Forest
Woody Wetlands
Emergent Wetlands
Barren; Quarries, Strip Mines, Gravel Pits
Barren; Bare Rock and Sand
Barren; Transitional
N
0 5 10 Miles
This map was produced by NYS DEC, from MRLC data, July 2005.

Upper Hudson Table 1. Multi-Resolution Land Classification (MRLC) land cover classifications and corresponding percent cover in the Upper Hudson River Basin.

Classification	% Cover
Deciduous Forest	40.91
Mixed Forest	19.17
Evergreen Forest	11.07
Pasture/Hay	10.71
Row Crops	7.08
Low Intensity Residential	2.96
Water	2.75
Wooded Wetlands	2.22
High Intensity Commercial/Industrial	1.21
High Intensity Residential	0.91
Parks, Lawns, Golf Courses	0.65
Emergent Wetlands	0.26
Barren; Quarries, Strip Mines, Gravel Pits	0.10

Upper Hudson River Table 2. Species of Greatest Conservation Need currently occurring in the Upper Hudson River Basin (n=106). Species are sorted alphabetically by taxonomic group, species group, and then species common name. The Species Group designation indicates which Species Group Report in the appendix will contain the full information about the species. The Stability of this basin's population is also indicated for each species.

Taxa Group	Species Group	Species	Stability
Bird	Bald Eagle	Bald eagle	Increasing
Bird	Barn owl	Barn owl	Unknown
Bird	Boreal forest birds	Cape May warbler	Unknown
Bird	Boreal forest birds	Olive-sided flycatcher	Decreasing
Bird	Boreal forest birds	Rusty blackbird	Unknown
Bird	Boreal forest birds	Spruce grouse	Decreasing
Bird	Boreal forest birds	Tennessee warbler	Unknown
Bird	Boreal forest birds	Three-toed woodpecker	Unknown
Bird	Breeding waterfowl	American black duck	Decreasing
Bird	Breeding waterfowl	Blue-winged teal	Decreasing
Bird	Common loon	Common loon	Increasing
Bird	Common nighthawk	Common nighthawk	Decreasing
Bird	Deciduous/mixed forest breeding birds	Black-throated blue warbler	Stable
Bird	Deciduous/mixed forest breeding birds	Cerulean warbler	Increasing
Bird	Deciduous/mixed forest breeding birds	Louisiana waterthrush	Unknown
Bird	Deciduous/mixed forest breeding birds	Red-headed woodpecker	Decreasing
Bird	Deciduous/mixed forest breeding birds	Scarlet tanager	Decreasing
Bird	Deciduous/mixed forest breeding birds	Wood thrush	Decreasing
Bird	Deciduous/mixed forest breeding birds	Worm-eating warbler	Decreasing
Bird	Early successional forest/shrubland birds	American woodcock	Decreasing
Bird	Early successional forest/shrubland birds	Black-billed cuckoo	Decreasing
Bird	Early successional forest/shrubland birds	Blue-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Brown thrasher	Decreasing
Bird	Early successional forest/shrubland birds	Canada warbler	Decreasing
Bird	Early successional forest/shrubland birds	Golden-winged warbler	Decreasing
Bird	Early successional forest/shrubland birds	Prairie warbler	Increasing
Bird	Early successional forest/shrubland birds	Ruffed grouse	Decreasing
Bird	Early successional forest/shrubland birds	Whip-poor-will	Decreasing
Bird	Early successional forest/shrubland birds	Willow flycatcher	Decreasing
Bird	Forest breeding raptors	Cooper's hawk	Increasing
Bird	Forest breeding raptors	Golden eagle	Decreasing
Bird	Forest breeding raptors	Long-eared owl	Unknown
Bird	Forest breeding raptors	Northern goshawk	Increasing
Bird	Forest breeding raptors	Red-shouldered hawk	Increasing
Bird	Forest breeding raptors	Sharp-shinned hawk	Increasing
Bird	Freshwater marsh nesting birds	American bittern	Decreasing
Bird	Freshwater marsh nesting birds	King rail	Decreasing
Bird	Freshwater marsh nesting birds	Least bittern	Stable
Bird	Freshwater marsh nesting birds	Pied-billed grebe	Decreasing
Bird	Freshwater marsh nesting birds	Yellow rail	Unknown
Bird	Grassland birds	Bobolink	Decreasing
Bird	Grassland birds	Eastern meadowlark	Decreasing
Bird	Grassland birds	Grasshopper sparrow	Decreasing
Bird	Grassland birds	Horned lark	Decreasing
Bird	Grassland birds	Northern harrier	Unknown
Bird	Grassland birds	Sedge wren	Unknown
Bird	Grassland birds	Upland sandpiper	Decreasing
Bird	Grassland birds	Vesper sparrow	Decreasing
Bird	High Altitude Conifer Forest Birds	Bicknell's thrush	Unknown
Bird	Osprey	Osprey	Stable
Bird	Peregrine falcon	Peregrine falcon	Increasing
Bird	Transient shorebirds	Buff-breasted sandpiper	Unknown
Crustacea/Meristomata	Blue crab	Blue crab	Unknown
Freshwater fish	Blackchin shiner	Blackchin shiner	Unknown
Freshwater fish	Brook trout, Heritage strains	Brook trout, Heritage strains	Stable
Freshwater fish	Comely shiner	Comely shiner	Stable
Freshwater fish	Round whitefish	Round whitefish	Decreasing
Herpetofauna	Box Turtle	Eastern box turtle	Decreasing
Herpetofauna	Eastern Spadefoot Toad	Eastern spadefoot	Unknown
Herpetofauna	Freshwater wetland amphibians	Four-toed salamander	Unknown
Herpetofauna	Freshwater wetland amphibians	Fowler's toad	Decreasing
Herpetofauna	Freshwater wetland amphibians	Northern cricket frog	Decreasing
Herpetofauna	Lake/river reptiles	Eastern ribbonsnake	Unknown
Herpetofauna	Lake/river reptiles	Northern map turtle	Unknown
Herpetofauna	Lake/river reptiles	Spiny softshell	Unknown
Herpetofauna	Lake/river reptiles	Wood turtle	Unknown
Herpetofauna	Lizards	Common five-lined skink	Unknown

Upper Hudson River Table 2. (continued)

Taxa Group	Species Group	Species	Stability
Herpetofauna	Snapping Turtle	Snapping turtle	Unknown
Herpetofauna	Stream salamanders	Longtail salamander	Decreasing
Herpetofauna	Stream salamanders	Northern red salamander	Unknown
Herpetofauna	Uncommon turtles of wetlands	Blanding's turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Bog turtle	Decreasing
Herpetofauna	Uncommon turtles of wetlands	Spotted turtle	Unknown
Herpetofauna	Uncommon turtles of wetlands	Stinkpot	Unknown
Herpetofauna	Vernal pool salamanders	Blue-spotted salamander	Unknown
Herpetofauna	Vernal pool salamanders	Jefferson salamander	Unknown
Herpetofauna	Vernal pool salamanders	Marbled salamander	Decreasing
Herpetofauna	Woodland/grassland snakes	Black ratsnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Eastern hognose snake	Decreasing
Herpetofauna	Woodland/grassland snakes	Northern black racer	Decreasing
Herpetofauna	Woodland/grassland snakes	Northern copperhead	Unknown
Herpetofauna	Woodland/grassland snakes	Smooth greensnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Timber rattlesnake	Decreasing
Herpetofauna	Woodland/grassland snakes	Worm snake	Decreasing
Insect	Barrens buck moth	Barrens buck moth	Unknown
Insect	Karner blue butterfly	Karner blue	Decreasing
Insect	Odonates of bogs/fens/ponds	Black meadowhawk	Unknown
Insect	Odonates of bogs/fens/ponds	Ebony boghaunter	Unknown
Insect	Odonates of bogs/fens/ponds	Forcipate emerald	Unknown
Insect	Odonates of bogs/fens/ponds	Incurvate emerald	Unknown
Insect	Odonates of bogs/fens/ponds	Taper-tailed darner	Unknown
Insect	Odonates of lakes/ponds	Comet darner	Unknown
Insect	Odonates of lakes/ponds	Lake emerald	Unknown
Insect	Odonates of lakes/ponds	New England bluet	Unknown
Insect	Odonates of lakes/ponds	Spatterdock darner	Unknown
Insect	Odonates of rivers/streams	American rubyspot	Unknown
Insect	Odonates of rivers/streams	Blue-tipped dancer	Unknown
Insect	Odonates of rivers/streams	Brook snaketail	Unknown
Insect	Odonates of rivers/streams	Common sanddragon	Unknown
Insect	Odonates of rivers/streams	Extra-striped snaketail	Unknown
Insect	Odonates of rivers/streams	Midland clubtail	Unknown
Insect	Odonates of rivers/streams	Pygmy snaketail	Unknown
Insect	Odonates of rivers/streams	Rapids clubtail	Unknown
Insect	Odonates of rivers/streams	Russet-tipped clubtail	Unknown
Insect	Odonates of rivers/streams	Septima's clubtail	Unknown
Insect	Odonates of seeps/rivulets	Arrowhead spiketail	Unknown
Insect	Odonates of seeps/rivulets	Tiger spiketail	Unknown
Insect	Odonates of small forest streams	Mocha emerald	Unknown
Insect	Odonates of small forest streams	Ocellated emerald	Unknown
Insect	Other butterflies	Brazilian skipper	Unknown
Insect	Other butterflies	Checkered white	Decreasing
Insect	Other butterflies	Frosted elfin	Decreasing
Insect	Other butterflies	Henry's elfin	Unknown
Insect	Other butterflies	Mottled duskywing	Decreasing
Insect	Other butterflies	Northern metalmark	Decreasing
Insect	Other butterflies	Northern oak hairstreak	Stable
Insect	Other butterflies	Persius duskywing	Unknown
Insect	Other butterflies	Regal fritillary	Unknown
Insect	Other butterflies	Silvery blue	Decreasing
Insect	Other butterflies	Tawny crescent	Decreasing
Insect	Other moths	*Semiothisa banksianae*	Unknown
Insect	Other moths	*Apamea inordinata*	Unknown
Insect	Other moths	*Phoberia orthosioides*	Unknown
Insect	Other moths	Acadian swordgrass moth	Unknown
Insect	Other moths	Coastal barrens buckmoth	Unknown
Insect	Other moths	Golden aster flower moth	Unknown
Insect	Other moths	Pine barrens zanclognatha	Unknown
Insect	Other moths	Pine devil	Unknown
Insect	Pine barrens tiger beetles	*Cicindela patruela*	Decreasing
Insect	Riparian tiger beetles	*Cicindela ancocisconensis*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Eurylophella bicoloroides*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Epeorus suffusus*	Unknown
Insect	Stoneflies/Mayflies of lotic waters	*Heptagenia culacantha*	Unknown

Upper Hudson River Table 2. (continued)

Taxa Group	Species Group	Species	Stability
Insect	Stoneflies/Mayflies of lotic waters	*Brachycercus maculatus*	Unknown
Insect	Tomah mayfly	Tomah mayfly	Unknown
Mammal	Furbearers	American marten	Unknown
Mammal	Furbearers	River otter	Stable
Mammal	Game species of concern	New England cottontail	Decreasing
Mammal	Indiana Bat	Indiana bat	Increasing
Mammal	Tree bats	Eastern red bat	Unknown
Mammal	Tree bats	Hoary bat	Unknown
Mammal	Tree bats	Silver-haired bat	Unknown
Marine fish	American eel	American eel	Unknown
Marine fish	American shad	American shad	Decreasing
Marine fish	Atlantic sturgeon	Atlantic sturgeon	Unknown
Marine fish	Alewife	Alewife	Decreasing
Marine fish	Blueback herring	Blueback herring	Unknown
Marine fish	Estuarine associates of SAV	Common pipefish	Unknown
Marine fish	Estuarine associates of SAV	Threespine stickleback	Unknown
Marine fish	Estuarine associates of SAV	Fourspine stickleback	Uknown
Marine fish	Rainbow smelt	Rainbow smelt	Decreasing
Marine fish	Shortnose sturgeon	Shortnose sturgeon	Stable
Marine fish	Tomcod	Atlantic tomcod	Unknown
Mollusk	Freshwater bivalves	Alewife floater	Decreasing
Mollusk	Freshwater bivalves	Eastern pearlshell	Unknown
Mollusk	Freshwater bivalves	Eastern pondmussel	Unknown
Mollusk	Freshwater bivalves	Elktoe	Unknown
Mollusk	Freshwater bivalves	Yellow lamp mussel	Unknown

Upper Hudson River Table 3. Upper Hudson River species diversity relative to the total number of SGCN statewide.

Taxa Group	# Species Groups in the Basin	# Species in the Basin	Total # SGCN Statewide	% of Total SGCN for this Group
BIRDS	**15**	**52**	**118**	**44.1**
Bald Eagle		1		
Barn Owl		1		
Boreal Forest Birds		6	7	85.7
Breeding Waterfowl		2	4	50.0
Common Loon		1		
Common Nighthawk		1		
Deciduous/Mixed Forest Breeding Birds		7	9	77.8
Early Successional Forest Breeding Birds		10	12	83.3
Forest Breeding Raptors		6	6	100.0
Freshwater Marsh Nesting Birds		5	6	83.3
Grassland Birds		8	11	72.7
High-Altitude Conifer Forest Birds		1	1	100.0
Osprey		1		
Peregrine Falcon		1		
Transient Shorebirds		1	14	7.1
CRUSTACEA	**1**	**1**	**7**	**14.3**
Blue Crab		1		
FRESHWATER FISH	**4**	**4**	**40**	**10.0**
Blackchin Shiner		1		
Heritage-Strain Brook Trout		1		
Comely Shiner		1		
Round Whitefish		1		
HERPETOFAUNA	**10**	**27**	**44**	**61.4**
Box Turtle		1		
Eastern Spadefoot Toad		1		
Freshwater Wetland Amphibian		3	5	60.0
Lake/River Reptiles		4	5	80.0
Lizards		1	3	33.3
Snapping Turtle		1		
Stream Salamanders		2	2	100.0
Uncommon Turtles of Wetlands		4	5	80.0
Vernal Pool Salamanders		3	4	75.0
Woodland/Grassland Snakes		7	8	87.5
INSECT	**13**	**51**	**197**	**25.9**
Barrens Buckmoth		1		
Karner Blue Butterfly		1		
Odonates of Bogs/Fens/Ponds		5	10	50.0
Odonates of Lakes/Ponds		4	5	80.0
Odonates of Rivers/Streams		10	19	52.6
Odonates of Seeps/Rivulets		2	4	50.0
Odonates of Small Forest Streams		2	3	66.7
Other Butterflies		11	18	61.1
Other Moths		8	92	8.7
Pine Barrens Tiger Beetles		1	3	33.3
Riparian Tiger Beetles		1	2	50.0
Stoneflies/Mayflies - Lotic		4	20	20.0
Tomah Mayfly		1		
MAMMAL	**4**	**7**	**21**	**33.3**
Furbearers		2	2	100.0
Game Species of Concern		1		
Indiana Bat		1		
Tree Bats		3	3	100.0
MARINE FISH	**9**	**11**	**51**	**21.6**
Alewife		1		
American Eel		1		
American Shad		1		
Atlantic Sturgeon		1		
Blueback Herring		1		
Estuarine Associates of SAV		3	5	60.0
Rainbow Smelt		1		
Shortnose Sturgeon		1		
Tomcod		1		
MOLLUSK	**1**	**5**	**59**	**8.5**
Freshwater Bivalves		5	39	12.8
TOTAL	**57**	**158**	**537**	**29.4**
% of all spp groups statewide	**44.5%**			

Upper Hudson River Table 4. SGCN that historically occurred in the Upper Hudson River Basin, but are now believed to be extirpated from the basin (n=53).

Taxa Group	Species Group	Species
Crustacea/Meristomata	Freshwater crustacea	Piedmont groundwater amphipod
Herpetofauna	Vernal pool salamanders	Tiger salamander
Insect	Odonates of bogs/fens/ponds	Ringed boghaunter
Insect	Odonates of bogs/fens/ponds	Subarctic darner
Insect	Odonates of high elevation lakes	Ringed emerald
Insect	Odonates of rivers/streams	Arrow clubtail
Insect	Odonates of rivers/streams	Cobra clubtail
Insect	Odonates of rivers/streams	Riverine clubtail
Insect	Odonates of rivers/streams	Skillet clubtail
Insect	Odonates of seeps/rivulets	Gray petaltail
Insect	Other moths	*Abagrotis barnesi*
Insect	Other moths	*Agrotis obliqua*
Insect	Other moths	*Amphipoea erepta ryensis*
Insect	Other moths	*Anomogyna rhaetica*
Insect	Other moths	*Apamea inordinata*
Insect	Other moths	*Apamea mixta*
Insect	Other moths	*Chaetaglaea cerata*
Insect	Other moths	*Chytonix ruperti*
Insect	Other moths	*Chytonix sensilis*
Insect	Other moths	*Eucoptocnemis fimbriaris*
Insect	Other moths	*Euxoa lidia thanatologia*
Insect	Other moths	*Euxoa pleuritica*
Insect	Other moths	*Fagitana littera*
Insect	Other moths	*Fishia enthea*
Insect	Other moths	*Heterocampa varia*
Insect	Other moths	*Hydraecia stramentosa*
Insect	Other moths	*Lithophane lepida lepida*
Insect	Other moths	*Orthodes obscura*
Insect	Other moths	*Paectes abrostolella*
Insect	Other moths	*Phoberia orthosioides*
Insect	Other moths	*Psaphida thaxteriana*
Insect	Other moths	*Richia acclivis*
Insect	Other moths	*Schinia bifascia*
Insect	Other moths	*Synedoida adumbrata*
Insect	Other moths	*Zale largera*
Insect	Other moths	Barrens dagger moth
Insect	Other moths	Bird dropping moth
Insect	Other moths	Imperial moth
Insect	Other moths	Pink sallow
Mammal	Extirpated large mammals	Canada lynx
Mammal	Extirpated large mammals	Eastern cougar
Mammal	Extirpated large mammals	Gray wolf
Mollusk	Freshwater bivalves	Green floater
Mollusk	Freshwater bivalves	Paper pondshell
Mollusk	Freshwater bivalves	Pink heelsplitter
Mollusk	Freshwater bivalves	Pocketbook
Mollusk	Freshwater bivalves	Tidewater mucket
Mollusk	Freshwater gastropods	Buffalo pebblesnail
Mollusk	Freshwater gastropods	Campeloma spire snail
Mollusk	Freshwater gastropods	Globe siltsnail
Mollusk	Freshwater gastropods	Lance aplexa
Mollusk	Freshwater gastropods	Mossy valvata
Mollusk	Freshwater gastropods	Watercress snail

Upper Hudson Table 5. Significant biodiversity areas of the Hudson River Estuary corridor that fall within the Upper Hudson River Basin (n=12). More detailed descriptions of these habitats and the species and threats associated with them can be found in Penhollow et al. (2002).

Significant Biodiversity Area	County	DEC Region	Acres	Description
Albany Pine Bush	Albany	4	9,000	The largest remaining inland pine barrens in the Hudson River Estuary Corridor. Contains globally rare pitch pine scrub oak barrens and pine-barrens vernal pools, as well as rare butterflies (e.g., Karner blue butterfly) and moths. Threats to this habitat include suppression of fire resulting in the conversion of pine barrens to hardwood forest, and invasive exotic and invasive native plant species.
Catskill Mountains	Delaware, Greene, Sullivan, Ulster	3, 4	435,000 in Greene & Ulster counties (485K total)	Contains major unfragmented forests, including first growth forest, as well as alpine communities and pristine headwater streams. Predominant vegetation types are beech-maple mesic forests and hemlock-northern hardwood forest. Supports regionally significant populations of forest interior nesting birds including Bicknell's thrush in high altitude spruce-fir forests, bald eagle, timber rattlesnake, spotted turtle, wood turtle, and rare plant communities. Threats include Incompatible residential & commercial development.
Dutchess County Wetlands	Dutchess	3	66,000	A network of four major wetland complexes (Milan Window, Stissing Mountain, La Grange/East Fishkill, East Park/Hyde Park) that provide important habitat for the most diverse turtle community in the State including Blanding's turtle, bog turtle, spotted turtle, wood turtle, and box turtle. Northern cricket frog, blue-spotted salamander, marbled salamander, four-toed salamander, and Eastern ribbonsnake are also found here, as well as the only consistent overwintering site by golden eagles. Important habitats include red maple-hardwood swamps, floodplain forest, deep emergent marsh, rich sloping fen, and medium fen communities. Threats include incompatible residential & commercial development, and runoff from roads, agricultural lands, and developed areas.
Esopus/Lloyd Wetlands and Ridges	Ulster	3	32,400	Contains wetland and upland habitat important to amphibians and breeding waterfowl including Northern cricket frog. Important habitats include mature hemlock-northern hardwood forest, red maple-hardwood swamp, Appalachian oak-hickory forest, beech-maple mesic forest, and one of the largest dwarf shrub bogs in the Hudson River Valley. Threats include incompatible residential development, and runoff from roads, agricultural lands, and developed areas.
Harlem Valley Calcareous Wetlands	Putnam, Dutchess, Columbia	3, 4	94,000	Found in the valleys and adjacent ridges of the Taconic Highlands, these wetlands contain high quality habitat for wetland-dependent species and some of the best bog turtle habitat in the Hudson River Valley. This area also includes adjacent upland ridge and ledge habitat important for timber rattlesnake and five-lined skink. Important habitats include red maple-hardwood swamp, floodplain forest, fens, and shallow emergent marsh. The area is comprised of two wetland complexes - the Northeast-Ancram fen complex to the north, and the Great Swamp area to the south. Threats include incompatible residential development, wetland succession, and invasive plant species (e.g., purple loosestrife).

Upper Hudson Table 5. (continued)

Significant Biodiversity Area	County	DEC Region	Acres	Description
Highlands	Ducthess, Orange, Putnam, Rockland, Westchester	3	405,300	A relatively undeveloped corridor of forests, wetlands, and grasslands of regional importance to breeding and migratory birds, resident herps, and rare plant communities. Species indicative of large, contiguous areas of undisturbed forest and wetland habitats include wood turtle, timber rattlesnake, and warblers and thrushes such as cerulean warbler. The area also contains mines used as bat hibernacula including the Indiana bat and small-footed bat. Important habitats include Appalachian oak-hickory forest, chestnut oak forest, and oak-tulip tree forest. The biggest threat is conversion and fragmentation of the area's forests and wetlands by development and roads.
Hudson Valley Limestone and Shale Ridges	Albany, Green, Ulster	3, 4	127,000	A regionally significant geologic feature that contains habitats that support rare mammal, amphibian, reptile, bird, and plant species. The area is comprised of the Helderberg escarpment to the north and the Potic Mountain ridge to the south. Important habitats include red maple-blackgum swamp, vernal pool, chestnut oak forest, Appalachian oak hickory forest, and pitch pine-oak-heath-rocky summit. Limestone caves on the Helderberg Escarpment provide bat habitat including the Indiana bat. Rare wildlife include Henslow's sparrow, upland sandpiper, sedge wren, and least bittern, spotted salamander, Jefferson salamander, blue-spotted salamander, and wood turtle. Threats include incompatible residential development and invasive plant species (e.g., garlic mustard, tree-of-heaven).
Rensselaer Plateau	Rensselaer	4	121,200	Contains a diverse mix of wetland and upland communities including spruce-fir swamp, shallow emergent marsh, sedge meadow, hemlock-northern hardwood forest, spruce flats, and boreal wetland communities. The high quality, large, contiguous nature of this area provides habitat for forest-interior bird species and large mammals (e.g., fisher, river otter). The biggest threat is conversion and fragmentation of the area's forests and wetlands by development and roads.
Rosendale Limestone Cave Complex	Ulster	3	5,000	Area consists of a series of extensive abandoned limestone mines that serve as critical habitat for several native bat species. This complex is among the top 15 sites in the world for hibernating Indiana and small-footed bats. Wetlands within the area provide habitat for Northern cricket frog and pied-billed grebe. Whiteport Wildlife Management Area is part of this complex. Threats include human disturbance to these sites.
Shawangunk Kill / Shawangunk Grasslands	Orange, Ulster	3	11,470	The Shawangunk Kill is a relatively undisturbed Hudson River tributary, flowing northeast between the Shawangunk Ridge and Wallkill River, then into the Hudson. Its relatively low nutrient levels, cool water, and lack of major water control structures allow it to support a regionally rare biological community including a high diversity of fish and mussels, unusual for the Hudson River corridor. Rare species include the brook floater, swollen wedge mussel, and wood turtle. This site includes the Shawangunk grasslands that are important for grassland birds including Henslow's sparrow, northern harrier, upland sandpiper, and short-eared owl. Threats to the Shawangunk Kill include excessive water withdrawals (impacting flow, water quality, dissolved oxygen, nutrients, and silt) for agricultural operations. Threats to the grasslands include insensitive agricultural practices (e.g., early haying).

Upper Hudson Table 5. (continued)

Significant Biodiversity Area	County	DEC Region	Acres	Description
Shawangunk Ridge	Orange, Sullivan, Ulster	3	87,000 (205K total)	Shawangunk Ridge contains a wide range of topography and substrate. The area contains habitats that range from wetland to forest to ridgetop, slope, and cliff. The forest matrix is chestnut oak forest (chestnut oak, red oak), hemlock-northern hardwood forest, and pitch pine-oak-heath rocky summit. The forest habitats are important migratory corridors for raptors and other migratory birds. Vernal pools and surrounding habitats support spotted salamander, Jefferson salamander, and long-tailed salamander. Timber rattlesnake, northern copperhead, eastern hognose snake, and five-lined skink occur at several locations. Turtles inhabiting the ridge include spotted turtles in ponds and wetlands, and wood turtles in riparian habitats. The area also supports rare odonates and moths. There are several threats to this area including forest and wetland habitat coversion and fragmentation and invasive exotics including hemlock wooly adelgid. In the future, overbrowsing by deer on vegetation could become a problem if deer populations increase. Also, radio towers could present a hazard to migratory raptors and other landbirds.
Taconic Mountains	Columbia, Dutchess, Rensselaer	3, 4	78,700	This area encompasses large areas of contiguous, high quality, northern hardwood forest, and it serves as a recharge area for numerous rich fens. Important habitats include hemlock northern hardwood forest and Appalachian oak-hickory forest. This area supports a diverse population of resident and migratory bird species as wintering and breeding habitat, and as a migratory corridor for passerine birds and raptors. Rare herp species found here include bog turtle and timber rattlesnake. The primary threat to this area is habitat fragmentation, especially on ridgetops, due to incompatible residential and other development.

Upper Hudson Table 6. Significant Coastal Fish and Wildlife Habitats (n=30) within the Upper Hudson River Basin. DEC evaluates the significance of coastal fish and wildlife habitat areas, and following a recommendation from DEC, the Department of State designates and maps specific areas.

Habitat Name	County	Acres	Significance Value [a]	Description
North and South Tivoli Bays	Dutchess	1852	162	The largest undeveloped, tidal freshwater wetland complex on the Hudson River, rare in NYS; osprey (T), least bittern (SC), wood turtle (SC), and spotted turtle (SC) have been documented; part of the Hudson River Estuarine Sanctuary; statewide significance for research and regional significance for recreational and educational uses
Hudson River Mile 44-56	Putnam	3353	148	An extensive area of deep, turbulent river channel with strong currents and rocky substrates; bald eagle (E) wintering area; possibly an important nursery for shortnose sturgeon (E); one of several important spawning areas for Hudson River striped bass; striped bass production in this area supports commercial and recreational fisheries throughout the northeastern U.S.
Ramshorn Marsh	Greene	1245	133	One of the largest tidal, forested wetlands in the Hudson Valley, a rare ecosystem type in NYS; least bittern (SC) and wood turtle (SC) have been documented; wildlife-related recreational uses
Germantown - Clermont Flats	Columbia	989	121	An extensive area of shallow, freshwater tidal flats and aquatic beds, rare in NYS; one of the major shad spawning areas in the Hudson River; some of the largest concentrations of migrant waterfowl on the Hudson; area supports commercial shad fishery of statewide significance; popular recreational fishing area in the Hudson Valley
The Flats	Ulster	581	118	An extensive area of shallow, freshwater tidal flats, rare in NYS; shortnose sturgeon (E) documented; one of the major shad spawning areas in the Hudson River; area supports a commercial shad fishery of statewide significance
Stockport Creek and Flats	Columbia	2172	115	An extensive area of undeveloped freshwater wetlands and mudflats, including a major tributary of the Hudson River; concentrations of waterfowl and various anadromous fishes unusual in the Hudson Valley ecoregion; scientific/educational value as an estuarine sanctuary is of statewide significance
Kingston Deep Water Habitat	Ulster	1768	110	An extensive area of deep, freshwater, estuarine habitat, rare in NYS; A shortnose sturgeon (E) wintering area; concentrations of sturgeon and other estuarine species; commercial netting of shad on overlying waters
Poughkeepsie Deepwater Habitat	Dutchess	2493	110	An extensive area of deep, freshwater, estuarine habitat, rare in NYS; a shortnose sturgeon (E) wintering area; concentrations of sturgeon and other estuarine species

Upper Hudson Table 6. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Rogers Island	Columbia	656	104	One of the largest tidal, forested wetlands in the Hudson Valley, a rare ecosystem type in NYS; concentrations of various fish and wildlife species unusual in the Hudson Valley ecoregion; one of the major waterfowl hunting areas on the Hudson River and a substantial contributor to the commercial shad fishery in the region
Esopus Estuary	Ulster	961	98	One of the major freshwater tributaries of the Hudson River; includes high diversity of estuarine communities; black bass use the mouth as an overwintering area; Rare species include migratory osprey (T)
Moodna Creek	Orange	310	92	A major freshwater tributary of the lower Hudson River including the largest tidal marsh in Orange County; summer and winter use of the area by bald eagle (E), concentrations of osprey (T) during migration, least bittern (SC) nesting documented; concentrations of wetland wildlife and anadromous fishes unusual in Orange County
Fishkill Creek	Dutchess	178	80	One of the major freshwater tributaries of the lower Hudson River and a relatively large, wooded peninsula isolated from human disturbance; concentration of osprey (T) and least bittern nesting (SC) has been documented; concentrations of osprey during migration unusual in the lower Hudson Valley; concentrations of anadromous and resident fishes unusual in Dutchess County
Schodack, Houghtal Islands/Schodack Creek	Rensselaer	2067	77	A large, undeveloped floodplain and wetland ecosystem type, rare on the Hudson River; an osprey (T) roosting and feeding area has been documented; commercial shad fishery of regional significance; recreational fishing and waterfowl hunting important at county level
Esopus Meadows	Ulster	385	71	Relatively large area of shallow, freshwater tidal flats and aquatic beds, rare in NYS; shortnose sturgeon (E) may occur in the area; a major concentration area for various fish and waterfowl species in the mid-Hudson Valley; one of the most popular waterfowl hunting and recreational fishing areas on the Hudson River; commercial shad fishery of regional significance.
Rondout Creek	Ulster	519	70	One of the major freshwater tributaries of the Hudson River accessible to anadromous fishes; however, human disturbance has threatened the habitat; osprey (T) concentrate at the mouth of the creek during spring migration; black bass use the mouth as an overwintering area; recreational fishing and waterfowl hunting attract recreationists from throughout the mid-Hudson Valley
Constitution Marsh	Putnam	428	69	One of the largest, undeveloped tidal wetlands on the Hudson River; however, chemical contamination has occurred; Least bittern (SC) nest site documented

Upper Hudson Table 6. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Vosburg Swamp and Middle Ground Flats	Greene	1307	57	An extensive area of tidal mudflats, wetlands, and littoral zones, rare in the Hudson Valley region; mud turtle (T) and least bittern (SC) may occur in this area; commercial shad fishery and waterfowl hunting important to residents of the Hudson Valley
Catskill Creek	Greene	156	54	One of the major freshwater tributaries of the Hudson River; however, human disturbance has threatened the habitat; wood turtle (SC) documented, as well as a major spawning stream for anadromous fishes; black bass use the mouth as an overwintering area; popular recreational fishing site
Wappinger Creek	Dutchess	224	54	One of the major freshwater tributaries of the lower Hudson River, containing a diversity of habitats and several rare plant species; however, human disturbance threatens this area; osprey (T) concentrate at the creek mouth during migration; black bass use the mouth as an overwintering area; popular fishing area in Dutchess County
Mill Creek Wetlands	Columbia	280	53	Tidal freshwater forested and scrub/shrub wetlands unusual in NYS; concentrations of many wildlife species
Inbocht Bay & Duck Cove	Greene	655	52	A relatively large area of sheltered littoral zones and mudflats, rare in the Hudson Valley ecoregion; some of the largest concentrations of migrant and wintering waterfowl in the Hudson Valley; one of the major waterfowl hunting areas in the Hudson Valley
Papscane Marsh & Creek	Rensselaer	712	48	One of the major freshwater tributaries of the Hudson River; however, human disturbance has threatened the habitat; least bittern (SC) nesting has been documented; concentrations of various migratory birds and anadromous fish species uncommon in the ecozone; provides a variety of wildlife-related recreational uses for regional residents
Roeliff - Jansen Kill	Columbia	109	46	One of the major freshwater tributaries of the Hudson River which is relatively undisturbed and accessible to anadromous fishes; concentrations of various fish species unusual in Columbia County; recreational fishing opportunities attract anglers from throughout the mid-Hudson Valley
Coxsackie Island Backwater	Greene	137	35	Vegetated backwater area, unusual in the Hudson Valley ecoregion; important wintering area for bass, one of four known in the upper Hudson estuary; popular recreational fishing area
Hannacroix Creek	Greene	30	31	A relatively undisturbed freshwater tributary of the Upper Hudson River; one of only 10 significant spawning streams for anadromous fishes in the upper Hudson River; popular fishing and waterfowl hunting area for county residents

Upper Hudson Table 6. (continued)

Habitat Name	County	Acres	Significance Value [a]	Description
Normans Kill	Albany	33	31	A relatively undisturbed freshwater tributary of the Upper Hudson River; one of only 10 significant spawning streams for anadromous fishes in the upper Hudson River; popular fishing area for county residents
Coxsackie Creek	Greene	55	26	A relatively undisturbed freshwater tributary of the upper Hudson River, rare in the ecological subzone; one of only 10 significant spawning streams for anadromous fishes in the upper Hudson River; black bass use the mouth as an overwintering area
Coeymans Creek	Albany	51	26	Freshwater tributary of the Hudson River; one of only 10 significant spawning streams for anadromous fishes in the upper Hudson River; popular fishing and waterfowl hunting area for county residents
Shad and Schermerhorn Islands	Albany	1103	22	Large, undeveloped floodplain area with important littoral zones and tributary streams, uncommon in the upper-Hudson Valley; however, human disturbance has threatened the habitat; includes two significant spawning streams for anadromous fishes, including one of the top 10 in the upper-Hudson Valley; recreational hunting and fishing important to county residents
Vanderburg Cove and Shallows	Dutchess	536	20	Relatively large, sheltered freshwater tidal coves and adjoining shallows; shortnose sturgeon (E) may occur in the area; one of the major waterfowl concentration areas in Dutchess County; popular waterfowl hunting area

[a] Significance Value = [(Ecosystem Rarity + Species Vulnerability + Human Use + Population Level) x Replaceability]

Upper Hudson Table 7. Office of Parks, Recreation & Historic Preservation (OPRHP) land units (n=27) within the Upper Hudson River Basin.

Unit Name (DEC Region)	DEC Region	Acres
Bristol Beach State Park	3	209
Minnewaska State Park	3	11,610
Highland Lakes State Park	3	3,082
Storm King State Park	3	1,403
Goose Pond Mountain State Park	3	1,513
Bear Mountain State Park	3	4,787
Hudson Highlands State Park	3	5,031
James Baird State Park	3	604
Margaret Lewis Norrie State Park	3	845
Clarence Fahnnestock State Park	3	10,050
Harriman State Park	3	46,725
Sterling Forest State Park	3	16,833
Lake Taghkanic State Park	4	1,563
Taconic State Park	4	5,664
Grafton Lakes State Park	4	2,310
Hudson River Islands State Park	4	96
Schodack Island State Park	4	864
Cherry Plain State Park	4	152
Peebles Island State Park	4	161
John Boyd Thacher State Park	4	1,657
Thompson's Lake State Park	4	308
Max V. Shaul State Park	4	76
Mine Kill State Park	4	464
Moreau Lake State Park	5	4,465
Saratoga Spa State Park	5	1,748
Pixley Falls State Park	6	373
Delta Lake State Park	6	311

Upper Hudson Table 8. NYSDEC Wildlife Management Area (WMA) land units (n=18) within the Upper Hudson River Basin.

Unit Name (DEC Region)	DEC Region	Acres
Bashakill Wildlife Management Area	3	2,957
Tivoli Bay Wildlife Management Area	3	1,722
Whiteport Wildlife Management Area	3	10
Black Creek Marsh Wildlife Management Area	4	490
Capital District Wildlife Management Area	4	4,144
Franklinton Vlaie Wildlife Management Area	4	196
Great Vly Wildlife Management Area	4	184
Knox/Margaret Burke Wildlife Management Area	4	246
Louise E. Keir Wildlife Management Area	4	177
Partridge Run Wildlife Management Area	4	4,594
Rogers Island Wildlife Management Area	4	281
Vinegar Hill Wildlife Management Area	4	394
Carter's Pond Wildlife Management Area	5	446
Parcel 45 Wildlife Management Area	5	59
Wilton Wildlife Preserve Wildlife Management Area	5	165
Oriskany Flats Wildlife Management Area	6	787
Plantation Island Wildlife Management Area	6	215
Utica Marsh Wildlife Management Area	6	213

Upper Hudson Table 9. NYSDEC State Forest, Wild Forest, Wilderness, Primitive Area, and Unique Area land units (n=133) within the Upper Hudson River Basin.

Unit Name	County	DEC Region	Acres
Depot Hill State Forest	Dutchess	3	267
Lafayetteville State Forest	Dutchess	3	715
Roeliff Jansen Kill State Forest	Dutchess	3	128
Stissing Mountain State Forest	Dutchess	3	596
Taconic Hereford State Forest	Dutchess	3	919
West Mountain State Forest	Dutchess	3	821
Hawk Watch Trailway	Orange	3	5
Kowawese State Unique Area	Orange	3	107
Moodna Creek Unique Area	Orange	3	60
Stewart State Forest	Orange	3	5,113
Castle Rock Unique Area	Putnam	3	130
Painter Hill State Forest	Sullivan	3	104
Roosa Gap State Forest	Sullivan	3	682
Wurtsboro Ridge State Forest	Sullivan	3	1,043
Big Indian Wilderness	Ulster	3	33,500
Hemlock Ridge State Forest	Ulster	3	51
Highwoods State Forest	Ulster	3	42
Oak Ridge State Forest	Ulster	3	100
Overlook Mountain Wild Forest	Ulster	3	563
Shawangunk Ridge State Forest	Ulster	3	1,491
Shawangunk State Forest	Ulster	3	55
Slide Mountain Wilderness	Ulster	3	47,500
Sundown Wild Forest	Ulster	3	29,132
Turkey Point State Forest	Ulster	3	138
Vernooykill State Forest	Ulster	3	3,686
Witchs Hole State Forest	Ulster	3	451
Indian Head Wilderness	Ulster/Greene	3/4	17,381
Phoenicia Wild Forest	Ulster/Greene	3/4	7,510
Shandaken Wild Forest	Ulster/Greene	3/4	5,245
West Kill Mountain Wilderness	Ulster/Greene	3/4	19,250
Cole Hill State Forest	Albany	4	871
Partridge Run State Forest	Albany	4	940
Pine Bush State Unique Area	Albany	4	1,500
Rensselaerville State Forest	Albany/Schoharie	4	2,604
Scott Patent State Forest	Albany/Schoharie	4	1,432
Beebe Hill State Forest	Columbia	4	1,402
New Forge State Forest	Columbia	4	621
Nutten Hook State Unique Area	Columbia	4	105
Stockport Creek State Wetland Preservation Area	Columbia	4	N/A
Ashland Pinnacle State Forest	Greene	4	949
Bearpen Mountain State Forest	Greene	4	2,492
Blackhead Range Wild Forest	Greene	4	11,368
Cairo-Lockwood State Forest	Greene	4	48
Colgate Lake Wild Forest	Greene	4	598
Halcott Mountain Wild Forest	Greene	4	4,817
Hunter Mountain Wild Forest	Greene	4	10,738
Huntersfield State Forest	Greene	4	1,338
Kaaterskill Wild Forest	Greene	4	11,905
Mount Pisgah State Forest	Greene	4	567
Windham High Peak Wild Forest	Greene	4	4,203
Charleston State Forest	Montgomery	4	3,947
Lost Valley State Forest	Montgomery	4	744
Rural Grove State Forest	Montgomery	4	1,295
Yatesville State Forest	Montgomery	4	724
Berlin State Forest	Rensselaer	4	1,970
Pittstown State Forest	Rensselaer	4	1,191
Taconic Ridge State Forest	Rensselaer	4	3,741
Tibbetts State Forest	Rensselaer	4	906
Featherstonhaugh State Forest	Schenectday	4	714
Armlin Hill State Forest	Schoharie	4	515
Bates State Forest	Schoharie	4	1,143
Blenheim Hill State Forest	Schoharie	4	782
Burnt-Rossman Hills State Forest	Schoharie	4	10,472
Clapper Hollow State Forest	Schoharie	4	800
Cotton Hill State Forest	Schoharie	4	513
Dutch Settlement State Forest	Schoharie	4	1,021
Dutton Ridge State Forest	Schoharie	4	1,246

Upper Hudson Table 9. (continued)

Unit Name	County	DEC Region	Acres
Gates Hill State Forest	Schoharie	4	741
High Knob State Forest	Schoharie	4	1,355
Honey Hill State Forest	Schoharie	4	1,044
Keyserville State Forest	Schoharie	4	1,159
Lutheranville State Forest	Schoharie	4	1,809
Mallet Pond State Forest	Schoharie	4	2,572
Patria State Forest	Schoharie	4	2,136
Petersburg Pass State Forest	Schoharie	4	1,087
South Mountain State Forest	Schoharie	4	1,477
Stone Store State Forest	Schoharie	4	734
Champlain II - Submerged Heritage Preserve	Essex	5	N/A
Dix Mountain Wilderness	Essex	5	44,710
Giant Mountain Wilderness	Essex	5	22,764
Hammond Pond Wild Forest	Essex	5	40,149
Hoffman Notch Wilderness	Essex	5	36,013
Blue Mountain Wild Forest	Essex/Hamilton	5	39,705
High Peaks Wilderness	Essex/Hamilton	5	190,455
Hudson Gorge Primitive Area	Essex/Hamilton	5	16,683
Gooseneck Pond Primitive Area	Essex/Warren	5	1
Pharaoh Lake Wilderness	Essex/Warren	5	44,650
Vanderwhacker Mountain Wild Forest	Essex/Warren	5	91,628
Lasselsville State Forest	Fulton	5	2,355
Peck Hill State Forest	Fulton	5	2,725
Rockwood State Forest	Fulton	5	869
Shaker Mountain Wild Forest	Fulton/Hamilton	5	40,429
Blue Ridge Wilderness	Hamilton	5	46,792
Cathead Mountain Primitive Area	Hamilton	5	212
Dug Mountain Primitive Area	Hamilton	5	50
Jessup River Wild Forest	Hamilton	5	47,408
Silver Lake Wilderness	Hamilton	5	105,795
Wakely Mountain Primitive Area	Hamilton	5	226
Siamese Ponds Wilderness	Hamilton/Warren	5	113,220
Daketown State Forest	Saratoga	5	504
Lake Desolation State Forest	Saratoga	5	445
Lincoln Mountain State Forest	Saratoga	5	1,001
Middle Grove State Forest	Saratoga	5	558
Wilcox Lake Wild Forest	Saratoga/Fulton/Hamilton/Warren	5	124,954
Land Tortoise - Submerged Heritage Preserve	Warren	5	N/A
Ralph Road State Forest	Warren	5	523
Sunken Fleet of 1758 - Submerged Heritage Preserve	Warren	5	N/A
Battenkill State Forest	Washington	5	519
Chestnut Woods State Forest	Washington	5	795
Goose Egg State Forest	Washington	5	456
Lake George Wild Forest	Washington	5	44,171
Mount Tom State Forest	Washington	5	1,723
Ferris Lake Wild Forest	Fulton/Hamilton/Herkimer	5/6	147,997
Moose River Plains Wild Forest	Hamilton/Herkimer	5/6	81,925
West Canada Lake Wilderness	Hamilton/Herkimer	5/6	169,021
West Canada Mountain Primitive Area	Hamilton/Herkimer	5/6	3,267
Black Creek State Forest	Herkimer	6	994
Hinckley State Forest	Herkimer	6	1,559
Ohisa State Forest	Herkimer	6	689
Otsquago State Forest	Herkimer	6	408
Steuben Hill State Forest	Herkimer	6	1,020
Black River Wild Forest	Herkimer/Oneida	6	108,091
Cottrell State Forest	Lewis	6	592
Mohawk Springs State Forest	Lewis	6	614
Buck Hill State Forest	Oneida	6	1,679
Clark Hill State Forest	Oneida	6	2,904
Jackson Hill State Forest	Oneida	6	1,185
Penn Mountain State Forest	Oneida	6	3,701
Point Rock State Forest	Oneida	6	1,207
South Hill State Forest	Oneida	6	517
Tassell Hill State Forest	Oneida	6	2,627
Webster Hill State Forest	Oneida	6	1,068
West Branch State Forest	Oneida	6	528

Upper Hudson Table 10. Bird Conservation Areas (BCA) within the Upper Hudson River Basin (n=10). NYSDEC's BCA Program, established in 1997, is modeled after the National Audubon Society's Important Bird Areas (IBA) program, which began in New York in 1996. The BCA Program applies criteria developed under the IBA program to state-owned properties.

Bird Conservation Area	County	DEC Region	Acres	Description
Catskill High Peaks [1]	Greene/Ulster	3	3,700	Over 3,500 feet in elevation, with dense subalpine coniferous forests. Bicknell's Thrush prefers dense thickets of stunted or young growth of balsam fir. This species of special concern is found less frequently in young or stunted spruce and heavy second growth of fir, cherry or birch. Another bird species of interest at this site is Blackpoll Warbler.
Sterling Forest [2]	Orange	3	16,833	Within a natural area of state and national importance due to its watershed, wildlife habitat, cultural resources, open space and outdoor recreation significance. A comprehensive inventory by the New York Natural Heritage Program indicates that most of the Park is covered by either ecological communities that have statewide significance or of such quality that they should be protected as significant examples within New York State. The Park has considerable biodiversity including a diversity of bird species. A part of the Hudson Highlands, the area has strong relief ranging from 800-1200' in elevation.
Constitution Marsh [2]	Putnam	3	270	Large fresh/brackish tidal marsh located on the east shore of the Hudson River. It is one of only five large tidal marshes on the Hudson River. Significant breeding bird species include Least Bittern (threatened), Virginia Rail, Marsh Wren, and Swamp Sparrow. It is an important waterfowl wintering and migratory stop-over site, particularly American black duck. Other species that use the site during migration and/or winter include Pied-billed Grebe (threatened), Osprey (special concern), Bald Eagle (threatened), Northern Harrier (threatened), and Peregrine Falcon (endangered).
Fahnestock [2]	Putnam	3	10,050	Large, wooded tract which includes six lakes, a hemlock/stream ravine, and some marsh habitat. Much of the forest is mature oak and mixed hardwoods with an understory of mountain laurel. Relatively large stands of hemlock are also present in some areas of the park. The BCA supports a representative community of breeding birds that prefer mature hardwood forests, as well as some marsh and water-dependent bird species.
Bashakill [1]	Sullivan	3	2,957	Habitat is primarily non-tidal emergent wetlands through which the Bashakill River meanders. Wetlands are surrounded by deciduous woods and mixed woods, with some shrub lands. The area hosts a number of rare plants and animals (Spreading Globeflower, Ironcolor Shiner, Spotted Sunfish and Long-tailed Salamander). Limestone caves exist in the area as well. The area supports characteristic breeding wetland-dependent species (such as Great Blue Heron, Virginia Rail, Sora and Common Moorhen), abundant waterfowl and several species at risk. Species at risk include: Pied-billed Grebe, American Bittern, Least Bittern, Osprey, Bald Eagle, Northern Harrier, Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, and Red-shouldered Hawk. The site hosts large migratory concentrations of Canada Goose (5,000) Ring-necked Duck and Wood Duck (1,000-2,000), as well as many other species of waterfowl.

Upper Hudson Table 10. (continued)

Bird Conservation Area	County	DEC Region	Acres	Description
Helderberg [1]	Albany	4	6,594	An upland complex that includes hardwood and conifer (plantation) forests, young regenerating forests, old fields, shrublands, reverting farmland, wooded swamp, shrub wetlands, and numerous ponds and wetlands. Some of the species of interest include American Woodcock, Ruffed Grouse, Brown Thrasher, Eastern Towhee, Prairie Warbler, Chestnut-sided Warbler, Nashville Warbler, Blue-winged Warbler, as well as a wide variety of forest warblers and songbirds, winter finches. Woodland raptors include Northern Goshawk (special concern).
Thacher/Thompsons Lake [2]	Albany	4	1,800	Thacher is dominated by forested uplands. The Thompson's Lake area consists of additional upland forest, old fields and a bur oak-black ash swamp adjacent to the lake. There are 171 species of birds that have been identified within the John Boyd Thacher/Thompson's Lake BCA, of which 102 are confirmed or probable breeders, including: Sharp-shinned hawk (Special Concern), Cooper's Hawk (Special Concern), Northern Goshawk (Special Concern) and Golden-winged Warbler (Special Concern). The forests support some of the area's highest densities of breeding songbirds such as Hermit Thrush, Winter Wren, Magnolia, Black-throated Blue, Black-throated Green, Blackburnian, Canada and Worm-eating Warblers and Louisiana and Northern Waterthrushes.
Schodack Island [2]	Rennselaer/Columbia/Greene	4	864	A peninsula in the tidal portion of the Hudson River. Forested communities dominate the site. There are also large areas of wetlands that include tidal wetlands. Ecological communities include successional old field, successional shrubland, dredge spoil forest, freshwater intertidal mudflat, freshwater tidal marsh, freshwater tidal swamp, and floodplain forest. Cerulean Warbler and Bald Eagle are key species here, and a Great Blue Heron rookery on the island contains about 50 nests. The western side of the Island, along the Hudson River shoreline, is predominately floodplain forest, and is of particular importance in regard to its use by eagles.
Carters Pond [1]	Washington	5	446	Wetland/upland complex that includes open water, emergent marsh, wooded swamp, shrub wetlands, forests, old fields, grasslands, and shrublands. Species of interest include: Pied-billed Grebe (Threatened), Least Bittern (Threatened), Osprey (Special Concern), Virginia Rail, Common Moorhen, American Coot, Marsh Wren, Great Blue Heron, Green-backed Heron, American Black Duck, Blue-winged Teal and American Woodcock.
Adirondack Sub-alpine Forest [1]	Franklin/Clinton/Essex/Warren	5	69,000	This BCA includes Adirondack Mountain summits above 2,800 feet in Clinton, Essex, Franklin, Hamilton and Warren counties. Surveyed and confirmed nesting locations for Bicknell's Thrush include: Mount Marcy, Algonquin Peak, Blue Mountain, Cascade Mountain, Giant Mountain, Kilburn Mountain, Hurricane Mountain, Lower Wolfjaw Mountain, Lyon Mountain, Mount Haystack, Phelps Mountain, Porter Mountain, Rocky Ridge Peak, Santanoni Peak, Snowy Mountain, Vanderwhacker Mountain, Wakely Mountain, Whiteface Mountain and Wright Peak. Critical habitats include dense subalpine coniferous thickets, and to a lesser degree, young or stunted and heavy second growth of cherry or birch.

[1] Managing agency is NYSDEC
[2] Managing agency is OPRHP

Upper Hudson Table 11. Critical Environmental Areas (CEA) within the Upper Hudson River Basin (n=28). CEAs are traditionally designated by DEC to protect drinking water supplies; however, DEC and other government agencies may designate CEAs to protect wildlife and their habitats and other natural resource elements

Critical Environmental Area	Location	DEC Region	Reason for Designation
Clinton Hollow Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Clinton Cornors Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Old Bulls Head Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Hibernia Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Frost Mills Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Pleasant Plains Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Schultzville Hamlet	Clinton, Dutchess County	3	Exceptional or Unique Character
Dutchess County Airport Balefill	Dutchess County	3	Inactive Landfill, Toxic Pollutants Present
Aquifer Protection Areas	Fishkill, Dutchess County	3	Protect Public Water Supply
Little Whaley Lake&Watershed	Pawling, Dutchess County	3	Unpolluted Drinkng Water Source
Buttercup Farm Sanctuary	Stanford, Dutchess County	3	Preserve Farmland, Wetland, & Mountain Habitat
Ryder Pond & Cagney Marsh	Stanford, Dutchess County	3	Protection of Waterfowl
Bontecou Lake	Stanford, Dutchess County	3	Protect Migratory & Nesting Birds
Snake Hill	Stanford, Dutchess County	3	Protect Rare Plants and Animal Communities
Wappinger Lake	Wappinger Falls, Ducthess County	3	Protection of Natural Resource
Chadwick Lake Reservoir	Newburgh, Orange County	3	Development Threat to Public Health
Ridge Preservation Areas	Wawayanda, Orange County	3	Preserve Ridgelines to Reduce Erosion
All State Wetlands	Woodstock, Ulster County	3	Protect the Wetlands
Shawangunk Ridge	Shawangunk, Ulster County	3	Soil Type, Slope, Wildlife Habitat
Walllkill Public Water Supply	Shawangunk, Ulster County	3	Protect Water Supply
Aquifer Area Overlay Zone	Rotterdam, Schenectady County	4	Conserve, Improve, & Protect Natural Resources
Roxbury Water District Aquifer	Roxbury, Town of	4	Protect Groundwater Aquifers
Wright Karst Area	Wright, Schoharie County	4	Protect Water Quality
Loughberry Lake Watershed	Saratoga Springs, Saratoga County	5	Protect Loughberry Lake Water Supply
Easton	Easton, Washington County	5	Unique Character of Resources
Round Pond	Queensbury, Warren County	5	Protect Water Quality & Natural Resources
Rush Pond	Queensbury, Warren County	5	Protect Water Quality & Natural Resources
Glen Lake and Surrounding Area	Queensbury, Warren County	5	Protect Water Quality & Natural Resources

Upper Hudson Table 12. Critical **aquatic** habitats found in the Upper Hudson River Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Palustrine	mineral soil wetland	28
Riverine	coldwater stream	23
Riverine	warmwater stream	12
Estuarine	intertidal	11
Palustrine	peatlands	11
Lacustrine	warm water shallow	10
Riverine	deep water river	9
Estuarine	shallow sub-tidal	7
Lacustrine	cold water deep	7
Estuarine	unknown	5
Lacustrine	cold water shallow	5
Estuarine	deep sub-tidal	4
Lacustrine	coastal plain	4
Riverine	coastal plain stream	4
Riverine	unknown	4
Lacustrine	unknown	2
Lacustrine	warm water deep	2
Estuarine	cultural	1
Estuarine	warmwater stream	1
Palustrine	unknown	1
Riverine	cultural	1
Riverine	deep sub-tidal	1
Riverine	shallow sub-tidal	1

Upper Hudson Table 13. Critical **terrestrial** habitats found in the Upper Hudson River Basin, classified at the system and sub-system level, adapted from Edinger et al. (2002). The number of SGCN that indicate each system/sub-system association as a critical habitat is indicated.

System	Sub-System	Number of Species
Terrestrial	forested	53
Terrestrial	open upland	43
Terrestrial	barrens/woodlands	26
Unknown	unknown	7
Terrestrial	alpine/mountain	4
Subterranean	natural/cultural	1

Upper Hudson Table 14. Summary of threats, number of (and percent of all) species groups affected, and percentage of all threats for SGCN in the Upper Hudson River Basin. For details on threats, see Appendix: *Threats Characterization for Wildlife and Their Habitats.*

Threats	# of Species Groups Affected	% of All Spp Groups in Basin	% of All Threats in Basin
Habitat Loss - cultural	39	69.6	12.3
Contaminants	28	50.0	8.8
Degradation of Water Quality	21	37.5	6.6
Human Disturbance - illegal/unregulated harvest	20	35.7	6.3
Human Disturbance - collisions	18	32.1	5.7
Barriers (dams, weirs, culverts, bridges)	14	25.0	4.4
Disrupted Predator/Prey Cycles	14	25.0	4.4
Habitat Loss - natural (e.g., succession)	14	25.0	4.4
Fragmentation	13	23.2	4.1
Interspecific Competition for Resources	13	23.2	4.1
Disease	12	21.4	3.8
Human Disturbance - general	9	16.1	2.8
Active Alteration of Natural Processes	9	16.1	2.8
Habitat Composition Altered by Terrestrial Invasive Species	8	14.3	2.5
Unsustainable Agricultural/Silvicultural Practices	8	14.3	2.5
Competition from Invasive Exotics	6	10.7	1.9
Sedimentation/Erosion	6	10.7	1.9
Reduction of Patch Size/Shape/Area	5	8.9	1.6
Loss of Connectivity/Metapopulation Dynamics	5	8.9	1.6
Climate Change (change in species range, distb'n, migration)	5	8.9	1.6
Loss of Streamside Buffers	4	7.1	1.3
Pollution	4	7.1	1.3
Altered Hydrology (water level mgmt/extraction)	4	7.1	1.3
Human Disturbance - entanglement/entrainment	4	7.1	1.3
Susceptibility to Stochastic Events (storms)	4	7.1	1.3
Habitat Composition Altered by Aquatic Invasive Species	3	5.4	0.9
Loss of Host Species	3	5.4	0.9
Detrimental Hybridization	3	5.4	0.9
Parasites	3	5.4	0.9
Susceptibility to Stochastic Events (isolated pop'ns)	3	5.4	0.9
Susceptibility to Stochastic Events (rare species)	3	5.4	0.9
Climate Change (change in water level, temperature)	3	5.4	0.9
Unknown Threats	3	5.4	0.9
Barriers to Movement (roads, powerlines)	2	3.6	0.6
Terrestrial Habitat Composition Altered by Overuse (e.g., deer)	2	3.6	0.6
Aquatic Habitat Composition Altered by Overuse (e.g., swans, beaver)	1	1.8	0.3
Negative Edge Effects	1	1.8	0.3
Impacts of Erosion on Terrestrial Habitats	1	1.8	0.3

Upper Hudson Table 15. Approved State Wildlife Grant studies relevant to the Upper Hudson River Basin (Coordination Grant T-1, Wildlife Grants T-2-1 and T-2-2, and Fish/Marine Grant T-3).

State Wildlife Grant Study	Location	Description
COORDINATION GRANT		
Project 1: Comprehensive Wildlife Conservation Planning & Coordinatior		
Job 1: SWG Coordination & Development of the Comprehensive Wildlife Conservation Strategy	Statewide	New York will develop a Comprehensive Wildlife Conservation Strategy by October 2005, focusing on species of greatest conservation need in the state. We will work closely with partner organizations and the public to develop the plan, which will identify management needs, goals and strategies for more than 500 animal species that are rare, declining, vulnerable, or status unknown in New York State.
WILDLIFE CONSERVATION GRANT		
Project 1: Conservation Planning for Species of Greatest Conservation Need		
Bird Conservation		
Job 1: New York State's 2nd Breeding Bird Atlas	Statewide	New York completed its first Breeding Bird Atlas during 1980-1985, and the second atlas project (2000-2004) is underway. State Wildlife Grant funding will ensure completion of the second atlas, which will document the current distribution of breeding birds in New York State and quantify changes in distributions of species between the two atlas periods. Once completed, Atlas results will be made available in book and web-based formats for use by conservation biologists, planners, and the public.
Job 2: Developing a Grassland Bird Conservation Plan for New York State	Statewide, where grassland habitats are present	Because of widespread loss and fragmentation of grassland habitat, grassland bird populations are declining in New York and throughout North America. This project will develop a comprehensive plan to guide and direct grassland bird conservation and management on public and private lands in New York State. The plan will help direct conservation efforts to the most important areas, provide guidance to grassland owners and managers, and identify monitoring and research needs for grassland birds.
Job 3: Spruce Grouse in Lowland Boreal Habitat of New York State: Distribution, Populations and Movements	Essex, Hamilton, Herkimer counties	The spruce grouse is an endangered species in New York, where some of its spruce-fir forest habitat has been lost due to forest maturation, habitat fragmentation, and logging. Confusion with the more common ruffed grouse has led to accidental hunting, and the species' unwariness has made it vulnerable to human disturbance. Urgently needed are: surveys to determine status and distribution; research to assess factors causing rarity or declines; population or habitat protection and management to secure the species' status; and completion and implementation of a state recovery plan. This project will help address those needs.
Job 4: Common Loon Migration and Wintering Areas	Adirondack Park	We know very little about where common loons, a species of special concern in New York State, spend their non-breeding periods. This project will use satellite telemetry to determine migration routes, wintering areas and seasonal movements of loons that summer in New York. The results will help identify potential threats to common loons during non-breeding periods, including coastal energy developments, exposure to Type E botulism in the Great Lakes, ocean contaminants, and commercial fishing gear.
Job 5: Golden-winged Warbler Habitat and Hybridization Study	Sterling Forest State Park, Orange County	The golden-winged warbler has declined at an annual rate of 8 percent for the last 35 years in the northeastern U.S. Possible factors in its decline include reforestation and range expansion of the blue-winged warbler. This project will investigate genetics and habitat segregation among these two species. Results will help to establish whether they should be considered distinct species and provide guidance for habitat management plans to sustain golden-winged warbler populations.
Job 17: Marshbird Conservation in New York State	Statewide, where freshwater emergent marshes are present	Baseline information on distribution and abundance is needed for many marsh-nesting species in New York State. Species of concern include pied-billed grebe, black tern, least bittern, American bittern, and king rail. This project will survey representative freshwater marsh habitats across the state during 2004-2006 to quantify abundance and habitat use of marsh birds, identify focus areas for marsh bird conservation, and develop a long-term monitoring program.
Job 18: Coordinated Comprehensive Bird Monitoring Plan for New York State	Statewide	Comprehensive and coordinated monitoring programs are needed to reliably assess the status of all bird "species of greatest conservation need" in New York State. This project will document details of existing bird monitoring and survey programs in New York and assess their utility for monitoring various species of concern. We will form a bird monitoring partnership, involving agencies, organizations, and individuals, to recommend and help implement new or improved monitoring and survey programs for all bird species in New York State.

Upper Hudson Table 15. (continued)

State Wildlife Grant Study	Location	Description
Job 19: Assesment of Boreal Forest Bird Habitats in the Adirondack Park	Adirondack Park	Boreal forests are recognized as critical breeding grounds for a variety of bird species that occur nowhere else in New York State. Within the state there are two relatively distinct assemblages of bird species found in "low elevation" and "high elevation" boreal forest types, each of which includes a number of New York's "species of greatest conservation need." The overall goal of this project is to better quantify the status and habitat requirements of various low and high elevation boreal forest birds.
Job 20: Status Assessment and Delineation of Essential Habitats of Bald Eagles of the Upper Delaware River	Orange, Sullivan, Ulster, and Delaware counties	The upper Delaware River in New York is one of the most important bald eagle wintering areas in the Eastern U.S., with as many as 200 eagles estimated to use this area. Eagles also breed here, with six pairs confirmed nesting in 2003. While the presence of eagles attracts thousands of visitors to the area, development pressure is increasing also. This project would use field observations and satellite telemetry to identify critical habitats used by breeding and wintering eagles to help guide management and development of the upper Delaware River corridor to ensure its continued importance to this species.
Job 22: Golden-winged Warbler Habitat Restoration Investigation	Sterling Forest State Park, Orange County	The golden-winged warbler (GWWA) has declined at an annual rate of eight percent for the last 35 years in the northeastern U.S. and is a candidate for federal listing as a threatened or endangered species. Possible factors in its decline include loss of habitat due to reforestation and hybridization with the blue-winged warbler. Results of prior SWG-funded research will be used to design and conduct an experimental habitat restoration project in Sterling Forest State Park to assess the feasibility of creating or maintaining suitable habitat for GWWA in southeastern New York.
Mammal Conservation		
Job 7: Determining Winter Roost Selection of *M. leibii* and summer destination of hibernating *M. sodalis* and *M. Leibii*	Essex and Ulster counties	The small-footed bat is the least common bat encountered during winter surveys in the eastern U.S., and 75 percent occur in New York. The species may be more common than winter counts suggest because it hibernates in hidden locations (under rocks, in crevices). DEC plans to radio-tag a sample of these bats as they enter a major hibernaculum to determine how many are detected during routine surveys. We also plan to radio-tag Indiana and small-footed bats as they emerge from their hibernacula and follow them by airplane to determine summer distribution and habitat preferences.
Job 8: Feasibility of Implementing a Robust Design Mark-Recapture Study for Indiana Bats	Statewide, where Indiana bats are present	The Indiana bat, a federally endangered species, has declined from roughly 600,000 in the 1960s to about 350,000 today. Population declines in southern portions of its range, primarily Kentucky and Missouri, have far exceeded increases in the north, including New York. We hope to conduct a large scale mark-recapture study to identify causes of the decline and regional differences in population trends. The first step is a feasibility study to determine if we can adequately address assumptions of the study design.
Job 9: Determining the Feasibility of a Statewide Summer Survey of Tree Bats	Statewide, north of NYC and Long Island	Tree bats (red, hoary and silver-haired bats) are among the least understood vertebrates in the state. We do not know the current status or distribution of any of these species, and the most comprehensive surveys were conducted more than 100 years ago. Recent technical innovations have increased the reliability of field sampling while reducing costs. We plan to conduct initial surveys to determine the costs and effectiveness of conducting a statewide status survey for tree bats in New York State.
Reptile & Amphibian Conservation		
Job 10: Assessment of the Status and Abundance of High Priority Reptile and Amphibian Species	Statewide	As a group, a higher proportion of amphibian and reptile species have suffered significant declines than any other vertebrate groups in New York State. To date, much effort has been placed on documenting distribution of these endangered and threatened species. This project will focus on collecting information on the status of known populations, following standard protocols, so that conservation efforts can be prioritized on those in greatest need.
Job 12: Reducing Turtle Mortality During Nesting	Statewide	Certain turtle species experience high mortality of females when they migrate from over-wintering locations to traditional egg-laying sites. This project will investigate methods of reducing this mortality through use of subsurface tunnels for crossing roadways, creation of protected nesting sites, and predator exclusions.
Job 23: Status Assessment and Evaluation of Habitat Quality for Bog Turtles at Bog Brook Unique Area (BBUA)	Bog Brook Unique Area and nearby fens in Putnam and Dutchess counties	The population status of bog turtles is currently unknown, although evidence suggests that the population has declined substantially since the early 1970s. DEC will produce a population assessment of the bog turtles at Bog Brook Unique Area (BBUA) that will include measures of population size, sex ratio and reproductive success. The overall goal for bog turtle management at BBUA is to have a stable or expanding bog turtle population of sufficient size.

Upper Hudson Table 15. (continued)

State Wildlife Grant Study	Location	Description
Job 24: Bog Turtle Dispersal and Population Monitoring	Dutchess County	One of the most significant threats to bog turtles is habitat fragmentation. Isolated turtle populations may suffer from genetic inbreeding and increased susceptibility to random catastrophic events; however, there is a lack of information on the affects and extent of fragmentation. One of the top three bog turtle populations in New York State is found in Dutchess County. This population presents a unique opportunity to study the affects of fragmentation. The goal of this work is to expand annual population surveys and combine the results of this work into a model that will accurately assess how habitat connectivity is related to movements of the bog turtle.
Job 26: Reptile and Amphibian Species Inventory (cont'd from Job 10, Grant T-2-1)	Statewide	Previous studies have identified many reptile and amphibian species in need of conservation, which is the first step in developing baseline information to measure changes in populations. This project will help complete surveys of other reptile and amphibian species that are listed as species of special concern by New York State. Completion of these surveys will produce a mechanism to assure continuity of surveys for this group of species, as gather well as data to determine the status of special concern reptile and amphibian species.
Invertebrate Conservation		
Job 13: Karner Blue Butterfly Monitoring Project	Glacial Lake Albany Recovery Unit (Albany, Schenectday, Saratoga, and Warren counties)	To determine whether populations of Karner blue butterflies are large enough to be considered viable under state and federal recovery criteria, and to be sure that we are accurately detecting population trends, we need a practical and reliable method of counting Karner blue populations. The goal of this project is to evaluate alternative census methods to determine the most cost-effective to use.
Job 14: Determination of Lupine Variability and Implications for Karner Blue Butterfly Management	Glacial Lake Albany Recovery Unit (Albany, Schenectday, Saratoga, and Warren counties)	The only food plant for the larvae of the Karner blue is wild blue lupine (*Lupinus perennis*). Recent declines in Karner blue numbers indicate a need to create larger areas of habitat to halt the loss of this species from the State. Presently, we use only lupine seeds from stock originating in the local vicinity (within the Glacial Lake Albany Recovery Unit stretching from Albany to Warren County) for creation/restoration of habitat; however, research is necessary to determine if lupine from other areas will have the same value to Karner blue for feeding (i.e., will have the same hardiness and phenology as the local lupine) and will not contaminate a possibly distinct local lupine population. If it is biologically feasible to use non-local lupine seed, it will dramatically increase the availability of seed for restoration activities, reduce seed costs, and accelerate the recovery effort.
Job 15: Odonate Inventory	Statewide	There is a need for a comprehensive survey or inventory for odonates (dragonflies and damselflies) statewide. This project will document the current distribution of odonate species in New York State and direct more intensive sampling in selected habitats, areas with expected high odonate diversity, or habitats of rare species. The project will include general surveys conducted by volunteers as well as directed surveys that target specific species, habitats, or poorly known areas of the state.
Job 27: Tiger Beetle Inventory	Statewide	There are 26 species or subspecies of tiger beetle reported from New York State. Of the 26 species, nine are considered globally rare or rare in New York State, while another five are thought to be uncommon in the state (Gordon 1939, New York Natural Heritage Program 2004.) Nearly all of the species of concern are found in habitats that have been heavily impacted by development or other deleterious factors. DEC will conduct status assessments for nine species (including one subspecies) of tiger beetles in New York State that will clarify the need for conservation actions in order to maintain these species.
Job 28: Karner Blue Butterfly Conservation in Glacial Lake Albany: Habitat Viability Assessment and Monitoring	Glacial Lake Albany Recovery Unit (Albany and Saratoga counties)	Over the past 30 years the federal and state endangered Karner blue butterfly has declined in abundance in New York State by over 90%, largely due to habitat degradation/destruction and loss of its obligate larval host plant, the wild blue lupine. DEC will hire one or more contractors to quantitatively assess the current status of Karner blue butterfly habitat patches, identify site-specific habitat restoration needs and measure habitat restoration success at sites throughout Glacial Lake Albany.
Project 2: Implementation of Wildlife Conservation Strategies		
Job 2: Karner Blue Butterfly Conservation in Glacial Lake Albany: Habitat Restoration & Adaptive Mgmt.	Glacial Lake Albany Recovery Unit (Albany and Saratoga counties)	Karner blue butterfly numbers have been sharply declining in the last 5 years. DEC will hire one or more contractors to develop a habitat restoration/management plan in conjunction with DEC Central Office, Regional foresters and wildlife staff to create habitat attributes such as canopy cover and structural heterogeneity. With an increase in suitable habitat, it is expected that Karner blue butterflies will be able to colonize and increase the size of the population.

Upper Hudson Table 15. (continued)

State Wildlife Grant Study	Location	Description
FISH AND MARINE CONSERVATION GRANT		
Project 1: Conservation Planning for Aquatic Resources		
Freshwater Fish Conservation		
Job 1: Adirondack Round Whitefish Investigation	Adirondack Park	Round whitefish are classified as threatened in New York and their recovery plan calls for an investigation of causes for and solutions to their decline. This project will include field studies to develop sampling protocols in Adirondack lakes, evaluate existing stocking efforts, and prioritize historic waters for likelihood of successful reestablishment.
Job 2: Conservation of Lesser Known Species of Fish	Statewide	This project involves review of DEC and New York State Museum fish records to identify information needs about the status of rare species. Findings will be used to plan new surveys that will eventually allow a complete assessment of the status and distribution of these "lesser known" freshwater fish species of New York State.

For more information on these projects visit NYSDEC website at www.dec.state.ny.us
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Upper Hudson Table 16. Priority species and groups, associated threats, and data collection efforts to address those threats. They are listed below by species group in bold, with example some of the most critical species within that group in italics. The threat listed applies to the entire species group.

Species Group / Species	Fill Critical Data Gaps	Intraspecific Competition	Direct Human Impacts	Habitat Loss & Fragmentation	Incompatible Agriculture/Silviculture	Invasive Native & Non-Native Biota	Altered Predator/Prey Dynamics	Degraded Water Quality/Altered Hydrology	Recommended Actions
BIRDS									
Barn Owl	X						X		* Monitor rodent populations (e.g., meadow vole) to determine relationship between owl breeding and foraging sites and prey abundance and distribution. * Document nesting locations, productivity, and foraging areas. * Investigate feasibility of nest box programs and/or releases of captive-raised owls to restore local populations.
Boreal Forest Birds *Olive-sided flycatcher* *Spruce grouse*	X								* Develop a long-term monitoring program to determine population and habitat trends and to determine threats to this group. * Incorporate the results of the 2004 State Wildlife Grant study on boreal forest birds into future monitoring efforts and data analyses.
Breeding Waterfowl *American black duck*	X								* Conduct more intensive surveys for breeding black ducks and blue-winged teal in the Upper Hudson River Basin and common goldeneye in the Adirondacks to estimate overall abundance, document habitat use, and design a long-term monitoring program (e.g., every 5 years).
Common Loon	X							X	* Monitor breeding population trends and productivity. * Continue banding & marking birds to determine movement patterns, behavioral ecology, and demography. * Monitor migratory trends in distribution and abundance, and investigate wintering distribution and ecology of Adirondack population. * Research energetic requirements of adults and young and juvenile movement patterns and behavior. * Determine the biological consequences of chemical and heavy metal toxicity in adults and eggs, and monitor lake pH levels in lakes within the Adirondack Park, survey forage base, and research the effects of lake acidification on breeding loons.
Deciduous/Mixed Forest Breeding Birds *Cerulean warbler* *Red-headed woodpecker*	X		X	X	X				* Conduct targeted monitoring of cerulean warblers to determine precise trends above and beyond the Breeding Bird Survey. Identify critical cerulean warbler focus areas. * Determine the effects of various cutting regimes (partial harvest, clear cut, etc.), and size and shape of the area harvested on "forest interior" birds (e.g., cerulean warbler, worm-eating warbler, wood thrush). * Research the possible area sensitivity and habitat requirements of cerulean warblers. * Determine the population status of Louisiana waterthrush in this Basin. * Investigate factors affecting habitat use and productivity in wood thrush, worm-eating warbler, red-headed woodpecker, and scarlet tanager. * Determine the magnitude of wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics.
Early Successional Forest/Shrubland Birds *Blue-winged warbler* *Canada warbler* *Golden-winged warbler* *Whip-poor-will*	X		X	X	X	X			* Determine the magnitude of wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics. * Complete an inventory and analysis that identifies core habitats (highest abundance) and geographic areas (where appropriate) for golden-winged and blue-winged warblers, Canada warbler, and whip-poor-will. * Develop a long term monitoring program for golden-winged warblers. In particular, monitor status and trends of golden-winged warblers along the “front” of blue-winged warbler invasion northward. Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on golden-winged warbler population status and habitat needs into future monitoring efforts and data analyses. * Research the possible causes for declines of Canada warbler and the effectiveness of forest management regimes in opening up the canopy and promoting ground growth and thickets beneficial to this species. * Determine effects of viburnam leaf beetle on early successional forest/shrub habitats and * Evaluate which cutting regimes (partial harvest, clear cut, etc.) provide the maximum bene
Forest Breeding Raptors *Long-eared owl*	X		X		X				* Determine the population status of golden eagles and long-eared owls in this Basin. * Experiment with different timber management techniques in order to find out which are compatible with forest breeding raptors and which methods provide the maximum benefits for forest breeding raptors. * Determine the magnitude of wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics.

Upper Hudson Table 16. (continued)

Species Group / Species	Fill Critical Data Gaps	Intraspecific Competition	Direct Human Impacts	Habitat Loss & Fragmentation	Incompatible Agriculture/Silviculture	Invasive Native & Non-Native Biota	Altered Predator/Prey Dynamics	Degraded Water Quality/Altered Hydrology	Recommended Actions
Freshwater Marsh Nesting Birds *American bittern* *King rail* *Pied-billed grebe*	X			X		X	X	X	* Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations. * Initiate baseline population surveys to determine abundance and distribution of high priority species to detect trends. * Conduct controlled experiments to see which management actions are effective in producing habitat suitable for marsh birds. * Identify and prepare a catalog of key breeding sites, migratory, staging, molting areas, and wintering grounds. * Investigate diet and nutrition in relation to breeding habitat quality and prey populations * Periodically monitor the levels of contaminants in marsh birds and their eggs * Identify invasive species (including purple loosestrife and Phragmites australis), quantify the impact on habitat quality, and investigate which control methods (biological vs. chemical vs. mechanical) are the most effective. * Incorporate the results of the 2004 State Wildlife Grant study on marsh birds into future monitoring efforts and data analyses.
Grassland Birds *Northern harrier* *Sedge wren* *Upland sandpipers*	X			X	X				* Develop and implement supplemental monitoring programs for grassland bird species that are not adequately sampled by the Breeding Bird Survey and use long term trend data to determine effectiveness of grassland conservation efforts. * Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations. * Complete an inventory of potential grassland habitat for species present, distribution, and relative abundance of priority species within this Basin. * Evaluate the effects of specific farming and management practices, such as: timing of mowing, intensity of grazing, frequency of mowing, mowing versus haying versus prescribed fire, and width of buffer strips on productivity of species in this group. * Integrate results into the NYS Grassland Bird Mgmt Plan being developed under the 2003 State Wildlife Grant.
High Altitude Conifer Forest Birds *Bicknell's thrush*	X			X					* Continue the Mountain Birdwatch monitoring protocol on all Adirondack and Catskill peaks where Bicknell's thrush are known to occur. Implement other long term monitoring if needed to determine population trend and to evaluate the long-term viability of Bicknell's thrush as a part of New York State's breeding avifauna. * Determine if active management (creation of habitat, such as regenerating fir waves) can be an effective management tool for Bicknell's thrush.
Osprey	X						X		* Annually or periodically monitor the population (or certain regions of the population) to determine the number of territorial pairs and reproductive outcome. * Determine the relationship between habitat quality, osprey survivorship, and changes in fisheries populations due to recreational and commercial harvest, changes in water quality, and impacts of wildlife such as cormorants.
Peregrine Falcon	X							X	* Annually monitor and determine the number of territorial peregrine falcons and their reproductive outcome at nest sites in the Hudson River corridor. * Conduct radio-telemetry studies as well as field observations to determine essential peregrine falcon habitat, site-fidelity, turnover, migration and wintering movements, home-ranges, mortality, and longevity. * Periodically monitor the levels of contaminants in carcasses and eggs to assess trends and determine the effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival.
FRESHWATER FISH									
Round Whitefish						X		X	* Continue on-going studies to determine the impacts of invasive predatory fish on round whitefish. * Continue research from the 2003 State Wildlife Grant to determine the causes of population declines and losses within the Adirondack region, especially the impact of acid rain.
Heritage-Strain Brook Trout	X								* Evaluate population status of brook trout in Nate Pond and Dix Pond. * Identify possible refugia ponds for each strain within the Upper Hudson River Basin. * Nominate waters on State wilderness lands for management of other heritage strains such as Little Tupper, Windfall, and Horn Lake strains if there are insufficient ponds in their own watersheds to continue protecting the strain.

Upper Hudson Table 16. (continued)

Species Group / Species	Fill Critical Data Gaps	Intraspecific Competition	Direct Human Impacts	Habitat Loss & Fragmentation	Incompatible Agriculture/Silviculture	Invasive Native & Non-Native Biota	Altered Predator/Prey Dynamics	Degraded Water Quality/Altered Hydrology	Recommended Actions
AMPHIBIANS AND REPTILES									
Box Turtle	X			X					* Document life history parameters including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements. * Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites to document the quality of occupied habitat. * Investigate mitigation strategies to manage the adverse effects of habitat fragmentation such as the current investigations into turtle mortality funded by the 2003 State Wildlife Grant.
Multiple Amphibian & Reptile Groups **Freshwater Wetland Amphibians** *Norther cricket frog* *Fowler's toad* **Lake/River Reptiles** *Eastern ribbon snake* *Wood turtle* **Stream Salamanders** *Long-tailed salamander* **Uncommon Turtles of Wetlands** *Blanding's turtle* *Bog turtle* *Spotted turtle* **Vernal Pool Salamanders** *Blue-spotted salamander* *Jefferson Salamander* **Woodland/Grassland Snakes** *Eastern hognose snake* *Timber rattlesnake*	X					X			* Conduct periodic surveys of occupied sites for these species to detect population trends, and to determine whether appropriate E/T/SC status listings are in effect for Northern cricket frogs and long-tailed salamander. * Develop standardized population and habitat survey protocols for these species, and implement survey protocols at all known and potentially suitable sites. * Document life history parameters for these species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and habitat requirements. * Identify invasive species (including purple loosestrife and *Phragmites australis*), quantify the impact on habitat quality, and investigate which control methods (biological vs. chemical vs. mechanical) are the most effective for Freshwater Wetland Amphibians, Lake/River Reptiles, Stream Salamanders, Uncommon Turtles of Wetlands, and Vernal Pool Salamanders. * Incorporate the results of the 2003 and 2004 State Wildlife Grant studies on high priority amphibian species into future monitoring efforts and data analyses.
INSECTS									
Karner Blue Butterfly	X								* Continue to monitor all known Karner blue sites where access is allowed, and pursue access where it is presently denied within the Glacial Lake Albany Recovery Unit. * Research aspects of Karner blue life history that are poorly understood including dispersal dynamics, best configuration of corridors, distribution/abundance of lupine, etc. * Implement habitat viability monitoring protocol (to be developed under the 2004 State Wildlife Grant).
Odonates *Common sanddragon* *Extra-striped snaketail* *Pygmy snaketail* *Septima's clubtail*	X								* Complete the statewide inventory of odonates and their habitats as outlined in the 2003 State Wildlife Grant. "Hot spots" of odonate diversity within this Basin should be identified and targeted for management action based on species richness, acuteness of threats, and overall value to odonates and other SGCN.
Other Butterflies *Frosted elfin* *Persius duskywing* *Regal fritillary*	X								* Determine the population status and distribution of high priority butterfly species including frosted elfin, persius duskywing, and regal fritillary and best management regimes for species in each locality. * Establish the duration of all life stages, the precise habitat needs of all life stages, important host and food plants, and how this information should be coordinated with management actions.
Other Moths *Barrens buckmoth*	X								* Determine the population status and distribution of high priority moth species including coastal barrens buckmoth. * Develop standardized measures of habitat parameters, investigate metapopulation dynamics , and develop standard definition of what is needed for "viable" populations of high priority moth species.

Upper Hudson Table 16. (continued)

Species Group / Species	Fill Critical Data Gaps	Intraspecific Competition	Direct Human Impacts	Habitat Loss & Fragmentation	Incompatible Agriculture/Silviculture	Invasive Native & Non-Native Biota	Altered Predator/Prey Dynamics	Degraded Water Quality/Altered Hydrolo	Recommended Actions
Riparian Tiger Beetles *Cicindela ancocisconensis*	X					X		X	* Determine the population status and distribution of *Cicindela ancocisconensis* in suitable habitats, with focus on the Hudson River and Esopus Creek. * Determine vegetation density, cobble size, and sand/cobble interspersion of occupied habitats, and determine if there are streams/rivers with existing dams where restoration of more natural flow regimes could result in suitable habitat. * Compile baseline data on existing threats including gravel mine permits, areas of high ATV use, hydrological flow alterations, and invasion by non-native plants such as *Polygonum cuspidatum* and *Lythrum salicaria*, in riparian areas. * Identify streams/rivers with existing dams or other physical modifications where restoration of more natural flow and sediment regimes could result in restoration of suitable habitat for this species. * Incorporate results from the 2004 State Wildlife Grant study on tiger beetle distribution and abundance into data analysis, monitoring, and management efforts for this species.
Stoneflies/Mayflies of Lotic Waters *Brachycercus maculatus*	X								* Survey sites within the historical ranges of *Eurylophella bicoloroides, Epeorus suffusus, Heptagenia culacantha,* and *Brachycercus maculatus*, and determine the critical habitat for these species. * Coordinate survey results with NYSDEC Division of Water's 30-year trends in water quality based on macroinvertebrate data.
MAMMALS									
Game Species of Concern *New England cottontail*	X								* Conduct high intensity surveys of New England cottontails in and around currently occupied sites to better understand their local distribution. * Continue low intensity fecal surveys in suitable habitats from Washington to Westchester County. Where animals are detected, conduct follow-up live trapping for confirmation of identity. * Compare the habitat within extant (Columbia, Dutchess, and Putnam counties) and extirpated (the far eastern border of New York State from Lewis County through Rensselaer County) sites to see if there are significant differences between the two. * Investigate the taxonomic separation of New England cottontail (*Sylvilagus transitionalis*) and the Appalachian cottontail (*Sylvilagus obscurus*) and determine if they deserve separate status.
Indiana Bat	X								* Survey new hibernacula, winter populations, and summer habitat requirements using cave counts, vocalization detectors, radio-tracking, and mist netting and tagging. * Investigate the impact of development on Indiana bat abundance and distribution. * Live trap and mark Indiana bats during the fall swarm, fall entry, and spring emergence to determine the arrival and departure periods of the species by age and sex, and to detect differences in mark retention and survival rates for PIT tags and at least two types of wing bands.
Tree Bats *Eastern red bat* *Hoary bat* *Silver-haired bat*	X		X						* Conduct summer surveys of tree bats including capturing individuals and acoustical monitoring. * Conduct surveys of migrants to determine the timing, distribution, species composition and elevation of migrating bats. * Determine the magnitude of wildlife collisions with human-created structures (e.g., wind towers, cell towers, and power lines) based on land use and development trends (number and distribution of structures), human population distributions, and other characteristics.
MARINE FISH									
Atlantic sturgeon	X		X						* Locate spawning and nursery habitat within the Hudson * Develop and implement population monitoring * Develop age-length data to allow age estimates of juvenile fish from length * Determine location and quantity of bycatch losses in existing fisheries
American shad	X		X	X					* Need to know basic biology, develop fecundity at age estimates, and better information on maturity schedules * Develop and implement population monitoring * Determine location and quantity of bycatch losses in existing fisheries
Alewife	X		X	X					* Develop habitat use information * Need more information about basic biology, abundance, life history, and population dynamics

Upper Hudson Table 17. Existing management plans and agreements within the Upper Hudson River Basin. This is an assortment of the major planning efforts within the Basin and is not a comprehensive list. Other planning efforts may exist at both the local and landscape scale and should be consulted before implementing conservation actions.

Plan/Agreement Name	Involved Parties	Information
Hudson River Estuary Action Plan (1996, 1998, 2001)	NYSDEC, Hudson River Estuary Program	Natural resources and ecosystem health; aquatic and upland habitat; recreation and tourism; economy; stewardship; use of river; pollution and other impairments
Hudson River Estuary Action Program - Report Card on the First Five Years (2001)	NYSDEC, Hudson River Estuary Program	Protecting and conserving the river; enjoying the river; cleaning the river
Natural Resource Management Plan for the Wappinger Creek Watershed (2000)	Dutchess County Environmental Management Council	Description of watershed; water quality;sources of pollution; strategies for achieving water quality goals; land use plan/zoning; funding; implementation strategy and schedule
The Battenkill Watershed: An Assessment of its Natural anc Man-made Resources and a Survey of its Residents (1997)	Battenkill Watershed Alliance	Hydrology; soils; vegetation; wildlife and habitat; land use and agriculture; the built environment; community involvement
The Great Swamp - A Watershed Conservation Strategy (1999)	The Nature Conservancy	The wetland and its watershed; water resources; plants, animals, and habitats; public use; strategies
Watervliet Reservoir Watershed Protection Study - DRAFT (2003)	Capital District Regional Planning Commission	Reservoir overview; water quality; environmental features; land use; population growth and development; existing policies and regulations; issues, threats, and recommendations
NYSDEC Unit Management Plans	NYSDEC	Assessment of the natural and physical resources present within a unit; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Blue Mountain Wild Forest (1995)	Moose River Plains Wild Forest (Draft)	
Blue Ridge Wilderness (Draft)	Saratoga-Warren State Forests (Draft)	
Dix Mountain Wilderness (Draft)	Shaker Mountain Wild Forest (Draft)	
Eminence State Forest (1995)	Shandaken Wild Forest (Draft)	
Ferris Lake Wild Forest (Draft)	Siamese Ponds Wilderness (Draft)	
Giant Mountain Wilderness (Draft)	Silver Lake Wilderness (Draft)	
Halcott Mountain Wild Forest (2001)	Sundown Wild Forest/Vernooykill State Forest (Draft)	
Helderberg Area (2001)	Vanderwhacker Mountain Wild Forest (Draft)	
High Peaks Wilderness (1999)	Westkill Mountain Wilderness (Draft)	
Hoffman Notch Wilderness (Draft)	Wilcox Lake Wild Forest (Draft)	
Jessup River Wild Forest (Draft)	William C. Whitney Wilderness (1998)	
Kaaterskill/West Mountain Wild Forest (Draft)	Windham High Peak Wild Forest (1994)	
Lake George Wild Forest (Draft)		
Bird Conservation Area Management Guidance Summaries	NYSDEC, OPRHP, Audubon	A physical description of the site, BCA criteria met, important species & habitat types, guidance for management, op/maintenance, research, education and outreach. Includes local contacts.
Catskill High Peaks (2000)		
Fahnestock (2000)		
Constitution Marsh (2001)		
Schodack Island (2002)		
Carter's Pond (2001)		
Helderberg (2004)		
John Boyd Thacher/Thompson's Lake (2004)		
Sterling Forest (2001)		
Bashakill (2001)		
Wildlife Management Area Plans	NYSDEC	Assessment of the wildlife, habitats and physical resources present; history of the property; management, op/maintenance, research, education and outreach objectives; opportunities for recreational use and ability of resources and ecosystems to accommodate public use; management objectives for public use
Baskakill WMA (1982)		
Tivoli Bay WMA (1999)		
Capital District WMA (1974)		
Knox/M. Burke WMA (1975)		
Partridge Run WMA (1976)		
Oriskany Flats WMA (1977)		
Plantation Island WMA (1986)		
Utica Marsh (1980)		

Upper Hudson Table 18. Candidate species for designation as Aquatic Nuisance Species in New York State.

Form	Common name	Scientific name
Freshwater aquatic plant	Curly-leaf pondweed	*Potamogeton crispus*
Freshwater aquatic plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Freshwater aquatic plant	European frog's bit	*Hydrocharis morsus-ranae*
Freshwater aquatic plant	Fanwort	*Cabomba caroliniana*
Freshwater aquatic plant	Water chestnut	*Trapa natans*
Freshwater wetland plant	Purple loosestrife	*Lythrum salicaria*
Freshwater wetland plant	Flowering rush	*Butomus umbellatus*
Freshwater/estuarine wetland plant	Common reed	*Phragmites australis*
Freshwater myxosporean parasite	Whirling disease	*Myxobolus cerebralis*
Freshwater cladoceran	Fishhook water flea	*Cercopagis pengoi*
Freshwater cladoceran	Spiny water flea	*Bythotrephes cederstroemi*
Freshwater amphipod	European amphipod	*Echinogammarus ischnus*
Freshwater decapod	Rusty crayfish	*Orconectes rusticus*
Freshwater mollusk	Asiatic clam	*Corbicula fluminea*
Freshwater mollusk	Zebra mussel	*Dreissena polymorpha*
Freshwater mollusk	Quagga mussel	*Dreissena bugensis*
Freshwater fish	Sea lamprey	*Petromyzon marinus*
Freshwater fish	Tench	*Tinca tinca*
Freshwater fish	European rudd	*Scardinius erythropthalmus*
Freshwater fish	Round goby	*Neogobius melanostomus*
Freshwater waterfowl	Mute swan	*Cygnus olor*

Monitoring and Adaptive Management

One of the 8 required elements for inclusion in the Comprehensive Wildlife Conservation Strategy (CWCS) is monitoring Species of Greatest Conservation Need (SGCN) and their habitats. Beyond meeting this requirement, the CWCS provides the impetus to states and their partners to develop and implement a comprehensive monitoring program to supplement or simply organize the often disjoint monitoring that already occurs. The added value of a comprehensive program is the coordination and broad application of data for many programs within DEC, our sister agencies, and other conservation partners that is greatly needed for all fish and wildlife resources and the habitats that support them, including SGCN.

There are several facets to the monitoring as outlined in the enabling legislation of the State Wildlife Grants Program. First we need to assess or inventory the ongoing and existing monitoring data relevant to SGCN and their habitats across the state. We must also identify gaps where such assessments do not exist. These assessments will provide a starting point and help track progress toward improving the health of these populations and their habitat statewide.

Second, in cases where monitoring or baseline assessments of some species and habitats do not exist, efforts to develop such assessments must be made. In the case of habitats, it is likely that a combination of remote sensing and on-the-ground assessments will be used. In the case of SGCN, surrogate indicator species may be used if direct observation techniques are not possible or are impractical.

Third, assessment and monitoring of threats to SGCN and their habitats is necessary. It is likely that this will require the development of indicators for some or all of the severe threats to SGCN and their habitats.

Fourth, we must assess the progress of the State Wildlife Grants program toward stabilizing or improving the status of SGCN and their habitats. In the case of directly funded SWG projects, final reports and data will be retained by the state. Updates of the overall condition of SGCN will be made at the time of updates to the CWCS or in grant reports made to USFWS. In the case of the extensive monitoring and assessment that goes on outside the sphere of the State Wildlife Grants program, we must be diligent in reaching out to share and use these data to complete the overall picture of wildlife and habitat health in New York.

There are several key concepts to bear in mind when contemplating a data management system of this magnitude:

- ❖ Collaboration with existing monitoring efforts at universities, government agencies, and not-for-profit partners. Outreach and diligent investigation into ongoing monitoring across the state and relevant national monitoring is crucial.
- ❖ Development of efficient information sharing among partners to maximize the benefits of limited funding.
- ❖ Development of minimum standards across these programs wherever possible.

- Long term stewardship of data sets, and technological and practical accessibility of these data sets.

Regardless of the resource of concern, all monitoring programs follow a similar cycle:

Monitoring & Assessment of Resource
↓
Threshold Values Comparison
↓
Determine Threats and Sources of Impact
↓
Prioritize/Rank/Target Resource
↓
Develop/Implement/Modify Management Measures
↓
Monitor Effectiveness of Actions
↓
Repeat Cycle

By asking the following questions, a basic framework of key elements of a monitoring program can be identified:

Purpose/ Objective**:** Why are we creating a monitoring program?

Method: How will this objective be achieved?
- ✓What are we going to monitor?
- ✓What scale is appropriate to achieve this objective?
- ✓Where are we going to sample?
- ✓How are we going to measure?
- ✓When are we going to sample?
- ✓Who will conduct monitoring?

Analysis: How will the data be stored and handled?

Application: How will we define thresholds?
- ✓How will the data be used to meet our objectives?

Management: What is the long-term goal or time frame for adaptive management?

In order to adequately monitor SGCN, their habitats, the effectiveness of proposed conservation actions, and the adaptations needed in response to new information or changing conditions, the following 10 elements of a monitoring and assessment program are crucial:

I. Develop program strategy
II. Define program objectives
III. Select data management procedures
IV. Select survey design and methods
V. Account for program infrastructure and support

VI. Develop quality assurance program and project plans
VII. Select data analysis procedures
VIII. Determine reporting framework
IX. Conduct programmatic evaluations

I. Program Strategy

The strategy will address the monitoring and assessment needs of all SGCN and their associated aquatic (freshwater, estuary, marine) and terrestrial habitats in New York State. This assessment will also include a plan for the State and its partners to address the remaining program elements in a timely manner. In addition, the strategy will identify technical issues and resources such as staffing and infrastructure needed in order to carry out a meaningful monitoring program. Finally, the monitoring strategy will identify specific long-term goals and a time frame for the successful achievement of those goals within an adaptive management framework.

II. Program Objectives

Defining objectives and identifying monitoring questions is a critical yet difficult first step in developing an efficient and meaningful program that addresses management and conservation needs. These objectives/questions will be clearly defined and based on: the long term goals of the State Wildlife Grants program, an interdisciplinary collaboration among key partners and experts, and an evaluation of the best available data for SGCNs and their associated habitats. This approach will also allow the DEC to prioritize monitoring targets and questions based on rarity, quality of data and public value. For example, an analysis of existing data for an individual SGCN may reveal a lack of quality data on the distribution of this individual species. Objectives would therefore be guided to collect the baseline information needed to effectively define the distribution of this species throughout the state. Questions related to this objective could include: What is the current distribution of this species? How is this species affected by local land management activities and human disturbance? Where are the high quality habitats for this species? Each objective will drive the monitoring scale, sampling design, methods, analysis, implementation, quality assurance, costs, and reporting of activities. Once effective objectives are in place, monitoring data can provide critical information about location, condition, function, and status and trends of the target resource. In addition, this data can be used to develop management thresholds, identify and assess threats and their sources, and evaluate specific management actions.

III. Data Management Procedures

An accessible electronic data management system must be identified in the initial stages of developing a monitoring and assessment program. The ability to retrieve and share collected data with partners for use in other studies and projects should be a primary goal of the program. This particular element requires careful thought and anticipation of the needs of the data gatherers (producers) and data users. At the state level, development of a data directory may be most appropriate to maintain the strength of individual data sets. Such a directory has precedent in the New York State Geographic Information Systems Clearinghouse maintained by the Office for Technology, or DEC's own master Habitat Data Bank. There are also myriad individual databases related to fish and wildlife species. Two examples from within DEC include the New York Natural Heritage Program database and the Bureau of Fisheries database.

The development of a derivative database with simple fields common to some or all of the extant data sets regarding SGCN and their habitats may be a desirable pursuit as well, though potentially complex. Incorporation of, at a minimum, simple spatial data for all data sets is crucial. There are a number of valuable procedures and sophisticated computer programs that can be applied to such database development. Workshops on advanced data storage and management will be conducted as the monitoring objectives become more clearly defined. Important considerations for database development include:

- Specific attention given to the needs of sensitive species or habitats (Following DEC Natural Heritage Program protocol)
- Access for all contributing and participating partners
- Georeferencing data when possible/applicable
- Meeting data quality standards defined in quality assurance programs
- Incorporation of metadata

IV. Survey Design and Methods

The monitoring objectives and questions will define ideal survey design and methods of collection. Once the objectives and targets have been clearly identified, sampling designs and methods that are appropriate for both species and habitats will be described. The key will be to create a sampling strategy that allows for estimates of statistically significant changes in the status of target resources (Vos et al. 2000). New York will cooperate with ongoing national efforts by USGS to create and coordinate SWG monitoring resources at the national level.

Once baseline data has been organized (from the myriad extant monitoring efforts and data sets) or collected through new projects, measuring the condition of these resources can either be done directly, through estimates of population size and habitat area, or can be indirectly suggested through the use of specific indicators. Environmental indicators are often proposed as time and cost efficient surrogates of ecological function, status or condition. For example, nutrient levels and Secchi disc measurements are used to evaluate water quality; while indices of biological integrity (IBI) assess stream, river, and wetland condition. Analogous indicators, or surrogate species, have also been proposed for monitoring distribution and population trends in other co-occurring species. However, the use of indicators has been controversial in the scientific community because populations are highly variable, responses of individual species may not represent trends in co-occurring species and correlational relationships are rarely rigorously tested. The use and development of indicators in any monitoring system must be carefully applied and rigorously tested. After monitoring objectives and questions have been clearly developed, indicators may be evaluated for their ability to represent attributes of a community or habitat that are too difficult or expensive to measure (Landres et al. 1988). These attributes can include the health and integrity of target habitats, the status of related species or the presence of high biological diversity.

Although related, the techniques employed for monitoring species and habitats differ. Sampling designs will thus be based on the monitoring questions and scale (watershed basin, landscape, community, habitat, individual populations, genetic), desired statistical power and cost effectiveness of implementation. Once this framework has been approved, a number of issues concerning sampling effort will be addressed. For example, how large will the sample area be? What is the sampling frequency? How many sampling sites and how many replications are needed for the desired statistical power? (Vos et al. 2000). In addition, state agencies are uniquely challenged with gaining access to private lands. Survey designs will initially focus on public lands, while the state develops new or additional protocols for voluntary participation or other private land owner initiatives.

MONITORING CRITICAL HABITATS

Habitat monitoring generally occurs at the landscape scale. Remote sensing and GIS will play an important role in measuring landscape patterns, tracking key habitats and identifying sites for longer-term monitoring. Monitoring questions at this scale will include: How much available habitat is there? Where is it located? And, is this habitat currently protected? (Gaines et al., 1999). Additionally, the dynamics of habitat change brought about by ecological succession, agriculture, timbering and human population distribution should be recognized and monitored at a general level to provide context for other efforts. Sites will then be identified that can represent a range of physical and biotic conditions for target habitats and may also be selected for the monitoring of SGCNs. An additional important component of this type of monitoring will be identification of threats and trends in major habitat types such as forests, grasslands, early successional habitats, wetlands, and waterbodies.

Monitoring habitats at the community level will provide an important connection between landscape scale processes and local conditions of target habitats and their associated SGCNs. Site selection at this stage will influence both our understanding of the current status of target habitats and how their condition varies over a range of management, landscape or geographic conditions. Reference sites will also be identified to represent habitats in the best available condition. Sample sites can then be compared to the reference condition to ascertain impairment, if any. For example, it may be critical to understand how a specific management action is having an effect on a target habitat. Selection will therefore focus on identifying sites with and without this management, and quantifying the differences in community composition and function.

Once the monitoring objectives and sampling framework are in place, there are a number of sampling techniques that can be used at the landscape or community level. Geographic Information Systems (GIS) and remote sensing will be used to ascertain distribution and abundance of resources and condition of large scale sampling areas, as was done in the New York GAP Analysis Project and the EPA's Multi-Resolution Land Classification project. It can build on existing databases and provides coarse information quickly to resource managers. At the community level, rapid assessment programs (RAP) can provide state agencies with a first cut evaluation of the status and quality of target communities. There are number of existing frameworks and peer reviewed protocols that will be considered for both terrestrial and aquatic RAP (U.S. EPA:

http://www.epa.gov/owow/monitoring/rbp/; Center for Applied Biodiversity Science: http://www.biodiversityscience.org/xp/CABS/research/rap/terrestrial_rap/terrestrap.xml). In addition to GIS and RAP, indices of biotic integrity are also useful in assessing the overall integrity of target communities. Currently the Division of Water at DEC uses a locally calibrated index of biotic integrity (IBI; Karr, no date) as an indicator of the health of aquatic resources within HUC (hydrologic unit code) watershed basins. This approach may also be useful in terrestrial systems, though; a terrestrial IBI has yet to be rigorously tested. Evaluation and implementation of both RAP and IBI will occur after setting clear monitoring objectives. The applicability of the New York Natural Heritage Program's ecological community classification system that has been applied to public and private lands throughout the state will also be evaluated.

Monitoring SGCNs

Monitoring of SGCNs will generally occur at the species or population level. Because populations are difficult to estimate accurately, indices are often used as surrogates of population size (Gibbs et al., 1998). Therefore, after evaluating existing data for individual species, a sampling scheme that incorporates direct measurement of abundance indices or presence/absence data, when appropriate, will be implemented. Monitoring questions at this scale will include: Are the existing populations increasing or decreasing? Where are these populations persisting? And how are management activities affecting populations?

There are a number of sampling designs that can be used to effectively answer species level monitoring questions. A sampling design based on random site selection allows conclusions from sample data to be generalized over the larger area from which the sites were drawn (Vos et al., 2000). However, if the populations being sampled cannot be considered homogenous, then a stratified random sampling technique is preferred. For example, if we would like to know what the population trend of a specific species is throughout the state, it may be important to stratify the sampling design by watershed basin or ecozone. Additionally, if the purpose is to evaluate the effects of specific management actions on individual populations, site selection will again focus on identifying sites with and without this management, and quantifying differences in abundance. A final and key consideration in choosing a sampling design is the statistical power. The statistical power is defined as "the probability that a monitoring program will detect a trend in sample counts when the trend is occurring, despite the noise in the count data" (Gibbs et al., 1998). The power will depend on how much noise there is in count data because of measurement error, sampling scheme, and spatial/temporal variability. Estimates of this "noise" can be quantified using pilot studies or from references in the literature (see especially Gibbs et al. 1998). Incorporating a power analysis into the sampling design will allow the DEC to define how many sites will be needed to detect a 10, 25, or 50 percent change for any target species.

Once the objectives and sampling framework are in place, sampling techniques to measure presence, abundance, or population viability will be selected. There are a number of peer reviewed techniques for collecting data on individual species (Clarke, 1986; Heyer et al., 1994; Wilson et al., 1996). Sampling method will be chosen based on: field verified techniques, reliability and cost-effectiveness (Vos et al., 2000). Reliability will be maximized by using simple field techniques whenever possible (Vos et al., 2000), and by quantifying the level of expertise of data collectors (agency biologists vs. volunteers). Cost-effectiveness will be evaluated by balancing the costs (labor hours and equipment) with effectiveness (power).

V. Program Infrastructure and Support

In order to develop and implement a useful and meaningful monitoring program, adequate resources and logistics must be identified up front. This includes funding for staff, training, laboratory costs, field activities, office equipment and supplies, and data management and analysis. These considerations will be defined by the monitoring objectives, sampling design and cost-benefit analysis. This stage will address questions such as:

- How many people will be needed?
- What type of training will they need?
- How will protocols be developed for reporting efforts?
- Who will be able to retrieve or use the data and what support/constraint will that require?

VI. Quality Assurance Program Plan

Data quality assurance (QA) is an important consideration for any monitoring effort. Quality assurance plans are used to allow for repeatability, and prevent errors in monitoring, laboratory work, and data analysis and reporting. There are a number of techniques that will be reviewed in order to maintain the reliability and repeatability of data collection. Currently, the DEC Division of Water utilizes a quality assurance program plan outlined in their Analytical Services Protocol, a requirement of EPA mandated water quality monitoring programs. All monitoring efforts that fall under the DEC Division of Water will continue to apply these protocols for data quality management. In addition, this type of quality assurance plan can be further developed and modified to meet the monitoring needs for SGCNs and aquatic and terrestrial habitats. Important considerations for QA will include: scientific validity, precision and accuracy, comparability and legally defensible. Approaches will differ depending on the type and experience of the observer and the objectives of the monitoring effort. For example, while citizen science can be an important component of any statewide inventory, it will be critical that skill level and collection techniques are considered when using volunteer data to assess the status of target resources.

VII. Data Analysis Procedures

Data analysis procedures used to evaluate collected monitoring data should meet specific monitoring and assessment objectives. The analysis methodology needs to influence each phase of the monitoring program: design and use of field data sheets, compilation of data, specification of statistical analyses, analysis of raw data, integration of all collected data, and assurance of quality assessments. All data analysis will occur at regular intervals and will be based on the most appropriate and up to date statistical techniques.

VIII. Reporting Framework

Results from a monitoring and assessment program should support management decisions. Project report format, style, audience, and peer review requirements should be addressed in the initial stages of a monitoring program. Because federal and state agencies are combining to affect a national CWCS, reporting format should likely be developed in concert with federal guidelines. Pittman-Robertson, Dingell-Johnson, or similar program reporting procedures could serve as prototypes for development of a reporting scheme that will satisfy this need.

IX. Programmatic evaluations

Regular reviews of each part of a monitoring program will ensure that the overall program is meeting the monitoring objectives, stated targets and needs of resource managers. The sampling strategy will be regularly evaluated to adjust for updates in ecological knowledge or sampling technique, shifts in the priority of target resources or changes in cost-effectiveness analyses. Currently the CWCS is on a mandatory 10 year cycle. However, appropriate time frames for analysis will vary according to habitat type, species natural history traits, and management actions. This suggests that although the "monitoring program" will be reevaluated every 10 years, individual monitoring efforts should tailor programmatic evaluations to their target resources. For example, monitoring the effect of a specific management action on an invertebrate population would require a much shorter time frame than monitoring the same management action on a population of terrapins. Therefore, once individual monitoring efforts have been established, programmatic evaluation time frames should be created with reference to the life history traits and temporal variability of the target resources.

Approach to Developing a Resource Monitoring Program in New York

The NYS Department of Environmental Conservation does not currently have the staff or resources to conduct a statewide monitoring program of SGCN and their habitats. The CWCS process provides the impetus to states and their partners to develop and implement such a program. In developing this monitoring plan, the DEC will be able to address each of the ten elements through a series of time sensitive phases (see Monitoring Table 1). Initial phases allow for the evaluation of existing data and identification of habitats, taxa or watersheds that lack quality information. Later phases will incorporate each of the ten elements into the design and implementation of a comprehensive SGCN monitoring program in an adaptive management framework. Although the timeline identifies elements that will be specifically addressed during each phase, all elements will be considered throughout the design and implementation of the resource monitoring program.

Monitoring Table 1. Phased approach to a comprehensive monitoring program for SGCN and their habitats in New York.

Phase	Objectives	Elements	Time table	Projected Outcomes
1	**1)** Identify stakeholders, key partners and existing databases. Create a partner workgroup to create monitoring framework. **2)** Identify and begin acquisition of relevant remote sensing and GIS data. **3)** Create geo-referenced central data directory that identifies existing SGCN data. **4)** Use baseline information to define purpose, objectives and questions in monitoring program and support management decisions. **5)** Develop a statewide protected lands GIS data layer.	I, II, III	Years 1-5	**1)** Identification and prioritization of SGCNs and their habitats that lack sufficient distributional and abundance data. Identified lead partners for each. **2)** Updated maps of target habitats, areas and watersheds in New York State **3)** Appointment of a database manager who will be responsible for the creation of a centralized and accessible data directory for current and future monitoring efforts **4)** Clear purpose, objectives and monitoring questions developed for implementation. Identification of possible environmental or SGCN indicators.

Monitoring Table 1. (cont'd)

Phase	Objectives	Elements	Time table	Projected Outcomes
2	**1)** Design ideal sampling strategy for individual species, habitats, and long term data collection- incorporate data quality concerns into design **2)** Account for program infrastructure and support **3)** Evaluate data analysis techniques **4)** Establish reporting framework	IV, V, VI, VII, VIII	Years 5-8	**1)** Identification of new sampling and data collection needs (volunteer vs. expert field work). Design and implementation of pilot studies **2)** Cost benefit analysis will help refine data collection techniques and prioritize target resources **3)** Identification of appropriate statistical methods **4)** Documentation of how the state expects reports to be generated, reviewed, published and distributed
3	**1)** Analyze pilot monitoring data and evaluate management actions **2)** Evaluate ranking of target resources **3)** Propose changes in data collection and management based on data analysis and budget needs **4)** Report findings to stakeholders, partners and the public	IX	Years 7-10	**1)** A comprehensive analysis of the status and distribution of SGCNs and their habitats **2)** Reassess the goals and targets for the DEC monitoring program in an adaptive management framework **3)** Strengthen the existing monitoring framework with new information and current budgetary constraints **4)** Creation of a publicly available and peer reviewed update of the CWCS with trend analysis and full transparency and data sharing (while maintaining appropriate protections for sensitive species)

Phase I

STEP 1. IDENTIFY STAKEHOLDERS, KEY PARTNERS, AND EXISTING DATABASES

Collaboration is a key element in any successful monitoring program. As such, the first step in development will be to hold several meetings with key partners in order to build on past and present monitoring efforts identify baseline data and form a stakeholder committee. Such partners include, but are not limited to, other divisions in DEC, other state agencies, federal agencies, universities, non-governmental organizations (NGO), museums, and the Tribal Nations of New York. These meetings will initiate much-needed communication and consistency in monitoring, and provide the springboard for sustained communication in the future. Committee sub-groups may be formed and lead partners will be identified to address specific monitoring needs.

It is important that we build upon existing monitoring and data assessment programs for efficiency, affordability, and continuity reasons. There are a number of wildlife and habitat databases that, although collected using a variety of techniques and at differing scales, will allow some assessment of the distribution and abundance of SGCNs and critical habitats. The information that can be gleaned from this data depends on the length of the study, and the quality and extent of the data collected. For example, while the NYS Breeding Bird Atlas has collected presence data for breeding birds throughout the state for both 1985 and 2005, the Breeding Birds Survey has collected relative abundance data along road transects since the 1960s. Both of these databases will be useful for understanding statewide distributions and local abundances of some SGCNs. Additional survey and monitoring efforts include: Christmas Bird Count, Birds in Forested Landscapes, Herpetofaunal Atlas, Marsh Monitoring Program, Natural Heritage program, fisheries surveys, and many, many other efforts carried out by government agencies, colleges, universities and private entities.

The application of existing remote sensing and GIS data will also play an important role in identifying the distribution of key habitats and associated species. For example, the New York State GAP (GAP) project, completed in 2001, has computerized the geographic distribution of plant and animal species in NYS. This information allows the state to identify critical situations in the protection of endangered species by locating key habitats and areas of significant biodiversity that are not currently protected by the state (Smith et al., 2001). Additional remote sensing and GIS data such as the Multi-Resolution Land Characteristics Consortium (MRLC), USGS land use land cover data (LULC) and the National wetland inventory can also be applied to develop baseline inventories. These databases will not only help identify important resources throughout the state but also facilitate data sharing between state and federal agencies.

Projected Outcome: The creation and application of all of these databases will allow the DEC to identify and prioritize SGCNs and their habitats that lack sufficient distributional and abundance data.

Step 2. Identify and begin acquisition of relevant remote sensing and GIS data

Application of GIS technology will facilitate the both the creation of a statewide inventory for target resources, and the integration of multiple databases to meet management needs. In addition, this technology will allow the state to prioritize target areas for site selection and create a more efficient and comprehensive sampling strategy. There are number of current remote sensing and GIS databases that will be applied. These include: GAP, LULC, MRLC, NYS Clearinghouse, New York State quadrangle maps and Cornell University geospatial data information repository (CUGIR). After reviewing and combining existing databases, the DEC will identify additional spatial data requirements such as: acquisition of current satellite imagery, improved vegetation cover maps, or application of higher resolution imagery for tracking rare communities. Development of a statewide protected lands GIS data layer, using property boundaries and meta-data from public agencies (federal, state, county, and municipal) and not-for-profit conservation organizations, will provide critical information showing where SGCN populations and their habitats have been conserved and where they may still be at risk.

Projected Outcome: Updated maps of target habitats, areas and watersheds in New York State

Step 3. Create geo-referenced central database that incorporates existing SGCN and habitat data.

The data management and analysis portion of a monitoring program will require a substantial investment of agency resources to provide meaningful information (Vos et al., 2000). The DEC will devote significant time and finances to create a geo-referenced central data directory, or series of compatible databases, before a monitoring program is put in place. This will ensure an efficient, user-friendly, data management system. The monitoring committee (as defined in Step 1.), or an appropriate sub-committee, will identify database systems to be used in New York's resource monitoring program. In addition the state expects to hire a specialized manager who will oversee the creation, standardization and distribution of the database. This system will require either a centralized data repository, or series of compatible and cross-referenced databases, capable of allowing multiple users to access and submit data within a strict framework of data quality assurance. The data will also be formatted for statistical assessment and reporting. The stakeholder committee and database manager will draw from existing data management systems such as the: National Biological Information Infrastructure (NBII), National Park Service Vital Signs Monitoring Database, Long-Term Ecological Network, NatureServe and the New York Natural Heritage Program, and the Bird Population studies section of the USGS Patuxent Wildlife Research Center.

Projected Outcome: Appointment of a database manager who will be responsible for the creation of a centralized and accessible database for current and future monitoring efforts

STEP 4. USE BASELINE INFORMATION TO DEFINE PURPOSE, OBJECTIVES AND QUESTIONS IN MONITORING PROGRAM AND SUPPORT MANAGEMENT DECISIONS

After identifying and organizing existing data, the DEC will again hold workshops with key partners, stakeholders and experts who are knowledgeable about SGCNs and their habitats. These workshops will refine the purpose, define the objectives and pose the questions necessary for a successful monitoring program. This will be an iterative process that can be revised as new information becomes available (Gaines et al., 1999). Questions will be ranked based on their priority and will be both management and science relevant. Ecological indicators will be identified where appropriate.

Projected Outcome: Clear purpose, objectives and monitoring questions developed for implementation. Identification of possible environmental or SGCN indicators.

Phase 2

STEP 1. DESIGN IDEAL SAMPLING STRATEGY FOR INDIVIDUAL SPECIES, HABITATS, AND LONG TERM DATA COLLECTION

The monitoring and objectives outlined in Phase 1 will define the survey designs and methods of collection. Monitoring efforts will need to be done at multiple scales in order to provide broad context and evaluate effects of specific management actions. Statisticians and experts knowledgeable about target species/habitats and sampling design will be consulted throughout this development.

Habitat monitoring can be conducted at the watershed basin, landscape, or community level. The sampling strategy for habitat monitoring at the landscape or watershed scale will depend on existing GIS/remote sensing data. The sampling strategy at the community level will depend on biologically relevant indicators of habitat quality and identification of reference habitats in the best available condition. Rapid assessment techniques at IBIs will be fully reviewed at this stage for relevance and applicability.

Species monitoring may be conducted at several levels, including individual species, guild, or population. For some species, sampling strategy will be based on an existing structure, such as the Breeding Bird Atlas blocks and state quad maps. After evaluating existing data for SGCNs, the sampling strategy will incorporate direct measurement of abundance indices or presence/absence data. In order to incorporate a power analysis, pilot studies will be implemented to quantify spatial/temporal variability, if estimates are not available from the literature.

Data quality assurance (QA) protocols will be created for the data sampling frameworks. Existing QA programs will be reviewed for their relevance and application to the sampling strategy. Example QA strategies may include: DEC Analytical Services Protocol, Washington State Environmental Assessment Program: Quality Assurance, U.S. EPA's Quality Assurance Program.

Projected Outcome: Identification of sampling and data collection needs (volunteer vs. expert field work). Design and implementation of pilot studies

STEP 2. ACCOUNT FOR PROGRAM INFRASTRUCTURE AND SUPPORT

At this stage, the DEC will conduct a monitoring cost-benefit analysis. A full review of cost for maintaining existing databases, implementing pilot studies and supporting existing and new personnel will be created. This analysis will allow the agency to fulfill budget requirements while prioritizing projects with greatest conservation need. New projects will be implemented or scaled down depending on a number of factors including: project feasibility and need, budget requirements and effectiveness (power).

Projected Outcome: Cost benefit analysis will help refine data collection techniques and prioritize target resources

STEP 3. EVALUATE DATA ANALYSIS TECHNIQUES

Data analysis techniques will be designed to address specific monitoring objectives and questions. These techniques will influence how the data are collected, analyzed and integrated throughout the monitoring process. Statisticians and agency personnel who are knowledgeable about statistical techniques will be consulted throughout this process. Data analysis will occur at regular intervals and will be based on appropriate and current techniques.

Projected Outcome: Identification of appropriate statistical methods

STEP 4. ESTABLISH REPORTING FRAMEWORK

The DEC will establish a reporting format that builds on existing federal guidelines. Pittman-Robertson, Dingell-Johnson, or similar program reporting procedures will serve as useful prototypes for the development of an audience appropriate reporting scheme.

Projected Outcome: Documentation of how the state expects reports to be reviewed, published, and distributed

Phase 3

STEP 1. ANALYZE PILOT MONITORING DATA AND EVALUATE MANAGEMENT ACTIONS

Evaluation of resulting data will depend on the data collection techniques, design of study, and natural history of the target resource. Although no specific approach to analyzing the monitoring data can be formalized, there are a few important considerations that will affect both the statistical and management aspects of this process (Vos et al., 2000):

- Analyses will focus on testing specific hypotheses
- The most up to date and relevant statistical tests will be used
- Results should be directly linked to management actions
- Reliability of the analysis should be explicitly stated
- Results will be presented to managers, key partners and stakeholders in a meaningful and timely manner
- Alternative management choices should be clearly addressed

Projected Outcome: A comprehensive analysis of the status and distribution of SGCNs and their habitats.

STEP 2. EVALUATE RANKING OF TARGET RESOURCES

At this stage, the agency will begin to reevaluate the prioritization and ranking of target resources. As the cycle of the monitoring process continues, the DEC will again hold workshops with key partners to update and address the needs of SGCNs and their associated habitats. Objectives will be redefined and new questions will be created as information is available. Existing monitoring efforts will continue if the programs are both cost-effective and reliable.

Projected Outcome: Reassess the goals and targets for the DEC monitoring program in an adaptive management framework

Step 3. Propose changes in data collection and management based on data analysis and budget needs

After reevaluating and prioritizing target resources, the state will conduct programmatic evaluations to determine which monitoring efforts should be continued. Cost-effective monitoring efforts will be updated with new collection techniques, quality assurance practices and sampling needs. New monitoring or pilot projects will be implemented within budgetary constraints.

Projected Outcome: Strengthen the existing monitoring framework with new information and current budgetary constraints

Step 4. Report results to stakeholders, partners and the public

Regular reporting to key stakeholders, partners and the public is an important part of any policy oriented monitoring program. Creation of a broadly accessible database will allow data sharing among agency departments, NGOs and academic institutions. Workshops and meetings will also facilitate communication among key participants. At this time the CWCS will be updated with current progress, trends in species and habitats, GIS maps, as well as budget and management revisions. The CWCS will be publicly available and peer reviewed. The format for presentation and publication of results will depend on the target audience.

Projected Outcome: Creation of a publicly available and peer reviewed update of the CWCS with trend analysis and full transparency and data sharing (while maintaining appropriate protections for sensitive species)

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Coordination and Outreach Efforts Associated with the Creation of the CWCS

ELEMENT 7 - *Plans for coordinating the development, implementation, review, and revision of the plan with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats.*

ELEMENT 8 - *Congress also affirmed through this legislation, that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the targeted species in greatest need of conservation which Congress has indicated such programs and projects are intended to emphasize.*

These elements are required to ensure that the resources used in developing and implementing the CWCS are best used and directed as the program continues and to ensure that the public is kept informed about these programs and their results. The elements require that the information that is used to develop the species list and the recommended strategies receives the most rigorous and broadest review in order that the strategies are as effective as they can be.

The seventh and eighth elements direct the development of the strategy to particularly include outreach to as broad a community of public interests as possible. They direct broad review and participation with government agencies and Indian tribes at all levels to best allow for the implementation of strategies that involve management of land and water areas. To accomplish this element the DEC has, from the beginning of the development of the CWCS, worked to keep government agencies and tribal authorities at all levels informed about the program, and facilitated the review of comments and concerns that they have expressed.

Species List Development and Species Experts

In 2003, a species list was developed for the State Wildlife Grants Program in New York by the Department's Division of Fish, Wildlife, and Marine Resources. The list includes mammals, birds, reptiles, amphibians, fishes, mollusks, crustaceans, beetles, mayflies, stoneflies, moths and butterflies. The specific species from each of these categories are those that were judged to be rare, declining, at risk, or of unknown status, and for which some conservation need or opportunity was evident. The basis for the selections was systematic assessments made by Division of Fish, Wildlife and Marine Resources staff. This list was shared with the public as well as experts and interested citizens that were well known to the designated species group project leaders. The Department provided a form on the web for interested citizens to submit comments regarding the species list. The result of this activity was the eventual receipt of over 300 comments from the public regarding the proposed species list. The comments also included information that has been useful in developing implementation strategies. The comments were summarized into a single document for staff review and the final determination as to the species to be included on the list of species of greatest conservation need (SGCN).

To continue to facilitate and coordinate the development of species specific data and strategies, the Division of Fish, Wildlife and Marine Resources has appointed central contacts for taxonomic groups. The following list designates the staff assigned and the taxonomic group(s) for which they are responsible.

Bryan Swift - Birds
Shaun Keeler - Freshwater Fish
Kim McKown - Marine Fish and Crustacea
Kathleen O'Brien - Butterflies, Moths and Freshwater Mollusks
Paul Novak - All Other Insects
Alan Hicks - Mammals
Debbie Barnes - Marine Mollusks
Alvin Breisch - Amphibians and Reptiles

Species Group Meetings and Outreach

The species group experts remained in contact with the groups of individuals that had provided comments and review of the species lists. In some case the groups held meeting to review and discuss the information being developed. Meetings were held with various bird species experts throughout the state on June 9, 2004 and October 6, 2004 to discuss the bird species list, overall goals for species groups, prioritization of actions, and objectives for species conservation. A meeting was held on June 9, 2004 with freshwater fish experts to discuss the species list, overall goals for species groups, prioritization of actions, and objectives for species conservation.

Other groups remained in contact sharing information regarding the various species and issues through the use of e-mail, telephone, and mail. These individuals will continue to be updated through implementation phase of the program. Lists of the species group participants and their affiliations are in Appendix F.

Steering Committee

DEC Division of Fish, Wildlife and Marine Resources developed an internal steering committee in 2002 to develop the initial list of SGCN and to select and develop projects for funding under the SWG program. This steering committee was later expanded to include staff from DEC Division of Lands and Forests; Division of Public Affairs and Education; New York State Office of Parks, Recreation, and Historic Preservation; and New York Department of State. This steering committee worked with the program coordinator to develop the CWCS document analysis approach and outline. This information was, in turn, shared with other divisions and programs within DEC, and with the Partnership Group as outlined below.

Watershed Review Team Meetings

Each of the watershed chapters were drafted by DEC staff in Albany. Each of the drafts was circulated to a local review team made up of DEC regional staff, other agency staff, and representatives from conservation groups. These teams were responsible for reviewing and revising the watershed chapters based on a team consensus. A list of review team members for each watershed is available in Appendix F.

Meetings with Partnership Group

In order to broaden the public review and participation the Department established a Partnership Group, including representatives of statewide species advocacy organizations, local governments, tribal organizations, state and federal agencies, non-profit conservation organizations, research and academic organizations, and other interested parties. The first meeting of this group was held on May 6, 2004. Letters of invitation were sent to over 300 individuals and organizations. 30 individuals participated in the meeting, held at the DEC Headquarters at 625 Broadway in Albany. The meeting participants received updates on the status of the SWG Program and the process that would be used in the continued development of the CWCS. Participants were encouraged to continue their involvement and to provide other contacts to continue to broaden the outreach program.

Another meeting of the partnership group was held on September 22, 2004. This meeting was held at DEC Headquarters at 625 Broadway in Albany. Updates were provided regarding the SWG and CWCS and the plans for continued progress and citizen participation.

Department staff remained available at the end of both meetings for discussions with interested participants.

The Department will continue to convene the Partnership group for meetings as necessary as the program continues to develop to share information and implementation strategies. The next meeting of the group will be in late 2005 after the submission of the Comprehensive Wildlife Conservation Strategy.

The Partnership group mailing list is included in Appendix F.

Review of Draft CWCS

The draft Comprehensive Wildlife Conservation Strategy will be available for public review during summer 2005. Copies of the draft will be sent to individuals and groups that have participated in the Strategy's development. The document will be available for download from the DEC Website. The public will be encouraged to submit comments on the draft.

Meeting with New York State Association of Environmental Management Councils

On October 13, 2004, the New York State Department of Environmental Conservation, met with the New York State Association of Environmental Management Councils (NYSAEMC). NYSAEMC is an umbrella organization which brings together county environmental management councils (EMC) from around the state to discuss common interests and issues. The membership of each council is made up of representatives from municipal citizen conservation councils and boards, representatives from county government, members-at-large appointed for their special interest or qualifications, Soil and Water Conservation District Boards of Directors, and representatives from the county board of legislators.

During the meeting, the Department outlined the purpose of the State Wildlife Grants Program and explained how the EMCs could participate in the development of the Comprehensive Wildlife Conservation Strategy.

EMCs are a focal point of the citizen environmental advisory role in county government. The duties of the county councils are to provide environmental information, advice, assistance, and training; review and comment on pending actions within the county which have environmental implications; advise county government on environmental protection policies and sound use of natural resources. They are established under Article 47 of the NYS Environmental Conservation Law.

The EMCs will be kept updated as the process of CWCS development continues. The Department typically provides an update meeting to the EMCs in June of each year at the DEC Headquarters in Albany. The Department also participates in the EMC Association Annual Meeting in the fall of each year.

State Wildlife Grants Program Web Pages

The DEC Web Page has been used to make information regarding the State Wildlife Grants Program since 2002. The Comprehensive Wildlife Conservation Strategy Additional information and updates regarding the State Wildlife Grants program, including available drafts of the CWCS, proposed plan, proposed studies, species lists, meeting announcements, and other information can be found on the Department's website at the following address: http://www.dec.state.ny.us/website/dfwmr/wildlife/wilddiv/swg/.

The draft Comprehensive Wildlife Conservation Strategy was available for review and comment on the DEC website for 30 days. Overall there were 20 comment submissions from non-governmental organizations, 15 from private citizens, 2 from federal agencies, and 6 internal to DEC.

Conservationist Magazine

An article about the State Wildlife Grants program was published in the October 2004 issue of *Conservationist* magazine. An additional article about the State Wildlife Grants program is planned for the February 2005 issue. The State Wildlife Grants article gives an overview of the program and encourages interested parties to participate or comment on the draft strategy.

Newsletter Article

An article describing the State Wildlife Grants program and opportunities for public participation was distributed to several organizations whose members may have interest in the program. The organizations were asked to run the article and supplied images in their member newsletters. A list of organizations that were provided with the article is in the Appendix F.

Fact Sheets

Fact sheets describing the State Wildlife Grants program have been produced and made available to interested citizens.

Overview of Planned CWCS Updates

The DEC will continue to inform the public regarding the work being accomplished with the State Wildlife Grant funding by regular updates of the Department's website. The Partnership Group will be convened annually to provide updates and the species experts will be kept informed as to the program's activities. The input received from these forums will be used to update the CWCS at regular intervals, as the DEC determines it is needed. At this time DEC anticipates annual reports on grant program initiatives, a 5 year progress report and SGCN list update, and a 10 year complete revision of the CWCS. We will continue to develop program initiatives in cooperation with partners.

Five Year Outlook

During the next five years, DEC will be developing a State Wildlife Grants Program within the Division of Fish, Wildlife and Marine Resources. New staff associated with this program will develop stepped-down, watershed level operational plans that will specify objectives for conserving SGCN and their habitats as well as needed actions for achieving these objectives. These staff will collaborate with watershed partners, similar to the watershed review teams convened during the initial statewide draft of the CWCS.

At the same time, DEC staff along with partners including, but not limited to, the NYS Education Department, other state agencies, universities, U.S. Fish and Wildlife Service, U.S. Geological Survey, New York State Biodiversity Research Institute, and the American Museum of Natural History, will develop a comprehensive statewide monitoring program. As discussed in the Monitoring section, the building of this proposed program and its eventual success will depend on the available funding, partners, and staff to implement this enormous undertaking. This monitoring program will be focused on measuring progress towards the objectives specified in the watershed operational plans.

Both the proposed monitoring program and watershed plans will be used to develop a 5-year update to the CWCS and the proposed 10-year revision.

Emergency Species Actions

There may be instances when emergency action regarding species of greatest conservation need is warranted. The status of a species not currently included in the program may become compromised between revisions of the CWCS and attendant list of species of greatest conservation need. Such a species would be reviewed by the SWG steering committee and relevant experts to place it on the list "off-cycle." An emergency situation may include a disease event, catastrophic habitat loss or alteration due to storms or fire, or introduction of an aggressive invasive species. These are only examples and the SWG steering committee will react to proposed emergency changes as they are presented to the SWG program coordinator.

Proposed Revision Process

DEC proposes to gather input from species experts, researchers, non-governmental organizations, and other state and federal agencies in support of revisions of the CWCS. We hope that over the next 10 years we have strengthened partnerships and public awareness of the program and strategy in order to have even more collaboration at the 5- and 10-year milestones. The proposed new staff positions will be working closely with partners in their watersheds of responsibility to increase our understanding of SGCN and the threats to their health and survival.

new york state

Comprehensive Wildlife Conservation Strategy

Appendices

FINAL SUBMISSION DRAFT

September 2005

Key to abbreviations used in Appendix A. The legal status of listed species based on Federal and State laws and regulations.

Status	Abbreviation	Federal Definition	State Definition
Endangered	E	Endangered Species are determined by the U. S. Department of the Interior to be in danger of extinction throughout all or a significant portion of their range, as defined in the Endangered Species Act of 1973, and as amended. All such species are fully protected, including their habitat. Note that piping plover is designated End/Thr because it is listed as endangered in one portion of its range within New York State and threatened in another portion.	Endangered Species are determined by the New York State Department of Environmental Conservation (DEC) to be in imminent danger of extinction or extirpation in New York State, or are federally listed as endangered. All such species are fully protected under New York State Environmental Conservation Law (ECL) 11-0535.
Threatened	T	Threatened Species are determined by the U. S. Department of the Interior aslikely to become endangered within the foreseeable future throughout all or a significant portion of their range, as defined in the Endangered Species Act of 1973, and as amended. All such species are fully protected.	Threatened Species are determined by the DEC as likely to become endangered within the foreseeable future in New York State, or are federally listed as threatened. All such species are fully protected under the New York State ECL 11-0535.
Migratory Bird Treaty Act	MBTA	Migratory Bird Treaty Act of 1918, and as amended. The MBTA, including amendments, implements conventions between Canada, Mexico and the United States, Russia, Japan for the protection of migratory birds.	N/A
Marine Mammal Protection Act	MMPA	Marine Mammal Protection Act of 1972, and as amended, was enacted for the protection, conservation, and management of all marine mammals to maintain the health and stability of the marine ecosystem.	N/A
Convention on the International Trade in Endangered Species (CITES)	CA1, CA2, CA3	Indicates species listed in Appendices 1, 2, or 3 under CITES, whose purpose is to protect certain species of flora and fauna against overexploitation in internationaltrade. CITES lists species in three categories (Appendices). Appendix 1 (CA1) includes species threatened with extinction. Appendix 2 (CA2) includes those species not currently endangered but which may become so if unrestricted trade occurs. Appendix 3 (CA3) includes species identified by a country as needing protection. The listing herein is based upon the 16 April 1997amendment, which can also befound on web site http://international.fws.gov/cites/cites.html.	N/A
Special Concern	SC	N/A	Special Concern Species are those native species which are not yet recognized as endangered or threatened, but for which documented evidence exists relating to their continued welfare in New York State. The Special Concern category exists within DEC rules and regulations, but such designation does not in itself provide any additional protection. However, Special Concern species may be protected under other laws.
Game Species	GS, GN	N/A	Game species are defined as “big game”, “small game” or “game bird” species in ECL 11-0103. GS indicates that there are seasons set for the species when they may be legally hunted. GN indicates that, while classified under the law as a game species, there are no seasons set and the species may not be hunted or taken at any time in New York.
Protected Birds	PB	N/A	Protected Birds are defined in ECL 11-0103 as all wild birds except those named as unprotected. Some of these birds, such as waterfowl and gallinaceous birds, are also listed as game species with seasons set, while others may not be taken at any time.
Special Regulations	SR	N/A	Th Special Regulations designation is used for two species: diamondback terrapin is protected under ECL 11-0311, where DEC can adopt regulations restricting destruction, disturbance or taking of a species after petition by ten or more citizens on behalf of that species. Protection for harbor seal comes via specific inclusion in ECL 11-0107.
Unprotected	Un	Unprotected under Federal law.	Unprotected means that the species may be taken at any time without limit; however, a license to take may be required.

new york state
Comprehensive Wildlife Conservation Strategy

Appendix A1:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Birds

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Bird
Species Group: Bald Eagle

Threats:
-Habitat loss/alteration
-human activity/disturbance
-alteration of prey base
-contaminants (e.g. Pb, Hg, PCB)
-vehicular collisions (including high-speed trains)
-deaths due to electrocution, trapping, collisions (e.g. from towers, wind-generators, electrical lines)

Trends:
-Although raw numbers of bald eagles have been increasing since 1980 in New York and elsewhere, the habitats upon which this species relies are diminishing in quantity and quality. The salient question is, when will the habitat-loss trend line (expected to continue at a steep, increasing slope) begin to cause the bald eagle population trend line to move in a negative direction, and how fast will the population crash and to what level as this species' habitats disappear. The bald eagle (and it's necessary habitats) can be used as an indicator to overall trends in habitat loss/alteration and biodiversity we are likely to encounter in as little as 20 years.

SEQR - No Action Alternative:
Even though the gross numbers of bald eagles are currently substantial and increasing, without an explicit understanding of the essential habitats used and required by this species in our state and elsewhere, and further the application of that knowledge to management and protection of those habitats, the inevitable consequence will be the eventual reversal of the increasing population trend, a rapidly decreasing and unsuccessful population, heading once again toward extirpation or extinction before protective/proactive steps can be put back in place.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bald eagle (Haliaeetus leucocephalus)	T		S2S3B,S2N	G4	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bald eagle (Haliaeetus leucocephalus)	Allegheny	Allegheny	Increasing
	Lake Champlain	Delaware	Increasing
	Lake Erie	Lake Champlain	Increasing
	Delaware	Lake Erie	Increasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Increasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	SE Lake Ontario	SE Lake Ontario	Increasing
	Susquehanna	Susquehanna	Increasing
	SW Lake Ontario	SW Lake Ontario	Increasing
	Upper Hudson	Upper Hudson	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bald eagle (Haliaeetus leucocephalus)	Great Lakes	High Allegheny Plateau	Increasing
	High Allegheny Plateau	Lower New England Piedmont	Increasing
	Lower New England Piedmont	North Atlantic Coast	Decreasing
	North Atlantic Coast	Northern Appalachian/Boreal Forest	Increasing
	Northern Appalachian/Boreal Forest	St. Lawrence-Lake Champlain Valley	Increasing
	St. Lawrence-Lake Champlain Valley	Western Allegheny Plateau	Increasing
	Western Allegheny Plateau		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bald eagle (Haliaeetus leucocephalus)				
	all	Lacustrine	warm water deep	other
	all	Terrestrial	forested	mixed deciduous/coniferous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bald eagle (Haliaeetus leucocephalus)				
	Breeding	Terrestrial	coastal	beach/shoreline
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Riverine	deepwater river	mud bottom
	Feeding	Riverine	warmwater stream	other
	Roosting/Congregating	Terrestrial	coastal	beach/shoreline
	Roosting/Congregating	Terrestrial	forested	mixed deciduous/coniferous

Goal and Objectives for Bald Eagle

Goal: To ensure the perpetuation and broad distribution of the bald eagle, its essential habitat, and the ecosystems upon which it depends within New York State.

Objective 1 : Determine the current overall landscape baseline across NYS: including total miles/extent of roads, human-occupied landscapes (buildings, marinas, etc.), forests, grasslands, protected vs. unprotected areas, etc., and monitor changes periodically.

Measure: *An comprehensive assessment is completed showing what the current conditions are across NYS on a landscape level, which is conducted at least every 5 years with appropriate comparisons and statistics of change completed and reported.*

Objective 2 : Ensure protection for a minimum of 50% (25) of the occupied bald eagle territories within each NYS Ecozone (6), except the Atlantic Coast Zone.

Measure: *A minimum of 25 bald eagle nesting territories within each of the specified NYS Ecozones are protected in perpetuity, assuring future suitability to and utilization by, bald eagles.*

Objective 3 : Ensure the protection and management of at least12 bald eagle wintering habitats in New York (e.g. St. Lawrence River, Upper Delaware River, Mongaup River, Upper and Lower Hudson River) capable of supporting a minimum of 400 wintering eagles.

Measure: *Essential bald eagle wintering habitats are identified, protected, monitored and managed, and annual counts made documenting the minimum number of wintering bald eagles (400).*

Objective 4 : Establish at least 50 breeding pairs of bald eagles (occupied pairs) within each NYS Ecozone (6), except the North Atlantic Coast zone, achieving an average annual productivity of 1.0 young per occupied pair.

Measure: *Bald eagle nests are identified, monitored, mapped, and their productivity determined annually.*

Recommended Actions

Development rights acquisition:

* Pursue conservation easements or outright fee-acquisition of essential bald eagle habitats.

Easement acquisition:

* Pursue conservation easements or outright fee-acquisition of essential bald eagle habitats.

Educational signs:

* Develop signs/displays and post in essential habitat areas to inform public of need to protect the species and to limit behavior that would be disturbing.

Fact sheet:

* Prepare a landowner/contact pamphlet describing "what does it mean that eagles are using my land".
* Develop materials and post in essential habitat areas to inform public of need to protect the species and to limit behavior that would be disturbing.

Habitat management:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential bald eagle habitat or to the continued use of essential bald eagle habitats.

Habitat monitoring:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential bald eagle habitat or to the continued use of essential bald eagle habitats.

Habitat research:

* Conduct live-capture radio telemetry studies, as well as through field observations, to delineate essential bald eagle breeding and wintering habitats.

Life history research:

* Determine site-fidelity, familial relationships to habitat use, migratory patterns/pathways, and home-ranges of breeding and wintering NYS bald eagles.

Other acquisition:

* Pursue conservation easements or outright fee-acquisition of essential bald eagle habitats.

Other action:

* Ensure cooperation of rail companies (i.e. Amtrak, Metro North) who operate high-speed trains in the daily removal of carrion from RR tracks and the recovery of bald eagles and other raptors killed by such trains.

Recommended Actions

* Ensure that essential wintering and breeding habitats are adequately posted and patrolled, as needed: hire seasonals to be on site monitors when necessary, as at major wintering locations where human disturbance is a serious issue.
* Ensure that all essential bald eagle habitat information is submitted to and included within the Natural Heritage/BCD database and updated annually.

Other management plan:

* Prepare individual site management plans for each bald eagle breeding territory and major wintering habitat.

Population monitoring:

* Annually monitor and determine the number of wintering bald eagles in NYS.
* Annually monitor and determine the number of breeding bald eagles and their reproductive outcome.
* Conduct live-capture radio telemetry studies, as well as through field observations, to delineate essential bald eagle breeding and wintering habitats.
* Periodically sample NYS bald eagles for contaminant lodes (eggs, blood, carcasses); collect injured or dead eagles and determine causes of morbidity and mortality.

Private fee acquisition:

* Pursue conservation easements or outright fee-acquisition of essential bald eagle habitats.

State fee acquisition:

* Pursue conservation easements or outright fee-acquisition of essential bald eagle habitats.

State land unit management plan:

* Ensure needs of bald eagles are incorporated into all UMPs.

Statewide baseline survey:

* Initiate comprehensive, statewide survey of landscape level habitat characteristics and trends across NYS; updating at least every 5 years. (this in order to monitor overall habitat loss/alteration trends).
* Annually monitor numbers and distribution of breeding and wintering bald eagles in NYS.

References

see extensive bibliography within, especially, : New York State Bald Eagle Recovery Plan, Nye, 1987 and US Northern States Bald Eagle Recovery Plan, Grier et al 1983 and Nye et al 1998, as well as other numerous references available from Nye-DEC, 625 Broadway, Albany, NY 12233-4754.

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Taxa Group: Bird
Species Group: Barn owl

Threats:
Factors that contribute to species population decline in New York State include:
1) Changes in agricultural practices, i.e. "lessened availability of open farm structures for nesting and roosting and the decline in agricultural lands that support sufficiently high densities of small mammals" (Poole 1992). Screening used to keep Rock Dove (Columba livia) out of farm structures have deterred use by Barn Owls (NYSDEC 1994).
2) Lack of foraging habitat (NYSDEC 1994).
3) Competition for nest sites with other cavity nesters such as Wood Duck (Aix sponsa) and raccoon (Procyon lotor) (NYSDEC 1994).
4) Avian and mammalian predators of eggs and nestlings (NYSDEC 1994).
5) Automotive collisions also contribute to barn owl mortality (Poole 1992), probably due to their adaptability to and association with human developments.
6) A secondary factor may include occasional poisoning due to the use of pesticides in and around farmlands and structures (Poole 1992).

Limiting Factors: Presence of foraging and nesting habitat.
Although species can be migratory, cold winter temperatures seem to determine its northern breeding range.

Trends:
Historic distribution and abundance. Historically (prior to late 1960s) in Long and Staten Islands, Finger Lakes region, Hudson and Genesee Valleys, in Wayne and Monroe Counties along Lake Ontario and in lowlands of lakes Erie and Ontario (NYSDEC 1994).
Current distribution and abundance. Locally resident and migratory. "Very rare upstate to fairly common along the coast" (Bull 1998). Well-represented in Long and Staten Islands, Finger Lakes region, Hudson and Genesee Valleys, and in agricultural lands of northwestern Livingston County in western NY (NYSDEC 1994).
NYS Breeding Bird Atlas data shows alarming differences from the 1980-1985 to the 2000-2004 atlases, with far fewer blocks containing confirmed breeding pairs of Barn Owls in the most recent atlas.
No Breeding Bird Survey data is available for this species.

SEQR - No Action Alternative:
If no action is taken on the part of the Barn Owl, it is likely that its numbers will continue to drop, although not totally. The Barn owl is able to adapt to human-induced changes in the environment. However, foraging habitat such as large open grassland is becoming more scarce in this state and will ultimately impact the number of breeding Barn Owls.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Barn owl (Tyto alba)			S1S2		P	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Barn owl (Tyto alba)	SW Lake Ontario	Upper Hudson	Unknown
	Upper Hudson	Lower Hudson - Long Island Bays	Unknown
	Susquehanna		
	NE Lake Ontario - St. Lawrence		
	Lower Hudson - Long Island Bays		
	Delaware		
	SE Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Barn owl (Tyto alba)	St. Lawrence-Lake Champlain Valley	Lower New England Piedmont	Decreasing
	Lower New England Piedmont	North Atlantic Coast	Unknown
	North Atlantic Coast		
	Great Lakes		
	High Allegheny Plateau		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Barn owl (Tyto alba)				
	all	Terrestrial	coastal	other
	all	Terrestrial	open upland	grasslands
	Roosting/Congregating	Terrestrial	forested	southern coniferous

Recommended Actions

Captive breeding:

* 3) Especially in upstate regions, investigate feasibility of nest box programs and/or releases of captive-raised owls to restore local populations.

Habitat management:

* 2) Maintain and expand foraging habitats (e.g. dense grasslands) used by Barn Owls in southern New York, and protect occupied nest sites.

Habitat monitoring:

* 1) Document nesting locations, productivity, and foraging areas of Barn Owls in New York.

Other action:

* 4) Determine whether pesticide use poses a threat to Barn Owls in New York. Monitor rodent populations (e.g. meadow vole) in conjunction with owl populations since Barn Owls seem to take up residence wherever prey abundance is high and suitable nesting habitat is present (NYSDEC 1994).
* 5)Cooperate with NYS farmers and grassland owners to establish best possible nesting and foraging opportunities for the Barn Owl, especially in areas where they are already known to breed.

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Taxa Group: Bird
Species Group: Beach and Island ground-nesting birds

Threats:
Habitat loss due to the prevention of storm-induced overwash events, the use of suitable nesting areas for beach-related recreational activities, and development on and adjacent to nesting and foraging habitat. In-season habitat disturbance by beach grooming operations, beach driving, boat landing and flooding prevent the establishment of nests and reduce the viability of established nests. Nest predation can be very high, particularly from fox, crow, raccoon, opossum, Norway rat and most recently, American oystercatcher. Predation of chicks by cat, gull, raccoon, fox and crow limits productivity of successfully nesting birds. Ghost crabs have also recently appeared on the South Shore of Long Island and have been suspected of taking chicks and/or eggs from shorebird nests. Other threats to island-nesting birds include rising sea level and erosion, which has reduced the area available for nesting in locations such as Jamaica Bay and Shinnecock Bay. Roseate terns have only two active breeding colonies and Caspian terns have only one active breeding colony in New York. Any severe storm or major disturbance/predator event at one of these three colonies during the breeding season would be disastrous.

Trends:
For piping plover, steadily increasing over past two decades, partially due to increased survey intensity during years immediately following Federal and State listing combined with protective efforts on public beaches. The number of active plover nesting sites has been increasing. Least and Common Terns have been decreasing over the past five years. Black skimmers and American oystercatchers have highly variable populations, partially due to less accurate censuses. Roseate terns have been fairly stable for the past five years, though the number of breeding locations has declined in recent years, with Great Gull Island and Fort Tyler (Gardiners Point Island) as the only stable breeding locations in all of New York. Caspian tern are restricted to a single breeding colony on Little Galoo Island, where there numbers have been trending upwards.

SEQR - No Action Alternative:
Without active management, piping plover, black skimmer and least tern populations would decline. Allowing uncontrolled access by vehicles, beach grooming and sand moving equipment would essentially remove all plover and tern nesting from recreational beaches. Plover would be restricted to smaller private beaches and least terns would largely be confined to isolated bay island breeding locations. Common terns could remain stable as long as marsh islands remain high enough above sea level to provide nesting substrate. As sea level continues to rise and erosion of historical breeding islands continues, suitable nesting sites of both Common and Roseate terns are likely to decrease, exposing both species to a higher likelihood of drastic population declines as the few remaining breeding locations contain a higher proportion of the entire population. A single predator at Great Gull Island could effectively impact over 60% of the entire Long Island breeding population of Common terns and over 95% of the breeding population of Roseate terns in New York. American oystercatchers have managed to maintain and/or expand their numbers with minimal protection or management on their behalf.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Caspian tern (Sterna caspia)			S1	G5	P	Migratory
Black skimmer (Rynchops niger)			S2	G5	P SC	Migratory

Least tern (Sterna antillarum)		X	S3B	G4	T	Migratory
Common tern (Sterna hirundo)		X	S3B	G5	T	Migratory
Roseate tern (Sterna dougallii)	E		S1B	G4	E	Migratory
American oystercatcher (Haematopus palliatus)			S3	G5	P	Migratory
Piping plover (Charadrius melodus)	T		S3B	G3	E	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Piping plover (Charadrius melodus)	SE Lake Ontario	Atlantic Ocean - NY Bight	Increasing
	Atlantic Ocean - NY Bight	Lower Hudson - Long Island Bays	Increasing
	Lower Hudson - Long Island Bays		
American oystercatcher (Haematopus palliatus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Stable
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Increasing
Roseate tern (Sterna dougallii)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Common tern (Sterna hirundo)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
Least tern (Sterna antillarum)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Black skimmer (Rynchops niger)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Stable
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
Caspian tern (Sterna caspia)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Piping plover (Charadrius melodus)	Great Lakes	North Atlantic Coast	Increasing
	North Atlantic Coast		
American oystercatcher (Haematopus palliatus)	North Atlantic Coast	North Atlantic Coast	Stable
		Lower New England Piedmont	Increasing
Roseate tern (Sterna dougallii)	North Atlantic Coast	North Atlantic Coast	Decreasing
Common tern (Sterna hirundo)	Great Lakes	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
Least tern (Sterna antillarum)	North Atlantic Coast	North Atlantic Coast	Decreasing
Black skimmer (Rynchops niger)	North Atlantic Coast	North Atlantic Coast	Stable
Caspian tern (Sterna caspia)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Piping plover (Charadrius melodus)				
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	maritime	beach/shoreline
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Estuarine	intertidal	sand/gravel
	Feeding	Marine	intertidal	sand/gravel
	Feeding	Marine	intertidal	shoreline
	Feeding	Terrestrial	maritime	beach/shoreline
American oystercatcher (Haematopus palliatus)				
	Breeding	Terrestrial	coastal	beach/shoreline

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American oystercatcher (Haematopus palliatus)				
	Breeding	Terrestrial	maritime	beach/shoreline
	Feeding	Marine	intertidal	mudflats
	Feeding	Marine	intertidal	sand/gravel
	Feeding	Terrestrial	maritime	beach/shoreline
Roseate tern (Sterna dougallii)				
	Breeding	Terrestrial	maritime	beach/shoreline
	Breeding	Terrestrial	maritime	cultural
	Feeding	Marine	shallow subtidal	pelagic
Common tern (Sterna hirundo)				
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	maritime	beach/shoreline
	Feeding	Lacustrine	cold water shallow	pelagic
	Feeding	Marine	shallow subtidal	pelagic
Least tern (Sterna antillarum)				
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	maritime	beach/shoreline
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
Black skimmer (Rynchops niger)				
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	maritime	beach/shoreline
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
Caspian tern (Sterna caspia)				
	Breeding	Terrestrial	coastal	beach/shoreline

Goal and Objectives for Beach and Island ground-nesting birds

Goal: Increase numbers and annual productivity of rare beach-nesting species and maintain populations of all beach-nesting species at or near population objectives.

Objective 1 : Increase or maintain number of breeding locations for each species

Measure: *Through annual surveys of breeding habitat, determine number of active breeding locations for each species*

Objective 2 : Protect beach-nesting bird habitats

Measure: *Through review of project proposals, work to establish a goal of no net loss of beach-nesting bird habitat*

Objective 3 : Raise awareness of habitat needs of beach breeding species

Measure: *Increase number of local cooperators assisting in management of beach breeding species.*

Objective 4 : Reduce predation at breeding locations

Measure: *Through annual assessment of productivity, achieve an increase in the 5 year average of productivity for each species that is currently declining.*

Recommended Actions

Easement acquisition:

* Protect nesting and foraging habitat and associated upland buffers through acquisition, easement and through regulatory constraints on development.

Educational signs:

* Post interpretive signage at all public nesting locations.

Fact sheet:

* Update Endangered Species fact sheets to reflect current status of species in New York.

Habitat management:

* Encourage the establishment of nesting and foraging populations by protecting newly created suitable habitat produced as a result of overwash and/or breaches with symbolic fencing and posting.
* Encourage and support a "no net increase" in shoreline armoring along Long Island bays and harbors.
* Encourage compliance with the recommendations for habitat and recreation management contained within Federal and State Recovery Plans for beach-nesting species.
* Encourage landowners to control predators that represent significant threats to the viability of species at risk. Options to be considered include control of predators through contact with a licensed nuisance wildlife control person, allowing hunting and/or trapping during legally specified seasons and habitat modification to remove roosting or denning sites of nest predators. It is recommended that the mechanism for predator control by landowners be done in consultation with DEC.
* Where possible, protect nesting areas from human disturbance by posting, electric fencing and symbolic fencing. Also, control density and composition of vegetation at breeding sites to maintain suitability for nesting. Accomplished through planting of fresh spoil sites with desired species and grading and/or spoil deposition at sites where vegetation has become to dense.

Recommended Actions

Habitat research:

* Support and encourage habitat research projects that would help define preferred habitat in order to guide restoration efforts and focus habitat protection efforts.
* Assess beach driving activities, locations and impacts.

Habitat restoration:

* Encourage the reestablishment of roseate tern colonies at suitable and historic sites throughout Long Island.
* Encourage and support policies that purchase storm-damaged homes within the coastal erosion hazard area for the purposes of beach and dune habitat restoration.
* Where possible, reestablish high quality foraging habitats by either manufacturing sand flats, mudflats or overwash fans or allowing such formations to build naturally. Also, ephemeral pool creation adjacent to beach nesting habitat will be pursued. Where possible, nesting habitat will be expanded to create new nesting opportunities for species. This will be accomplished through dredge spoil management, input into beach renourishment projects and de-vegetation of formally suitable sites.

Life history research:

* Support research that addresses priorities established in species Recovery Plans (Piping plover and Roseate tern), the Tern Management Handbook (Kress and Hall, 2002) and similar planning documents currently being prepared through interstate and interagency working groups.

Other action:

* Minimize and mitigate habitat impacts from development and public works projects by pursuing a goal of no net loss of habitat at a project location.
* Establish and /or maintain enforcement of no-work windows within breeding habitats during the breeding season (April 1 - September 1 on Long Island).
* Educate the public on the impacts of domestic cats on birds and encourage landowners to keep their cats indoors.
* Secure funding to initiate new beach-dependent species programs.

Population monitoring:

* Annual surveys will track population status at known breeding locations.

Regional management plan:

* Develop a long term management plan that establishes population objectives for all beach-dependent breeding birds and management recommendations to achieve them.

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Taxa Group: Bird
Species Group: Boreal forest birds

Threats:
Boreal forest species of concern include: spruce grouse (Falcipennis canadensis), American three-toed woodpecker (Picoides tridactylus), olive-sided flycatcher (Contopus cooperi), bay breasted warbler (Dendroica castanea), rusty blackbird (Euphagus carolinus), Cape May warbler (Dendroica tigrina), Tennessee warbler (Vermivora peregrina).

The spruce grouse is endangered in NY and Bicknell's thrush is special concern.

In NY threats include: lack of forest management and forest structural diversity on Forest Preserve lands, loss of boreal/conifer habitats, insect and disease outbreaks, acid rain and global warming.

When looking at this diverse list of species, it would appear to be a daunting task to do research or manage for all of these species. A more workable approach is to select "focus" species to be the primary driving force, while trying not to forget the diversity of the group as a whole. To do this, a number of factors need to be considered.

Focus species include spruce grouse and olive-sided flycatcher.

Spruce grouse populations in NYS have declined to a very low level and long term viability of the population is in question. One primary factor in declines is the maturation of the forest, in particular in the Forest Preserve where forest management is prohibited. Spruce grouse prefer a mixture of older and younger coniferous forest. Without forest management to simulate this habitat type this species habitat has become spotty and patchy leading to isolation and eventual extirpation of local populations. Acid rain could also be playing a role by stressing coniferous forests.

Olive-sided flycatchers are declining by - 6.3%/year (1966-2002) in New York. This is a very dramatic decline. This species is also declining by - 3.4 %/year across its range. Olive-sided flycatchers prefer openings in conifer stands with residual standing snags for singing perches. One primary factor in declines is the maturation of the forest, in particular in the Forest Preserve where forest management is prohibited. Without forest management t to create openings, their habitat is decreasing. The range wide decline suggests there are other factors involved, such as acid rain, or pesticide use. Causes for declines need to be determined.

The effects of deforestation of conifer forests is beginning to subside as NY's forests, and in particular NY Forest Preserve lands mature. Conifer forests (outside of plantations) are still probably not as extensive as in pre-European times. Acid rain could be having serious impacts on conifer forests in areas where soils have low buffering ability and at higher elevations in the Adirondacks. Global warming could also have a detrimental impact on NY's boreal and conifer forests over time. Fire suppression could be a factor limiting some habitat types.

The setting aside of over 3.2 million acres in Forest Preserve should help many of the species in this suite as these forests mature and change back to more natural communities. Species that prefer openings or disturbance will not benefit from mature preserve forests and will need natural disturbance, or will be more abundant on private lands open to forest management.

With the maturing of NY's forests, it is understandable why species that rely on early successional boreal forests are declining. Intermediate forest conditions seem to be doing quite well. Mature forest boreal species is the most puzzling result. With over 3 million acres in forest preserve (which can not be cut), and many older plantations, it is puzzling why mature boreal forest species would be declining more in NY than in other areas of the Northeast that undergo more extensive softwood harvesting.

Trends:

Historic distribution and abundance.

The historic range and distribution of the species in this suite is not as well known as the other suites due to the remoteness of many of their core habitats. Some of the species in this suite were probably more common prior to the extensive logging of the conifer forests in the 1800's and early 1900's. Construction of hydroelectric power and flood control dams that flooded large tracts of lowland spruce/fir forest also likely played a role (BB Atlas). Planting of plantations of pine and spruce during the early to mid 1900's probably provided new habitat for those species able to make use of these forest types.

Current distribution and abundance.

The current distribution is probably beginning to return to historic levels. As forests mature some species will be favored as others that prefer openings or gaps continue to decline. As forest structure in Forest Preserve lands returns to the form it had prior to extensive unregulated logging, the distribution of these species should continue to return to a more natural state. This could mean that some species, especially those that prefer early successional conifer forests, will become even rarer, or be extirpated without active intervention. Extensive conifer plantations offer a new habitat type and may have widened the distribution of some species. Effects of acid rain may be starting to negatively influence distribution and abundance.

Post (2004) completed an analysis of Breeding Bird Survey (BBS) data (Table 1). For boreal species, the trend was less consistent than for the other habitat suites. Six of the 14 species (43 %) were declining in NY (only 2 species showed positive trends and 6 showed no significant trend). In contrast, 8 species showed increasing trends in USFWS Region 5, and 6 species survey-wide. Only 16 % (3/16) of the species were declining in USFWS Region 5, while 31 % (5/16) were declining survey-wide. There is much greater between-geographic-area variation in the percent of declining species and numbers of increasing species for this suite than any other. The majority of species show no significant declines. A closer look at what is happening in NY appears warranted.

A closer look at these boreal species shows that when species favoring early successional boreal forests are examined separately, 60 % (3/5) of the species in NY are declining, with 33 % of the species declining in USFWS Region 5 and survey-wide. None of the intermediate/general species in NY and USFWS Region 5 were declining (0/6), but 33 % (2/6) were declining survey-wide. All (3/3) of the mature boreal forest species were declining in NY, but only 25 % (1/4) were declining in USFWS Region 5 and survey-wide.

Some of these differences are surprising. NY has over 3.2 million acres of Forest Preserve (no forestry allowed) in the Adirondacks, yet all the mature forest boreal species are declining. Logging in much of the northern forest outside of New York is more intensive than in NY. This would seem to suggest that NY's "mature" forest species should be doing well in comparison, yet they are not. Why NY has such a high percent of species declining when compared to the entire USFWS Region 5 is unexplained, perhaps influences of acid rain are more profound in NY, or it may be an artifact of inadequate monitoring across all habitats. It's also possible that our understanding of the forest structure preferred by some of these species is not precise.

Boreal forest species population trends as a whole show less consistency within the suite than the other habitat suites. In NY, 43% of the boreal forest species (6/14) are declining (Post 2004). Only 16 % are declining in USFWS Region 5 and 31 % are declining range wide. The other species suites do not show these substantial discrepancies between regions. Further, 60 % (3/5) of the boreal species that show a preference for early successional habitats are declining in NY, 100 % (3/3) of the species preferring mature forest are declining, and none (0/6) of the species that prefer an intermediate stage are declining. Some of these apparent declines may be due in part to insufficient BBS routes to precisely determine trends. Only 8 of the 16 species assessed showed significant trends (Post 2004). This means 8 species had no significant trend (a much higher percent than for other habitat suites), and therefore may have somewhat biased the percent species declining towards a lower number. More intensive monitoring is needed to determine the actual trend of these species.

Of these species in the boreal species suite, several are sufficiently rare that their current status is uncertain. These include: spruce grouse, A. three-toed woodpecker, black-backed woodpecker, bay breasted warbler, rusty blackbird, as well as a species that did not make the BCR lists but appears to be of concern in NY: gray jay (-40 %/ yr 1966-2002).

Most of the species in this suite appear to be increasing or stable. Those that are declining tend to be declining at a very rapid rate (see Table 1.)

Table 1

BBS TREND DATA FOR BOREAL FOREST BIRDS (1966-2002, % change per year)

Species	Total percent decline in NY, 1966-2002	NY	USFWS Region 5	Survey Wide
Boreal chickadee		- 6 (ns)	+ 6	-2 (ns)
Ruby-crowned kinglet	88%	- 6.4	- 1.8 (ns)	- 0.9
Gray jay	>99%	- 40 (ns, p= .11)*	+ 10 (ns)	+ 4.8 (ns)
Cape May warbler	95%	- 8.8 (ns, p=0.11)*	- 7.1	+ 0.8 (ns)
Bay-breasted warbler	99%	- 13.6	+ 0.1 (ns)	- 2.6 (ns)
Lincoln sparrow	75%	- 4	+5.8 (ns, p=0.12)**	+ 1.9
Rusty blackbird		+ 4 (ns)	+ 9 (ns)	- 10.1
Olive-sided flycatcher	90%	- 6.3	- 2.6	- 3.4
White-throated sparrow		- 1.1 (ns)	- 1.9	- 1.8
Yellow-bellied flycatcher		+ 6.4	+ 5.6	+ 2.1
Palm warbler		NA	+ 29 (ns, p=0.14)**	+ 3.9
Pine siskin		0.1 (ns)	+ 1.1 (ns)	- 1.8
Red crossbill		NA	+ 11.2	- 0.7 (ns)
Winter wren		+ 2.5 (ns)	+ 1.8	+ 2.7
Magnolia warbler		+ 2	+ 3.5	+ 1.4
Northern parula		+ 3.4 (ns)	+ 2.1	+ 0.8
Species with positive trend		2	8	6
Species with negative trend		6	3	5
Species with ns trend		6	5	5
% of species in decline*		43 ** (6/14)	16 *** (3/16)	31 (5/16)

NA = no BBS trend data available

ns = not a statistically significant ($p < 0.1$) trend (includes abundant species whose trend estimate is close to 0, and species which have larger trend estimates, but which are not detected by BBS in sufficient numbers to determine a significant trend).

* calculated as: number of species declining ÷ total number of species.
** percent includes 2 species with p= 0.11
*** percent includes 1 species with p= 0.14 and 1 with p=0.12

Percent Boreal Species Declining by Habitat

	NY	USFWS Region 5	Survey wide
Early successional	60 (3/5)	33 (2/6)	33 (2/6)

General/Intermediate	0 (0/6)	0 (0/6)	33 (2/6)
Mature forest	100 (3/3)	25 (1/4)	25 (1/4)

SEQR - No Action Alternative:

If no action is taken, it is probable that species such as Olive-sided Flycatcher, and Spruce Grouse will decline in areas where logging is prohibited (Forest Preserve), due to their preference of regenerating and young coniferous forest, and forest openings. Spruce grouse is likely to be extirpated within the next 20 years without active intervention and management. Other populations of species that prefer mature boreal forest will likely remain stable, although the effects of acid rain could negatively impact them.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Cape May warbler (Dendroica tigrina)			S2		P	Migratory
Tennessee warbler (Vermivora peregrina)			S2		P	Migratory
Rusty blackbird (Euphagus carolinus)			S3	G5	P	Resident
Bay-breasted warbler (Dendroica castanea)			S2	G5	P	Resident
Olive-sided flycatcher (Contopus borealis)					P	Migratory
Three-toed woodpecker (Picoides tridactylus)			S2	G5	P	Resident
Spruce grouse (Falcipennis canadensis)			S2	G5	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spruce grouse (Falcipennis canadensis)	Unknown	Lake Champlain	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Upper Hudson	Decreasing
Three-toed woodpecker (Picoides tridactylus)	Unknown	Lake Champlain	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
Olive-sided flycatcher (Contopus borealis)	Unknown	Lake Champlain	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bay-breasted warbler (Dendroica castanea)	Unknown	NE Lake Ontario - St. Lawrence	Decreasing
		Lake Champlain	Decreasing
		Unknown	Decreasing
Rusty blackbird (Euphagus carolinus)	Unknown	Lake Champlain	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
Tennessee warbler (Vermivora peregrina)		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
		Lake Champlain	Unknown
Cape May warbler (Dendroica tigrina)		Lake Champlain	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spruce grouse (Falcipennis canadensis)	Unknown	Northern Appalachian/Boreal Forest	Decreasing
Three-toed woodpecker (Picoides tridactylus)	Unknown	Northern Appalachian/Boreal Forest	Unknown
Olive-sided flycatcher (Contopus borealis)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
Bay-breasted warbler (Dendroica castanea)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
Rusty blackbird (Euphagus carolinus)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Tennessee warbler (Vermivora peregrina)		Northern Appalachian/Boreal Forest	Unknown
Cape May warbler (Dendroica tigrina)	Unknown	Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spruce grouse (Falcipennis canadensis)				
	Breeding	Terrestrial	forested	northern coniferous
Three-toed woodpecker (Picoides tridactylus)				
	all	Terrestrial	forested	northern coniferous
Olive-sided flycatcher (Contopus borealis)				
	Breeding	Terrestrial	forested	northern coniferous
Bay-breasted warbler (Dendroica castanea)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous
Rusty blackbird (Euphagus carolinus)				
	Breeding	Palustrine	mineral soil wetland	shrub swamp
	Breeding	Terrestrial	forested	northern coniferous
Tennessee warbler (Vermivora peregrina)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous
Cape May warbler (Dendroica tigrina)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous

Goal and Objectives for Boreal forest birds

Goal: Maintain the greatest diversity possible of viable populations of boreal forest birds.

Objective 1 : Complete an inventory and analysis of the distribution and abundance of boreal species.

Measure: *Inventory and analysis of the distribution and abundance of boreal species completed.*

Objective 2 : Determine causes for declines for species known to be declining.

Measure: *Plan for research completed and causes determined.*

Objective 3 : Determine management options for stabilizing declining species.

Measure: *Management plan completed.*

Objective 4 : Develop a long term monitoring program to determine population trends and distributions of boreal species.

Measure: *Monitoring program implemented.*

Recommended Actions

Habitat management:

* Cooperate with private landowners to encourage land management strategies that favor spruce grouse, olive-sided flycatcher and other species dependent on early successional boreal forests.

Habitat monitoring:

* Conduct field studies to determine causes for declines of species known to be declining.

Habitat research:

* Complete an inventory and analysis of the distribution and abundance of boreal species.

Population monitoring:

* Develop a long term monitoring program to determine population trends of boreal forest birds.

State land unit management plan:

* Review Department wildfire management for Forest Preserve lands.

References

The Atlas of Breeding Birds in NYS. Andrle and Carroll, editors. Cornell University Press.

Bull's Birds of NYS. 1998. Emanuel Levine, editor. Comstock Publishing.

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Taxa Group: Bird
Species Group: Breeding waterfowl

Threats:

Viable breeding populations of these species occur in limited areas of New York State, and available data suggest changing or uncertain distributions during the past 20 years. However, available data are inadequate to reliably assess population status and/or limiting factors.

Black ducks have a relatively wide distribution in New York, but their numbers have declined dramatically (probably >90% for breeding populations) over the past 50 years. The principal potential threats are interactions with mallards (e.g., competition, displacement, inter-breeding or hybridization) and over harvest. Potential impacts of mallards may be most important but least understood, although most of the effect may have occurred decades ago. Mallard stocking by DEC in the1950s may have contributed to the black duck decline, and continued releases of captive-reared mallards by shooting preserves, game bird breeders and others may affect prospects for recovery in New York. Breeding habitat loss is not currently known to be a problem in upstate New York, but continued loss or degradation of coastal marshes on Long Island may contribute to further decline of this species.

Common goldeneye is an uncommon cavity-nesting species whose apparent range (based on Breeding Bird Atlas data) seems to have shifted since the 1980s for unknown reasons. They occur only in the Adirondacks and on Lake Champlain, but documented breeding locations are limited. This species could be affected by clearing of mature forest near lakes and ponds in the Adirondacks, by intensive recreational activity near nesting areas, or by contaminants (e.g., mercury) in their diet, either locally or in migration and wintering areas.

Blue-winged teal typically nest in grasslands and open fields near wetlands, with highest densities in the St. Lawrence Valley and Great Lakes Plains of New York. Agricultural practices that affect availability and use of grasslands for nesting is likely the principal factor affecting this species in New York. Predation during the nesting season may also be limiting reproductive success of this species in New York. Harvest of blue-winged teal is typically very low because most migrate south before duck hunting seasons open.

Ruddy ducks are an uncommon breeding species in New York, with Jamaica Bay and Montezuma being the principal breeding locations known for many years. Recent breeding bird atlas data suggest expanding distribution upstate, but disappearance or decline on Long Island. Causes of the decline on LI are unknown, but may include loss or degradation of emergent marsh habitat due to various factors.

Trends:

Breeding Bird Survey data suggest an annual decline of -4.4%/year for black duck abundance in New York, and an annual decline of -5.2% for blue-winged teal, between 1966 and 2003, whereas mallards increased +14.4%/year over the same period. BBS data are not available for common goldeneye or ruddy duck. Breeding waterfowl surveys conducted in New York since 1989 show no clear trend for black ducks or blue-winged teal, but estimates are imprecise (e.g., ranging from 2,500-11,000 pairs of black ducks annually) and average approximately 5,500 pairs of black ducks and less than 5,000 pairs of blue-winged teal statewide. Population estimates are not available for common goldeneye or ruddy ducks breeding in New York. Breeding Bird Atlas data suggest that distribution of black ducks and blue-winged teal is more limited now than 20 years ago, while the number of goldeneye breeding locations has remained about the same and ruddy ducks appear much more common. Winter counts of black ducks and common goldeneye in New York and the Atlantic Flyway indicate lower numbers of both species than in the 1950s, but relatively stable numbers during the past 30 years. Winter counts of ruddy ducks in NY have increased during the past 30 years. However, winter counts include many birds from more northern breeding areas and may not be a good indicator of nesting populations in New York.

SEQR - No Action Alternative:

Without the above actions, the status of black duck, blue-winged teal and common goldeneye will remain uncertain at best and in jeopardy of further decline or disappearance over the long term. Ruddy ducks seem secure at a statewide level but it's future on Long Island is uncertain without knowledge of factors causing their decline in that region, and actions to address potential threats.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ruddy duck (Oxyura jamaicensis)			S1		P	Migratory
Blue-winged teal (Anas discors)					P	Migratory
Common goldeneye (Bucephala clangula)			S2	G5	G	Migratory
American black duck (Anas rubripes)			S4	G5	G	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American black duck (Anas rubripes)	Allegheny	Lake Champlain	Decreasing
	Delaware	NE Lake Ontario - St. Lawrence	Decreasing
	Lake Champlain	Upper Hudson	Decreasing
	Lake Erie	Lower Hudson - Long Island Bays	Unknown
	Lower Hudson - Long Island Bays		
	NE Lake Ontario - St. Lawrence		
	SE Lake Ontario		
	Susquehanna		
	SW Lake Ontario		
	Upper Hudson		
Common goldeneye (Bucephala clangula)	Lake Champlain	Lake Champlain	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Blue-winged teal (Anas discors)	Allegheny	SW Lake Ontario	Decreasing
	Delaware	Lake Erie	Decreasing
	Lake Champlain	SE Lake Ontario	Decreasing
	Lake Erie	Allegheny	Decreasing
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Decreasing
	NE Lake Ontario - St. Lawrence	Lake Champlain	Decreasing
	SE Lake Ontario		
	Susquehanna		
	SW Lake Ontario		
	Upper Hudson		
Ruddy duck (Oxyura jamaicensis)	SE Lake Ontario	SW Lake Ontario	Increasing
	Lower Hudson - Long Island Bays	SE Lake Ontario	Increasing
		Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American black duck (Anas rubripes)	Great Lakes	Northern Appalachian/Boreal Forest	Decreasing
	High Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest		
	St. Lawrence-Lake Champlain Valley		
	Western Allegheny Plateau		
Common goldeneye (Bucephala clangula)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blue-winged teal (Anas discors)	Great Lakes	St. Lawrence-Lake Champlain Valley	Decreasing
	High Allegheny Plateau	Western Allegheny Plateau	Decreasing
	Lower New England Piedmont	Great Lakes	Decreasing
	North Atlantic Coast		
	Northern Appalachian/Boreal Forest		
	St. Lawrence-Lake Champlain Valley		
	Western Allegheny Plateau		
Ruddy duck (Oxyura jamaicensis)	North Atlantic Coast	Great Lakes	Increasing
	Great Lakes	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American black duck (Anas rubripes)				
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Lacustrine	warm water shallow	pond/lake shore
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Breeding	Riverine	warmwater stream	marsh
Common goldeneye (Bucephala clangula)				
	Breeding	Lacustrine	unknown	unknown
Blue-winged teal (Anas discors)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Breeding	Terrestrial	open upland	grasslands
Ruddy duck (Oxyura jamaicensis)				
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Palustrine	mineral soil wetland	emergent marsh

Goal and Objectives for Breeding waterfowl

Goal: Maintain viable breeding populations of all native waterfowl species that have historically nested in New York on a regular basis.

Objective 1 : Maintain viable breeding populations of black ducks in New York, with a minimum of 1,000 pairs nesting on Long Island and 4,000 pairs nesting in the Adirondacks.

Measure: *Breeding pair estimates in the Adirondack and Long Island regions of New York.*

Objective 2 : Maintain viable breeding populations of blue-winged teal in New York, with a minimum of 5,000 pairs nesting in the St Lawrence Valley and Lake Plains regions of New York.

Measure: *Breeding pair estimates in the St Lawrence Valley and Great Lakes Plains regions of New York.*

Objective 3 : Maintain viable breeding populations of common goldeneye in New York, with a minimum of 100 pairs nesting in the Adirondacks, and 50 pairs in the Champlain Valley.

Measure: *Breeding pair estimates in the Adirondack and Champlain Valley regions of New York.*

Recommended Actions

Habitat management:

* Encourage land use practices, including small wetland protection/restoration and maintenance of grassland habitats for nesting blue-winged teal in the St. Lawrence Valley and Lake Plains regions of New York.
* Install nest boxes to increase populations or productivity of common goldeneye in appropriate locations in the Adirondacks or Champlain Valley.
* Maintain or increase abundance and suitability of emergent marsh habitats for breeding black ducks in the Adirondack region of the NE Lake Ontario-St. Lawrence, Lake Champlain, and Upper Hudson watersheds.
* Maintain or enhance approximately 25,000 acres of potential black duck breeding habitat in coastal areas of Lower Hudson/Long Island watershed, including protection and management of upland buffer areas.

Habitat research:

* Conduct field studies to document critical habitats for black ducks breeding in the Lower Hudson/Long Island watershed.

Life history research:

* Investigate potential impacts of captive-reared mallard releases by shooting preserves and game bird breeders on black duck populations.
* Conduct field studies to document life history and habitat use by blue-winged teal breeding in the St. Lawrence Valley and Great Lakes Plains regions of New York.

Recommended Actions

Modify regulation:

* Establish hunting regulations that will not adversely affect long-term status of waterfowl species breeding in New York.

Population monitoring:

* Conduct annual statewide breeding waterfowl surveys to derive breeding pair estimates (±25%) for black ducks, blue-winged teal and other more common breeding waterfowl species.

Statewide baseline survey:

* Conduct more intensive surveys for common goldeneye in the Adirondacks and Champlain Valley to estimate overall abundance, document habitat use and design a long-term monitoring program (e.g., every 5 years).
* Conduct more intensive surveys for breeding black ducks and blue-winged teal in appropriate regions of New York to estimate overall abundance, document habitat use and design a long-term monitoring program (e.g., every 5 years).

References

North American Waterfowl Management Plan (2004 Update) and draft focus area plans for Great Lakes - St.Lawrence Valley and Atlantic Coast regions.

Breeding waterfowl population estimates for 1989-2004 - unpublished data in DEC files (B. Swift)

Breeding Bird Survey - data at http://www.mbr-pwrc.usgs.gov/bbs/

NYS Breeding Bird Atlas (1980-85 and 2000-2004) - data at http://www.dec.state.ny.us/apps/bba/results/index.cfm

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Taxa Group: Bird
Species Group: Colonial-nesting herons

Threats:
Loss of foraging and breeding habitat due to human activity is the most critical threat for these species. Loss or modification of wetland habitat affects breeding and foraging for all species throughout the state. On Long Island, loss of maritime shrub and grassland habitat is an additional threat. Many species (Snowy Egret, Little Blue Heron, Tricolored Heron, Yellow-crowned Night Heron, Glossy Ibis) nest exclusively or almost entirely in the Lower Hudson-Long Island Bay Basins of the North Atlantic Coast Ecoregion. Only the Great Egret and Black-crowned Night Heron have substantial breeding populations in upstate New York. Competition for nesting habitat with other waterbird species has the potential to alter colony species composition and locations. Further, of the species breeding in the North Atlantic Coast Ecoregion, the Tricolored Heron, Yellow-crowned Night Heron and the Glossy Ibis are at or close the northern limit of their breeding ranges. Detailed information on the breeding biology and foraging ecology of all of these species for New York State is incomplete or unavailable, particularly for Little Blue Heron, Tricolored Heron and Snowy Egret. Such information is important for population management efforts, and especially so for species whose numbers appear to be declining or that are breeding near range limits.

Trends:
Population trends (numbers of colonies, colony size, colony distribution) vary significantly among species of colonially nesting herons and egrets. The Long Island Colonial Waterbird Survey of the New York State Department of Environmental Conservation and the New York City Audubon Society's Harbor Herons Nesting Survey collectively provide the longest-term population information from which trends can be deduced. These data have permitted the assessment of trends for this study over the interval 1985 – 2004. An interesting characteristics of all of these species is the generally high level of variation in nesting numbers among years, providing additional evidence that the long-term population dynamics of herons are complexly non-linear (see McCrimmon et al. 1997). There is also evidence (Erwin 1979, Erwin and Korschgen 1979) of historically (e.g., 1970s) higher breeding numbers of some of these species (e.g., Black-crowned Night Herons, Snowy Egret; Parsons Pers. Comm.) in the North Atlantic Coast Ecoregion than is currently the case, though the length of time prior to the 1970 those numbers had been higher is difficult to determine.

Great Egret: 1988 BBA (Breeding Bird Atlas) assessment suggested a stable population statewide (Peterson in Andrle and Carroll 1988). Species has extended its range upstate to the Niagara and Lake Champlain Basins, where they have bred in small but increasing numbers (NYSDEC 2004a, Griffith in Levine 1998, Kandel Pers. Comm.). Data from Long Island/Metropolitan New York shows that the species has increased significantly in that region since 1985, though with greater variability in breeding numbers in recent years (Sommers et al. 2002, Kerlinger 2004, NYSDEC 2004b).

Snowy Egret: Long Island and New York Harbor populations have declined significantly since 1985 (Sommers et al. 2002, Kerlinger 2004, NYSDEC 2004b) consistent with declines reported in the mid-1990s (Griffith in Levine 1998). Interim 2000-2003 BBA data indicates possible expansion of breeding range to the Niagara Basin (NYSDEC 2004a).

Little Blue Heron: Although some have claimed a stable population downstate (Lauro in Levine 1998), since 1985 the species has declined significantly in the region (Sommers et al. 2002, Kerlinger 2004, NYSDEC 2004b). Species bred in small numbers on islands on northeastern side of Staten Island in mid-1990's (NYC Audubon Society). 2000-2003 BBA data indicates possible breeding range expansion into Tompkins County upstate (NYSDEC 2004a).

Tricolored Heron: On Long Island and Metropolitan New York, populations may be stable (Lauro in Levine 1998). This is generally confirmed with data from 1985 onwards (Sommers et al. 2002, Kerlinger 2004, NYSDEC 2004b) but the number of breeding birds is extremely small, generally less than 20 pairs and as low as 3 pair in 2004, as the species is at the northern portion of its breeding range.

Black-crowned Night Heron: In mid-20th Century, loss of wetlands, intentional colony destruction, and pesticide contamination greatly reduced the breeding population in downstate New York (Marcotte 1998). In the mid-1990s, more than 50 percent of the State's population nested on the Harbor Herons complex of islands northwest of Staten Island (NYC Audubon Society). Colonies upstate along the upper and lower Hudson Valley, the Lake Champlain Valley, eastern Lake Ontario, throughout Central New York and along the Niagara River had declined significantly by the 1970s, attributed to the loss of wetland habitat (Levine in Andrle and Carroll 1988). Compared to the mid-1980s, currently numbers of colonies appear to be stable in the Lake Champlain Basin, increasing in the NE Lake Ontario - St. Lawrence and Lake Erie Basins, and decreasing in the SE and SW Lake Ontario, Lake Erie and Lower Hudson - Long Island Bays Basins (Sommers et al. 2002, Kandel Pers. Comm. Kerlinger 2004, NYSDEC 2004a,b).

Yellow-crowned Night Heron: Breeding entirely confined to the Lower Hudson - Long Island Bays Basin. Compared with the mid 1980s, new colonies of this species were established on the Hudson River and islands northwest of Staten Island (NYSDEC 2004a). Although the population appears to be stable, with small numbers of breeding birds, which appears to have been the case since the late 1930s (Peterson in Andrle and Carroll 1988), the species could rapidly disappear if the availability of crustaceans on which it forages is reduced. Recent substantial population fluctuations culminated in the known breeding population being sharply reduced to seven pair in 2004 (from an average of 21 pairs since 1985).

Glossy Ibis: The nesting range of this species may have expanded recently to include Lake Champlain and the Upper Hudson River (NYSDEC 2004a). It is difficult to ascertain the exact status of this species due to local and regional shifts in breeding locations in response to human and natural disturbances (Spahn in Levine1998). Long Island colonies showed significant declines from the mid-1980s through 2004 (Sommers 1996 reported by Spahn in Levine 1998, Sommers et al. 2002, Kerlinger 2004, NYSDEC 2004b) though Peterson (in Andrle and Carroll 1988) suggests that the State's Glossy Ibis population for approximately the same period might be increasing.

Cattle Egret: Currently breeds in NYC area and two upstate location, Lake Champlain and Eastern Lake Ontario basin. Old world species, which came to North America via South America, it was first reported in NY in 1970 on Gardiners Island, Suffolk County. The first upstate breeding record was of several pairs and one active nest on Four Brothers Island in Lake Champlain, Essex County in 1973. In the early 1980s the two upstate colonies showed a downward trend, and the coastal colonies continued to increase to about 351 pairs in 1985. Since that time those colonies have also decreased or in some cases disappeared (Chamberlaine in Levine 1998).

SEQR - No Action Alternative:

Under protection, populations of herons and egrets have recovered nationwide and particularly in the Eastern United States since the low points reached due to human depredation in the early 20th century. Wetland conservation has risen in importance as well, at national, regional, state and local levels. Naturally occurring processes such as increased abundance of beaver flowages has enhanced the availability of foraging and even breeding locations for many herons and egrets. Nesting of species such as Snowy Egrets have been reported in for VT and Canada (Griffith in Levine 1998). It is possible that there will be additional range expansion and confirmed inland and upstate nesting of this and some other species (i.e., Great Egrets, Little Blue Herons and Black-crowned Night Herons) in the future.

Human disturbance of heron nesting sites and human induced alteration of breeding and foraging habitat generally poses the most important threat to stability of regional populations of these birds. The human population of New York State grew at less than half the national rate in the 1990s (5.5 percent versus 13.2 percent), though this was more than double the 2.5 percent growth rate of the 1980s. Two decades of population growth for the state as a whole continued the rebound from the state’s population decline of the 1970s (Wing 2003). The population of New York City increased 9.4 percent, while the rest of the state grew only 2.8 percent (Wing 2003). Upstate, rural human populations declined more than urban populations. The implications of this bifurcated growth pattern suggest that conservation efforts for herons and egrets should be focused principally in downstate regions, especially in the North Atlantic Coast Ecoregion. Because heronry sites are characterized by relatively high turnover over intervals of one or more decades, conservation efforts should focus on protection of current nesting locations from human disturbance and protection of foraging areas.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Cattle egret (Bubulcus ibis)			S2		P	Migratory
Glossy ibis (Plegadis falcinellus)			S2	G5	P	Migratory
Yellow-crowned night-heron (Nyctanassa violacea)			S2	G5	P	Migratory
Black-crowned night-heron (Nycticorax nycticorax			S3	G5	P	Migratory
Tricolored heron (Egretta tricolor)			S2	G5	P	Migratory
Little blue heron (Egretta caerulea)			S2	G5	P	Migratory
Snowy egret (Egretta thula)			S2S3	G5	P	Migratory
Great egret (Ardea alba)			S2	G5	P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Great egret (Ardea alba)	Lower Hudson - Long Island Bays	Lake Champlain	Unknown
		Lake Erie	Increasing
		Lower Hudson - Long Island Bays	Increasing
Snowy egret (Egretta thula)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Little blue heron (Egretta caerulea)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Tricolored heron (Egretta tricolor)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Black-crowned night-heron (Nycticorax nycticorax)	Lake Champlain	Lake Champlain	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Lower Hudson - Long Island Bays	Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Stable
Yellow-crowned night-heron (Nyctanassa violacea)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Glossy ibis (Plegadis falcinellus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Cattle egret (Bubulcus ibis)	Unknown	Lower Hudson - Long Island Bays	Decreasing
		Lake Champlain	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Great egret (Ardea alba)	North Atlantic Coast	St. Lawrence-Lake Champlain Valley	Unknown
		Great Lakes	Increasing
		North Atlantic Coast	Increasing
Snowy egret (Egretta thula)	North Atlantic Coast	North Atlantic Coast	Decreasing
Little blue heron (Egretta caerulea)	North Atlantic Coast	North Atlantic Coast	Decreasing
Tricolored heron (Egretta tricolor)	North Atlantic Coast	North Atlantic Coast	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Black-crowned night-heron (Nycticorax nycticorax)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Great Lakes	Great Lakes	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Increasing
		North Atlantic Coast	Stable
Yellow-crowned night-heron (Nyctanassa violacea)	North Atlantic Coast	North Atlantic Coast	Decreasing
Glossy ibis (Plegadis falcinellus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Cattle egret (Bubulcus ibis)	Unknown	St. Lawrence-Lake Champlain Valley	Decreasing
		North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Great egret (Ardea alba)				
	Breeding	Terrestrial	forested	southern deciduous
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Lacustrine	warm water shallow	mud bottom
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
	Feeding	Riverine	warmwater stream	mud bottom
	Feeding	Terrestrial	open upland	grasslands
	Roosting/Congregating	Terrestrial	forested	northern deciduous
	Roosting/Congregating	Terrestrial	maritime	shrublands
Snowy egret (Egretta thula)				
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
	Feeding	Riverine	coastal plain stream	marsh
	Roosting/Congregating	Terrestrial	maritime	shrublands
Little blue heron (Egretta caerulea)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Little blue heron (Egretta caerulea)				
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Lacustrine	warm water shallow	mud bottom
	Feeding	Riverine	coastal plain stream	mud bottom
	Roosting/Congregating	Terrestrial	maritime	shrublands
Tricolored heron (Egretta tricolor)				
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Riverine	coastal plain stream	marsh
	Roosting/Congregating	Terrestrial	maritime	shrublands
Black-crowned night-heron (Nycticorax nycticorax)				
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	southern coniferous
	Breeding	Terrestrial	forested	southern deciduous
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Lacustrine	warm water shallow	mud bottom
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
	Feeding	Riverine	coastal plain stream	marsh
	Roosting/Congregating	Terrestrial	forested	northern coniferous
	Roosting/Congregating	Terrestrial	forested	northern deciduous
	Roosting/Congregating	Terrestrial	forested	southern coniferous
	Roosting/Congregating	Terrestrial	forested	southern deciduous
	Roosting/Congregating	Terrestrial	maritime	shrublands
Yellow-crowned night-heron (Nyctanassa violacea)				
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	shallow subtidal	mud
	Roosting/Congregating	Terrestrial	maritime	shrublands
Glossy ibis (Plegadis falcinellus)				
	Breeding	Terrestrial	maritime	grasslands
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
	Feeding	Palustrine	mineral soil wetland	shrub swamp
	Feeding	Terrestrial	coastal	beach/shoreline
	Feeding	Terrestrial	open upland	grasslands
	Roosting/Congregating	Terrestrial	maritime	shrublands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Glossy ibis (Plegadis falcinellus)				
Cattle egret (Bubulcus ibis)				
	Breeding	Terrestrial	maritime	shrublands
	Feeding	Terrestrial	open upland	cultural
	Feeding	Terrestrial	open upland	grasslands
	Roosting/Congregating	Terrestrial	maritime	shrublands

Goal and Objectives for Colonial-nesting herons

Goal: Maintain breeding populations at or above current levels

Objective 1 : Identify important breeding and foraging areas for each species

Measure: *Location, habitat characteristics, disturbance*

Objective 2 : Apply appropriate conservation efforts as indicated under SEQR No Action Taken and Objectives 1-6 of this section.

Measure: *Regional, State and Federal conservation actions*

Objective 3 : Compare NYS trends with regional trends to investigate pop. dynamics of herons and egrets over large geographic and multiyear scales

Measure: *State, Federal and NGO surveys and censuses*

Objective 4 : Develop a banding program to provide information about basic population distributions of these ciconiiformes both upstate and downstate

Measure: *adult/juvenile mortality, recruitment, movement*

Objective 5 : Develop a systematic, long-term, comprehensive monitoring program for both upstate and downstate breeding populations

Measure: *Colony sizes, distribution, turnover rates*

Objective 6 : Investigate external threats in addition to human disturbance such as pathogens, invasive species or other factors with a focus on quantification of impact and feasibility of control.

Measure: *Mortality, recruitment, movement*

Objective 7 : Study basic foraging ecology in New York State

Measure: *location and habitat, prey, bioenergetics*

Objective 8 : Study basic reproductive ecology in New York State

Measure: *Physiology, pathology, productivity, gene flow*

Recommended Actions

Habitat management:

* Integrate bird conservation interests in agency planning, management, and research projects, within the context of agency missions. Watersheds 1, 5 and 10 have the highest priority with Watershed 10 the highest of those. Priority action 4.
* Develop coordinated and specific management and habitat restoration projects for identified focus areas that can then be submitted as grant proposals. Watersheds 1, 5 and 10 have the highest priority with Watershed 10 the highest of those. Priority action 3.

Habitat research:

* Identify habitat research projects for heron and egret species that can then be submitted as grant proposals.

Habitat restoration:

* Work with State, Federal and NGOs to identify wetlands and fund their restoration. Develop coordinated and specific habitat restoration projects for identified focus areas that can then be submitted as grant proposals.

Life history research:

* Identify research needs for New York populations dealing with habitat, food habits, behavior, breeding, and reproductive success for heron and egret species that can then be submitted as grant proposals.

Population monitoring:

* Initiate statewide, comprehensive colonially nesting heron survey. Resurvey every five years after initial survey. Watersheds 1, 5 and 10 have the highest priority with Watershed 10 the highest of those. Priority action 1.

Statewide management plan:

* Develop coordinated, statewide management plan that takes into consideration differences in colony sizes, species distribution, habitat characteristics and human populations for upstate and downstate regions, particularly Long Island. Watersheds 1, 5 and 10 have the highest priority with Watershed 10 the highest of those. Priority action 2.

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Originator

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Taxa Group: Bird
Species Group: Common loon

Threats:

Common Loons are susceptible to human disturbance at breeding lakes (via development of shoreline areas and aquatic recreational activities), acid rain alterations of lake ecosystems, and mercury poisoning. Also, loons may be jeopardized in some areas by fluctuating water levels at the nest site and by increased numbers of predators such as raccoons, otters and eagles.

Habitat Loss And Degradation:
- Direct and indirect effects of shoreline development may reduce the suitability of lakes for nesting. Researchers have observed reduced hatching success of loons nesting within 150 meters of developed shorelines compared to nests on less developed lakes.
-Loon nests located along island shorelines or on small hummocks may be affected by fluctuating water levels, adults may abandon nests and nests become more susceptible to predation. Fluctuations also stir sediments, releasing mercury trapped in the sediments and enhancing its conversion to methyl mercury.

Human Disturbance And Hunting:
-During the breeding season, human disturbance may reach levels that will cause nests to fail or result in the death of chicks or adults. Paddlers, campers, boaters, and jet-skiers all can contribute to disturbance of loons on nests and interrupt incubation, resulting in nest failure or abandonment. The illegal shooting of loons, along the Atlantic coast and elsewhere, is a known mortality factor potentially affecting Adirondack Common Loon populations.

Competition:
- Intraspecific competition may limit productivity.

Entanglement:
- Mortality in known to occur from entanglement in monofilament sports fishing line and in commercial nets.

Environmental Pollutants:
-Organochlorines and their residues have been detected in eggs and carcasses and may have adverse, sub lethal effects.
-Mercury (Hg) levels in freshwater and marine fish in North America are at levels that pose significant health risks to wildlife that consume fish. Mercury levels in loons generally increase from west to east across North America, with the highest levels occurring in birds breeding in New England and eastern Canada. High levels of mercury are correlated with behavior changes that lead to decreased reproductive success, decreased survival of juvenile and adult loons, and increased susceptibility to other diseases. Preliminary results indicate that 17% of the birds sampled in the Adirondacks from 1998-2000 have mercury levels high enough to result in behavioral changes or decreased reproductive success. Other heavy metals, such as cadmium, selenium and lead are potential hazards.
-The poor buffering capability of the thin, acidic soils and nutrient-poor water bodies in the Adirondack Park make lakes and ponds within the Park susceptible to acidification. Acid deposition, resulting from emissions of sulfur dioxide and nitrogen oxide compounds by a variety of sources leads to decreased prey diversity and abundance. Acid deposition also contributes to increased availability of methyl mercury in affected water bodies, leading to greater bioaccumulation of methyl mercury in the food chain.
-Ingestion of lead (Pb) fishing tackle by loons causes lead poisoning and eventually death when the acidic environment of the bird's stomach breaks down the metal weights or lures. Loons ingest lead tackle while they are feeding, or when they pick up small stones, which aid in grinding food in the gizzard. Ingestion of fish hooks and entanglement in fishing line can cause permanent injury or death.
-Oil spills pose a serious, although localized, threat to habitat. Exposure to oil, primarily on the wintering grounds or

during migration, contaminates and reduces the water repellency of feathers. Ingested petroleum acts as a laxative.

Predation:
-Loon eggs are susceptible to loss by both mammalian and avian predators, including ravens, raccoons, otters, mink, and gulls. Loon chicks often fall prey to eagles, snapping turtles, large fish, and other loons. Adult loons are also susceptible to harassment or predation by species such as otters and eagles, particularly if already compromised by another problem. In addition, intraspecific competition can lead to nest failure or abandonment, chick mortality, and trauma or death of adult birds.

Diseases And Parasites:
-Common Loons are susceptible to a variety of diseases and parasites including aspergillosis, air sacculitis, peritonitis, umbilical infections in chicks and cancer. Though they may not always result in mortality, diseases and parasites may weaken a bird's immune system, making it susceptible to other factors, including attack by other loons.
-Loons are susceptible to epidemics of both type C and type E botulism. Since 1999, an outbreak of Type E botulism, Clostridium botulinum, has occurred annually on Lake Erie. Outbreaks on Lake Ontario were documented beginning in 2002. Two invasive exotic species, the round goby and quagga mussels appear to play a role in the transmission of the type E toxin to waterbirds utilizing these lakes during migration.

Trends:

Large declines in breeding populations were recorded in the northeastern US over the past several decades prior to the 1990s. A northward range constriction has been documented within the last 100-150 years, and several states that once supported breeding loons have lost them. More recently, North American Breeding Bird Survey (BBS) data indicate a significant 2.2% annual increase in North America, 1966-89.

The ability to habituate to moderate levels of lakeshore and recreational use indicates that populations may continue to survive if suitable breeding, staging, stopover and wintering habitats are available. Loons are currently increasing in Vermont, New Hampshire and Massachusetts, and populations appear to be stable in New York and Maine. Just as human-induced habitat changes and recreational pressures probably caused the widespread declines noted prior to the 1970s, integrated management programs have contributed to the recovery in much of their northeastern US breeding range. The potential for continued recovery is favorable.

Common Loons are listed as a Species of Special Concern by the Department. This designation reflects the fact that, although loons are not endangered or threatened, there is concern for the continued welfare of the loon population summering and wintering in New York. Common Loons, their feathers, eggs, and nests are also protected by federal law under the Migratory Bird Treaty Act.

A survey of the breeding population of Common Loons in the Adirondack Park was conducted during the summer of 1977 and 1978. Observations on 301 lakes throughout the Park indicated that the population was low in density, but high in productivity (estimated at 0.83 chicks fledged/pair of breeding adults) In the summers of 1984 and 1985, NYS DEC conducted a second survey of breeding loons in the Adirondack Park, finding 157 breeding pairs and 196 chicks on 500 lakes and ponds. Two hundred and forty-seven non-breeding adult loons were also counted. It was estimated that 200-250 breeding pairs, and a total of 800-1000 adult loons inhabited the water bodies of the Adirondacks. Compared to the earlier survey, the 1984-85 survey indicated that the population of breeding loons in the Park appeared stable or possibly increasing.

An index of the summer loon population in the Adirondack Park is obtained through an annual loon census, conducted by volunteers on the third Saturday in July. Adirondack Cooperative Loon Program (ACLP) staff hope to be able to determine trends in the Adirondack breeding loon population over time through repeated observations on the same lakes in the Park. Census results are coordinated with similar loon censuses in other states in the Northeast to provide an indication of change and trends in the regional population.

SEQR - No Action Alternative:

With no action Common Loon would, for the foreseeable future, continue to breed in suitable habitats within the Adirondack Park and St. Lawrence River regions. Productivity, though, may be poor in regions with contamination problems, such as mercury, or high levels of human disturbance. Loons would also continue to utilize Lake Ontario and Lake Erie, as well as other large water bodies as resting and re-fueling stops during migration. The impact of disease, such as Type E botulism, may cause the number of loons utilizing these waters annually to decline over time, thus negatively impacting loon productivity in Canadian provinces.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Common loon (Gavia immer)			S3	G5	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Common loon (Gavia immer)	SE Lake Ontario	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	Lake Champlain	Lake Champlain	Increasing
	Upper Hudson	Upper Hudson	Increasing
	SW Lake Ontario	SW Lake Ontario	Unknown
	Lake Erie	Lake Erie	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Common loon (Gavia immer)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Great Lakes	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Common loon (Gavia immer)				
	Breeding	Lacustrine	cold water deep	sand/gravel bottom
	Breeding	Riverine	deepwater river	sand/gravel bottom
	Feeding	Lacustrine	cold water deep	sand/gravel bottom
	Feeding	Lacustrine	cold water shallow	sand/gravel bottom
	Feeding	Marine	deep subtidal	pelagic
	Nursery/Juvenile	Lacustrine	cold water deep	sand/gravel bottom
	Nursery/Juvenile	Lacustrine	cold water shallow	sand/gravel bottom
	Nursery/Juvenile	Marine	deep subtidal	pelagic
	Roosting/Congregating	Lacustrine	cold water deep	sand/gravel bottom
	Roosting/Congregating	Marine	deep subtidal	pelagic

Goal and Objectives for Common loon

Goal: Maintain breeding and migrating populations at or above current levels

Objective 1 : Assess known threats and stressors and identify sub-populations at risk

Measure: *List threats and stressors, statistically evaluate productivity of populations impacted vs. control populations, delineate geographic regions and populations at risk*

Objective 2 : Develop a systematic long term monitoring program at a state and regional scale to document population trends and productivity

Measure: *Distribution, number of breeding pair, productivity, recruitment, movement, mortality, physiology, pathology, gene flow*

Objective 3 : Identify and protect known breeding, migration stopover, and wintering habitats for New York State breeding population

Measure: *Locations, habitat characteristics, timing*

Objective 4 : Increase public awareness of loon conservation needs

Measure: *Brochures, signage, web sites, kiosks, presentations*

Objective 5 : Reduce contaminant (i.e.. mercury Mg, lead Pb, and type E botulism toxin) levels in the environment

Measure: *Blood levels, feather levels, egg levels*

Objective 6 : Research the life history of juveniles between fledging and their return to New York State and other northern lakes.

Measure: *Distribution, status, mortality, timing, geographic regions*

Recommended Actions

Educational signs:

* Improve public understanding of loon conservation issues. Post interpretive signs at boat ramps, beaches, campgrounds and other public access points. Produce and distribute informational brochures, posters, press releases and other educational materials. Provide educational programs to schools, lake associations and other groups.

Habitat management:

* Identify and protect know nesting areas. Protect small islands <5 ha and dead waters from development. Establish 150m buffer zones on either side of mainland nests. Shoreline areas adjacent to known nursery sites should be protected, and 150 buffers established.
* Protect coastal wintering areas from the damages of oil spills.
* Maintain constant water levels during peak nesting period.
* Use artificial nesting platforms to improve nesting success on lakes that lake natural islands and have poor shoreline nesting habitat, fluctuating water levels, or a history of low productivity.

Habitat monitoring:

* Continue aerial and beach transect surveys during the fall to determine impacts of Type E botulism on water birds utilizing the Great Lakes as stop-over sites during migration.
* Monitor lake pH levels in lakes within the Adirondack Park, survey forage base, and research the effects of lake acidification on breeding loons.

Habitat research:

* Research migration routes and staging areas of Adirondack population.
* Research the causes of type E botulism and how outbreaks can be prevented or minimized.

Life history research:

* Research wintering distribution and ecology of Adirondack population.
* Research the life history of juveniles between fledging and their return to northern lakes.
* Research the energetic requirements of adults and young, recruitment patterns of young and non-breeders into breeding populations, effects of intra-specific competition on breeding status and success, site fidelity and territory turnover patterns, duration of pair bonds, and pattern of lake colonization or recolonization.
* Determine the biological consequences of chemical and heavy metal toxicity

Recommended Actions

Modify regulation:

* Reduce human disturbance near nest sites and nursery areas during the nesting and chick-rearing period. Limit boat engine horsepower and establish speed limits on smaller breeding lakes or in designated areas of larger lakes.
* Reduce mortality on the Great Lakes from commercial fishing operations by encouraging the use of fish traps that open at the top to allow loons to escape.

Population monitoring:

* Monitor breeding population trends and productivity. Census adult population using repeated standardized surveys. Survey a specified sample of lakes annually, or every few years to document population trend. Verify breeding by the presence of recently used nest or flightless young. Determine breeding chronology and outcome (chicks not considered fledged until at least 4 weeks old). Utilizing volunteer observers, implement simultaneous counts to provide an index of lake occupancy and productivity and refine statewide population totals.
* Monitor chemical contaminants and heavy metals in adults and eggs on a regular basis.
* Continue the banding and marking of individual birds to determine loon movement patterns, behavioral ecology, and demography.
* Research and utilize radio transmitter technology on loons to determine chick survival, juvenile movement patterns and behavior, and identify migration patterns, stopover sites, and wintering habitats.
* Monitor migratory trends in distribution and abundance utilizing Christmas Bird Counts and coastal/Great Lakes fall/winter loon watches.

Regional management plan:

* Genotype breeding, wintering, and migratory populations using newly developed genetic techniques in an effort to map subpopulations throughout the Northeast.
* Collaborate with existing planning initiative such as the North American Waterbird Plan, Bird Conservation Regional Plans and other regional efforts.

Relocation/reintroduction:

* Reduce predator caused breeding failure, where problematic, by increasing hunting or trapping opportunities.

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Taxa Group: Bird
Species Group: Common nighthawk

Threats:
Common nighthawk is a special concern species in NY.

Historically nested on barren ground in open areas in NY. Probably utilized fire dominated communities. May have nested in large clear cuts and close cropped pasture lands occupied by larger herds of sheep (in 19th century). Probably benefited from flat gravel roof construction, which they utilize for nesting.

Threats include: reforestation, wildfire suppression and more intensive agriculture which result un loss of breeding habitat. Reductions in large moth populations (a favored food) due to pesticide use and other human factors may also be influencing populations. Fire suppression could also be causing habitat to become unfavorable. Gravel roof construction method is no longer in favor. This results in reduced nesting habitat available.

The most pressing need is for better monitoring to determine precise population trends. If the declines are significant then research to determine causes of declines is needed. It is unlikely that we can influence changes in roof construction, so it would be important to determine if there are other limiting factors which could be positively influenced.

Trends:
Common nighthawk is a species about which we have relatively little information. BBS trends show very steep declines, although the data is statistically very questionable (insufficient routes with detections). BBS routes are unlikely to be an effective means of monitoring this nocturnal/crepuscular species.

Historic distribution and abundance.

Historically nested on barren ground in open areas in NY. Probably utilized fire dominated communities. May have nested in large clear-cuts and close cropped pasture lands occupied by larger herds of sheep (in 19th century). Distribution is uncertain, likely never to have been very common in most of state. Probably benefited from flat gravel roof construction.

Current distribution and abundance.

Common nighthawk is an uncommon and extremely local breeder (BBA). Preliminary BBA 2000 data suggests it has disappeared from many former locations. This is a species which has been influenced by humans. They are known to nest on flat gravel roofs, which provide the preferred substrate with minimal human disturbance. BBA data appear to indicate that the species concentrations showed some correlation with towns and cities.

Current trend not known, BBS does not detect on sufficient routes to determine a precise trend. Suggestions of rapid decline, including preliminary BBA data.

SEQR - No Action Alternative:
Species continues to decline with probable extirpation in future.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Common nighthawk (Chordeiles minor)			S4	G5	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Common nighthawk (Chordeiles minor)	Unknown	Allegheny	Decreasing
		Delaware	Decreasing
		Lake Champlain	Decreasing
		Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		SE Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SW Lake Ontario	Decreasing
		Upper Hudson	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Common nighthawk (Chordeiles minor)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Lower New England Piedmont	Decreasing
		North Atlantic Coast	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Western Allegheny Plateau	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Common nighthawk (Chordeiles minor)				
	Breeding	Terrestrial	open upland	cultural
	Breeding	Terrestrial	open upland	grasslands
	Breeding	Terrestrial	open upland	other

Goal and Objectives for Common nighthawk

Goal: Maintain a viable breeding population of common nighthawk.

Objective 1 : Determine population status.

Measure: *Breeding locations and population trends are documented.*

Objective 2 : Determine/confirm causes for declines.

Measure: *Causes for declines are determined.*

Objective 3 : Develop management plan with potential conservation actions and strategies for increasing populations..

Measure: *Plan completed.*

Recommended Actions

Habitat management:

* Develop management plan with potential conservation actions and strategies.
* Increase use of prescribed fire in natural fire adapted communities.

Habitat restoration:

* Evaluate feasibility of artificial nesting structures on roof tops.

Population monitoring:

* Develop survey methodology to determine population trend.

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Taxa Group: Bird
Species Group: Deciduous/mixed forest breeding birds

Threats:

This species suite contains those species often thought of as "forest interior" species that prefer "mature" forests. As a whole this species suite is doing relatively well, and is less threatened than the other bird species suites.

Species of interest include: red-headed woodpecker (Melanerpes erythrocephalus), wood thrush (Hylocichla mustelina), cerulean warbler (Dendroica cerulea), worm-eating warbler (Helmitheros vermivorus), Louisiana water thrush (Seiurus aurocapillus), black-throated blue warbler (Dendroica caerulescens), Kentucky warbler (Oporornis formosus), prothonotary warbler (protonotaria citrea), and scarlet tanager (Piranga olivacea).

Cerulean warbler, and red-headed woodpecker are special concern species in NY.

In NY threats include: in more heavily developed portions of the state- human development, in Adirondacks - acid rain, in lake plain - human development in riparian areas (cerulean warblers). Some species appear to have serious issues on their winter grounds.

A wide variety of other forest species will benefit from the conservation efforts to benefit this species suite. Some are considered to be of very high conservation concern by experts throughout the Northeast, including: Eastern wood pewee and rose-breasted grosbeak.

When looking at this diverse list of species, it would appear to be a daunting task to do research or manage for all of these species. A more workable approach is to select “focus” species to be the primary driving force, while trying not to forget the diversity of the group as a whole.

Focus species include wood thrush and cerulean warbler.

Wood thrush is declining by - 2.1%/yr since 1966. This is thought to be due in part due to acid rain and loss of shrub layer in forest due to forest maturation and potentially deer over browsing in some areas. Acid rain may be impacting on prey availability, in particular on snails that provide calcium for egg laying. It is unlikely that bird conservationists can have any influence over acid rain, hopefully higher levels of government can help address this issue. Winter habitat loss is an issue.

Presumed threats in NY include acid rain, deer over browsing, lack of shrub cover (potentially due to insufficient forest management).

Research on exact causes for declines and potential management techniques to increase productivity of habitat is needed.

Research on exact causes for declines and potential management techniques to increase productivity of habitat is needed.

Cerulean warbler is increasing in NY by 9 %/yr since 1966. This is based on a limited number of routes with detections, so caution should be used; however, the species appears to be doing fairly well. This species will utilize a variety of habitats in different parts of the country. In NY it appears to favor riparian corridors, and hillsides and mountains in the lower Hudson Valley and Southern Tier (including forested drumlins). Riparian habitats favored appear to include at least some very large “super canopy” trees. Winter habitat loss is a concern.

The species is not doing well in the core of its range (- 4%/yr). NY is at the more northern end of the species range. There are indications that the species range within NY expanded in the decades prior to recent times.

Threats in NY include loss and degradation of nesting habitat in the lake plain. Cerulean habitats in the lake plain tend to be in relatively fragmented landscapes. Human development in these areas could result in loss, degradation and fragmentation of habitats over time.

One frequently mentioned concern for forest species is fragmentation. Most avian experts do not include properly planned forest management at relatively small scales in heavily forested areas to be "fragmentation". For the purposes of this plan fragmentation is defined as loss of habitat due to human development. Most studies in heavily forested areas show that some level of forest management is beneficial to most forest breeding birds. Much research has been done on the effects of forest fragmentation on forest birds. Much of this research has centered on areas where the forests are already highly fragmented due to agriculture and/or human development (e.g., Maryland, Ohio), and was confined to nest productivity alone. While this research in these areas has shown that further fragmentation can sometimes be a serious issue, research in more heavily forested areas has not shown the same effects. Audubon’s studies in NY and Pennsylvania show that many species thought of by many as "forest interior" breeders will breed in moderate to heavy cut areas, and some even breed in clear cuts. Further, recent studies (even in states with relatively fragmented forests such as Ohio) show that "forest interior" breeding species heavily utilize even age and other heavily harvested areas post breeding for foraging and cover (M. Reynolds, personal communication).

While fragmentation due to development is a concern in already fragmented landscapes, and may be a concern in more heavily forested areas, the effects of forest management will vary with the amount of forest cover and specifics of the harvest. Some research suggests forest management has no effect, or a positive impact on forest species, while other research appears to show there may be a negative impact. There are a tremendous number of variables that could influence the effects of forest management on bird productivity. Most older studies just looked at productivity through fledging by looking at nesting success. More recent studies have indicated that is only part of the picture as post- nesting success may be enhanced by having even aged or heavy cuts which provide soft mast and insects for food, and the thick growth provide cover for forest species after nesting and to some degree during nesting.

Acid rain could be a threat to forest health and therefore this species suite.

Lack of forestry or natural events like fire and wind throw to open the canopy and generate herbaceous and shrub growth could have serious detrimental impacts on ground and shrub nesters (see Table 2). The erroneous public perception that forest management is bad for most wildlife may be the greatest overall threat.

Conservation for this species suite should include maintaining large blocks of forest in relatively unfragmented form. Low levels of forest management that include patches of light harvesting will benefit ground and shrub nesting species which tend to be the species in this suite that are declining. Some areas of moderate or even aged management would also be beneficial to many species by providing food and cover, although the majority of the forest needs to be in a relatively mature state.

Overall, this species suite rates a lower priority than other landbird suites.

Trends:

Historic distribution and abundance.

Many of these species were probably abundant prior to European settlement. With the deforestation of large areas of forest with no consideration to the consequences in the 1800's and early 1900's, many of these species likely declined.

Current distribution and abundance.

In the last (20th) century, the amount of forest cover has more than doubled, and the majority of the species in this suite have greatly increased, and are now stable. Distributions in portions of the state that have large amounts of human influence (development, agriculture) probably have not returned to pre-settlement conditions, but more heavily forested areas are doing well.

Post (2004) completed an analysis of Breeding Bird Survey (BBS) data (see Table 1). In the general/intermediate suite none (0 %) of the species were declining in NY (8 species showed positive trends and 6 showed no significant trend). Twenty one percent (3/14) of the species were declining in USFWS Region 5 and survey-wide, with 7 and 8 species showing increasing trends in USFWS Region 5 and survey-wide, respectively. The majority of the species in this suite are increasing or showed no significant trend.

The mature forest bird suite includes 23 species. Eleven species showed increasing trends in NY, 14 species in USFWS Region 5, and 13 species survey-wide. Eight species showed no significant trend in NY, 6 survey-wide, and 4 species in USFWS Region 5. In NY and survey-wide 17 % (4/23) of the species were declining, with 22 % declining in USFWS Region 5. The majority of species in this suite were increasing.

Table 1
BBS TREND DATA FOR MATURE FOREST BIRDS
(1966-2002, % change per year)

Species	NY	USFWS Region 5	Survey Wide
Barred owl**	ns (1.9)	+ 4.4	+ 2.7
Blackburnian warbler*	ns (+.2)	ns (+.2)	+ 0.9
Black-capped chickadee*	+ 1.9	+ 1.5	+ 1.3
Black-throat. blue warbler*	ns (-1.2)	ns (+1)	ns (+.8)
Black-thro. green warbler*	ns (-.8)	+1.3	ns (+.5)
Blue-headed vireo**	+ 3.0	+ 4.1	+ 4.8
Broad-winged hawk**	+ 3.8	ns (+1)	ns (+1.1)
Cerulean warbler**	+ 9.0	- 3.4	- 4
Cooper’s hawk**	ns (-3)	+ 4.3	+ 5.1
E. wood pewee*	- 2	- 2.4	- 1.7
Golden-crowned kinglet*	+ 3.3	+ 3.7	ns (-.2)
Hairy woodpecker*	+ 2.2	+ 1.0	+ 1.8
Hermit thrush*	+ 5.1	+ 3.5	+ 1.6
Least flycatcher*	- 1.8	- 1.6	- 1.0
Louisiana water thrush**	ns (-2.2)	ns (+.2)	+ 0.8
Ovenbird*	+ 2.2	+ 1.8	+ 0.6
Red-eyed vireo*	+ 2.2	+ 1.3	+ 1.3
Scarlet tanager*	- 1.5	- 0.5	ns (-.1)
Sharp-shinned hawk**	+ 6.8	+ 3.8	+ 4.6
White-breasted nuthatch*	ns (+1)	+ 2.2	+ 2.1
Winter wren*	ns (+2.3)	+ 1.7	+ 2.3
Wood thrush*	- 2.1	- 2.2	- 1.7
Yellow-bellied sapsucker*	+ 3.5	+ 5.4	ns (-.02)
Species with positive trend	11	14	13
Species with negative trend	4	5	4
Species with ns trend	8	4	6
% species in decline***	17 (4/23)	22 (5/23)	17 (4/23)

BBS TREND DATA FOR GENERAL/ INTERMEDIATE FOREST BIRDS

(1966-2002, % change per year)

Species	NY	USFWS Region 5	Survey Wide
Dark-eyed junco**	ns (+.06)	ns (+.1)	- 1.3
Downy woodpecker*	ns (-.5)	ns (-.4)	ns (+.1)
Great-crested flycatcher*	ns (-.4)	ns (.2)	ns (0)
Hooded warbler**	+ 3.7	+ 1.8	ns (+.7)
Magnolia warbler*	+ 2	+ 3.5	+ 1.4
Nashville warbler**	ns (-1)	- 0.3	+ 1.0
Pine warbler**	+ 6.1	+1.9	+1.2
Pileated woodpecker**	+ 4.1	+ 3.5	+ 1.8
Prairie warbler**	+ 4.3	- 1.5	- 2.1
Purple finch*	ns (-.5)	- 0.9	- 1.6
Red-breasted nuthatch**	+ 2.5	+ 1.8	+ 1.5
Warbling vireo**	+ 1.8	+ 1.9	+ 1.2
Yellow-rumped warbler**	+ 2.7	+ 3.5	+ 0.6
Yellow-throated vireo**	ns (-1.6)	ns (-.5)	+ 1.1
Species with positive trend	8	7	8
Species with negative trend	0	3	3
Species with ns trend	6	4	3
% species in decline***	0 (0/14)	21 (3/14)	21 (3/14)

ns = not a statistically significant ($p < 0.1$) trend (includes abundant species whose trend estimate is close to 0, and species which have larger trend estimates, but which are not detected by BBS in sufficient numbers to determine a significant trend).

* assemblages based on Audubon NY review of several studies in northern hardwood forests in relatively heavily forested areas
** species from BBS species suite listings that were not found in Audubon's study
*** calculated as: number of species declining ÷ total number of species.

SEQR - No Action Alternative:

If no action is taken, it is likely that most of the mature deciduous forest species populations will remain stable, or continue to increase. Due to the massive amount of reforestation throughout the state over the past several decades, with 70% of the state now forested, this species suite is doing relatively well as a whole. The species populations that are likely to suffer if no action is taken are those that prefer deciduous forest habitats with heavy understory tree and shrub layers. This type of habitat requires forest management that opens the canopy allowing herbaceous and shrub/sapling growth, and in some places control of deer populations. Cerulean warbler populations in the lake plain may decline if not protected from human development.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Kentucky warbler (Oporornis formosus)			S2			Migratory
Prothonotary warbler (Protonotaria citrea)			S2			Migratory
Black-throated blue warbler (Dendroica caerulesce					P	Migratory

Scarlet tanager (Piranga olivacea)				P	Migratory
Louisiana waterthrush (Seiurus motacilla)	X			P	Migratory
Worm-eating warbler (Helmitheros vermivorum)				P	Migratory
Cerulean warbler (Dendroica cerulea)	X	S4B	G4	P SC	Migratory
Wood thrush (Hylocichla mustelina)		S5	G5	P	Migratory
Red-headed woodpecker (Melanerpes erythroceph		S4	G5	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Red-headed woodpecker (Melanerpes erythrocephalus)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Decreasing
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Wood thrush (Hylocichla mustelina)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Cerulean warbler (Dendroica cerulea)	Allegheny	Allegheny	Increasing
	Delaware	Delaware	Increasing
	Lake Champlain	Lake Champlain	Increasing
	Lake Erie	Lake Erie	Increasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Increasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	SE Lake Ontario	SE Lake Ontario	Increasing
	Susquehanna	Susquehanna	Increasing
	SW Lake Ontario	SW Lake Ontario	Increasing
	Upper Hudson	Upper Hudson	Increasing
Worm-eating warbler (Helmitheros vermivorum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
		Upper Hudson	Decreasing
		Susquehanna	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Louisiana waterthrush (Seiurus motacilla)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown
Scarlet tanager (Piranga olivacea)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Black-throated blue warbler (Dendroica caerulescens)	Allegheny	Allegheny	Stable
	Delaware	Delaware	Stable
	Lake Champlain	Lake Champlain	Stable
	Lake Erie	Lake Erie	Stable
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Stable
	SE Lake Ontario	SE Lake Ontario	Stable
	Susquehanna	Susquehanna	Stable
	SW Lake Ontario	SW Lake Ontario	Stable
	Upper Hudson	Upper Hudson	Stable
	Upper Hudson		
Prothonotary warbler (Protonotaria citrea)		Allegheny	Unknown
		Delaware	Unknown
		Lake Erie	Unknown
		Lower Hudson - Long Island Bays	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		SE Lake Ontario	Unknown
		Susquehanna	Unknown
		SW Lake Ontario	Unknown
Kentucky warbler (Oporornis formosus)		Lower Hudson - Long Island Bays	Unknown
		SE Lake Ontario	Unknown
		Susquehanna	Unknown
		SW Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Red-headed woodpecker (Melanerpes erythrocephalus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Wood thrush (Hylocichla mustelina)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Cerulean warbler (Dendroica cerulea)	Great Lakes	Great Lakes	Increasing
	High Allegheny Plateau	High Allegheny Plateau	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	North Atlantic Coast	North Atlantic Coast	Increasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Western Allegheny Plateau	Western Allegheny Plateau	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Worm-eating warbler (Helmitheros vermivorum)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
		High Allegheny Plateau	Unknown
Louisiana waterthrush (Seiurus motacilla)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Scarlet tanager (Piranga olivacea)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Black-throated blue warbler (Dendroica caerulescens)	Great Lakes	Western Allegheny Plateau	Stable
	High Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Stable
	Lower New England Piedmont	Northern Appalachian/Boreal Forest	Stable
	North Atlantic Coast	North Atlantic Coast	Stable
	Northern Appalachian/Boreal Forest	Lower New England Piedmont	Stable
	St. Lawrence-Lake Champlain Valley	High Allegheny Plateau	Stable
	Western Allegheny Plateau	Great Lakes	Stable
Prothonotary warbler (Protonotaria citrea)		Great Lakes	Unknown
		High Allegheny Plateau	Unknown
		Lower New England Piedmont	Unknown
		North Atlantic Coast	Stable
		St. Lawrence-Lake Champlain Valley	Stable
		Western Allegheny Plateau	Unknown
Kentucky warbler (Oporornis formosus)		Lower New England Piedmont	Unknown
		North Atlantic Coast	Unknown
		High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Red-headed woodpecker (Melanerpes erythrocephalus)				
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	open upland	cultural
	Breeding	Terrestrial	open upland	other
Wood thrush (Hylocichla mustelina)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Wood thrush (Hylocichla mustelina)				
	Breeding	Terrestrial	forested	southern deciduous
Cerulean warbler (Dendroica cerulea)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	other
	Breeding	Terrestrial	forested	southern deciduous
Worm-eating warbler (Helmitheros vermivorum)				
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	other
Louisiana waterthrush (Seiurus motacilla)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	other
Scarlet tanager (Piranga olivacea)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
Black-throated blue warbler (Dendroica caerulescens)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
Prothonotary warbler (Protonotaria citrea)				
	Breeding	Palustrine	mineral soil wetland	mixed deciduous/coniferous
Kentucky warbler (Oporornis formosus)				
	Breeding	Terrestrial	forested	southern deciduous

Goal and Objectives for Deciduous/mixed forest breeding birds

Goal: Manage forest habitat to benefit the greatest diversity of bird species, and stabilize populations of forest bird species that are declining.

Objective 1 : Determine causes for declines in wood thrush, and develop management actions to halt declines.

Measure: *Causes determined and management recommendations developed.*

Objective 2 : Determine causes of declines for red-headed woodpecker.

Measure: *Causes determined.*

Objective 3 : Determine the major threats to forest bird habitat, including excessive deer browse, fragmentation by development, pests and diseases, invasive plants, and atmospheric deposition.

Measure: *Threats determined and conservation recommendations derived.*

Objective 4 : Develop a management plan to provide a shifting mosaic of forest types and structures that will benefit and sustain the greatest diversity of species.

Measure: *plan completed*

Recommended Actions

Habitat management:

* Identify critical cerulean warbler focus areas and enhance populations.
* Minimize the effects of fragmentation of habitats due to human development.
* Maintain habitat conditions for Louisiana waterthrush.
* Implement population control of whitetail deer in areas where deer populations are affecting forest regeneration and species composition.

Habitat research:

* Habitat research to study area sensitivity and habitat requirements of cerulean warblers.
* Research effects of logging on "forest interior" birds.
* Initiate research to investigate factors affecting habitat use and productivity in wood thrush.
* Identify the critical core areas for cerulean warblers in the lake plain and protect them from human development.

Other action:

* Educate the public on the benefits and need for forest management to enhance populations of ground and shrub nesting forest breeding birds on public and private lands.
* Educate the public on the benefits and need for forest management on public and private lands.

Population monitoring:

* BBS appears adequate for most species. Cerulean warblers need targeted monitoring to determine precise trends.

References

The Atlas of Breeding Birds in NYS. Andrle and Carroll, editors. Cornell University Press.

Bull's Birds of NYS. 1998. Emanuel Levine, editor. Comstock Publishing.

Originator

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Taxa Group: Bird
Species Group: Early successional forest/shrubland birds

Threats:
Shrubland and early successional forest species of concern include: American woodcock (Scolopax minor), whip-poor-will (Caprimulgus vociferus), willow flycatcher (Empidonax traillii), golden-winged warbler (Vermivora chrysoptera), blue-winged warbler (Vermivora pinus), Canada warbler (Wilsonia canadensis), black billed cuckoo (Coccyzus erythropthalmus), brown thrasher (Toxostoma rufum), N. bobwhite (Colinus virginianus), ruffed grouse (Bonasa umbellus), and yellow-breasted chat (Icteria virens)

The legal status of these species is: Golden-winged warbler, yellow-breasted chat, and whip-poor-will are NYS special concern. American woodcock, Northern bobwhite quail, and ruffed grouse are game species with open seasons in NY.

Conservation efforts to benefit this species suite will also help to benefit many other species, including several that experts throughout the Northeast consider to be very high concern, including: field sparrow, chestnut-sided warbler, veery, E. towhee, black and white warbler, and N. flicker.

In NY threats include: reversion of shrublands to forest; loss of small dairy farms; fire suppression; more intensive agriculture that results in loss of hedgerows, shrubs, and shrub wetlands; reversion of young forest habitat to mature forest; inadequate amounts of forest management that includes even aged and heavy partial removal; and the erroneous public perception that forest management is harmful to birds. Some species appear to have wintering ground issues (e.g., American woodcock, Canada warbler).

When looking at this diverse list of species, it would appear to be a daunting task to do research or manage for all of these species. A more workable approach is to select “focus” species to be the primary driving force, while trying not to forget the diversity of the group as a whole. To do this, a number of factors need to be considered.

Focus species include: American woodcock, golden-winged warbler, whip-poor-will, brown thrasher, Canada warbler and ruffed grouse.

This species suite includes species with fairly substantial variability in their habitat preferences. The focal species generally fall into 3 major habitat categories: shrub, pine barren, and early successional forest.

Key habitats and communities

Shrubland : Brown thrashers tend to prefer open shrublands, and dense thickets; golden-winged warblers prefer shrublands with herbaceous ground cover, and a nearby forest edge; N. bobwhites prefer a combination of shrubland, grassland and agriculture (in NY populations are largely confined to Long Island).

Pine barrens: whip-poor-will.

Early successional forest: ruffed grouse, Canada warbler, woodcock . Woodcock need young thickets, moist productive soils, openings for singing and night roosting, second growth for nesting.

It will take a variety of habitats and management techniques to address the needs of this suite. One thing that most species in this suite do have in common is that they are in widespread decline due to widespread land use changes and negative societal perceptions of forest management.

American woodcock is the focus of an international assessment and planning effort. BCR Woodcock plans are currently being prepared. This species needs a mosaic of habitat types that includes shrublands or young forests with moist productive soils (high biomass of worms), second growth hardwoods for nesting, and openings or fields for singing grounds and night roosting. Singing ground surveys indicate this species has declined by 2.3 % per year since the 1960's.

Article 24 of the NYS ECL provides some measure of protection for wetland habitats some of which are prime woodcock habitat. However, the inadequacies of the wetland maps at protecting linear (stream corridor) wetlands is apparent. These stream corridor wetlands are often critical breeding and migration habitats, for a variety of species such as woodcock. Article 24 also only protects wetlands larger than12.4 acres, which means many small or linear wetlands are not protected (may be protected by Army Corp). Of course, Article 24 also makes even-aged management more complicated since it is likely to mean a permit is needed.

Loss of small dairy farms, and more intensive agriculture also do not favor woodcock.

Management in riparian areas may be critical to success. Small strip or block clear-cut or heavy patch cuts provide good habitat, but many private landowners believe such management is bad for wildlife. Seeding in log landings with clover or legumes will provide open areas for singing grounds.

Ruffed grouse have many of the same needs as woodcock, except they don’t need the moist soils, or openings for singing grounds. Rotational cutting that provides a mosaic of forest conditions is optimal management.

Brown thrasher has declined by - 5.8%/yr since 1966. It prefers dryer, open shrublands, especially with thorny thickets and tall saplings. It is normally confined to lower altitudes. It is widespread outside of Adirondacks and Catskills, though not very common. It may be one of the first species to appear when farmlands revert to shrublands (Rosche 1967). Changing land use patterns are the primary cause of the declines for this species. Systematic removal of shrubs (including exotic invasives such as multiflora rose and tartarian honeysuckle) from pastures and hedgerows may be a contributing factor to recent declines. Thrashers will tolerate human development if preferred habitat is available.

It will be harder to manage for this species since it prefers open shrublands, which are somewhat expensive to maintain. Brushhogging is likely the most effective means of maintaining habitat over time, but that is expensive in terms of time and money. Brush hogging should leave areas of brush interspersed with open ground. Subsidies to farmers to leave some brush in pastures and grasslands would benefit this species. Low elevation suburban developments should be encouraged to maintain shrubby thickets and hedgerows.

Golden-winged warbler has declined at - 5.8%/ yr since 1966. Loss of habitat to forest maturation and competition and inbreeding with blue-winged warblers are serious concerns. Golden-wings prefer shrubby openings near tree lines or with scattered trees with herbaceous ground cover. Their distribution is changing fairly rapidly expanding to the north and contracting at the southern edge. This is believed to be largely due to the results of inbreeding with blue-winged warblers. Once blue-wings enter an area, golden-wings usually begin to decline and eventually are extirpated. There are exceptions to this, such as Sterling Forest where the species have co-existed for decades.

John Confer (Ithaca College) is currently researching the interactions of blue-wings and golden-wings at Sterling Forest. There are reports that blue-winged males pursue females of a golden-wing pair more than a male golden-wing pursues females of a blue-wing pair. His research indicates that the male blue- golden-wings are more aggressive at breeding with female golden-wings than vice versa. Thus, inferentially suggesting that hybridization by extra-species, extra-pair fertilization may occur at a significant rate for golden-wing pairs. Further, male golden-wings accept hybrid females more frequently than male blue-wings. Therefore, golden-wings are breeding themselves out of existence as males continue to inbreed with blue-wings resulting in hybrids rather than pure golden-wings. Confer's research has indicated that there may be some habitat segregation occurring at Sterling Forest, and that a management protocol that favors golden-wings over blue-wings might be developed. His ongoing research is testing this approach by attempting to alter habitat to favor golden-wings over blue-wings.

Utility right of ways can and do provide quality habitat if properly managed. Management that leaves shrubs and encourages herbaceous ground cover are beneficial. Clear-cut provide excellent habitat in the Midwest, but this habitat has not been proven to support substantial populations of golden-wings in NY. Research is needed on how to manage for golden-wings in a way that will allow them to coexist with blue wings (Confer is looking at this issue currently).

Canada warbler has declined by - 4.4%/yr since 1966. It is most common in the Adirondacks and Tug Hill plateau, Catskills, and the Eastern Appalachian plateau. Habitats are variable but tend to include higher elevations, or cool damp areas at lower elevations. Thick ground cover is almost always a requirement. This could be in a heavy cutting, forest edge, stream bank, or bog.

Forest maturation is a possible reason for declines. These areas of mature forest do not tend to provide the thick ground cover preferred. Over browsing by deer may be a concern in some areas since it removes much of the shrub layer.

Since Canada warblers will breed in a variety of habitats, the exact causes for declines are not known. Research into causes for declines and potential for forestry to be beneficial by opening up the canopy and promoting ground growth and thickets is needed.

Condition of key habitats and communities

Shrubland and early successional forest species are in widespread decline in NY and throughout the Northeast. Habitat loss to development and maturation of forests are two primary reasons. An analysis of forest inventory data shows that the amount of early successional habitat in BCR 13 (St. Lawrence Valley) declined by 57 % during the period from the early 1970's to 2002 (Post 2003, BCR 13 Woodcock Plan, in progress).

Overall, maturation of NY's forests, and increasing habitat loss to human development are serious threats. Human efforts to control wildfire (especially in pine barren type habitats adapted to fire), insect outbreaks, and beaver control contribute to declining or reduced habitats (although high populations of beaver do still provide large areas of habitat). Perhaps the most serious threat is the erroneous public perception that forest management harms all wildlife, and that mature forests are always preferred. A smaller component to this is the movement towards no forest management in riparian areas, which could have serious consequences on woodcock and potentially grouse. Riparian habitats need periodic regeneration to provide optimal habitat, especially to keep alders, willows and other shrubs present and vigorous. Such shrubs tend to become decadent with time and die off or revert to mature forest.

Mature forests do not provide optimal habitat for these species, and very few will be found there in any significant number. Increasing the amount of forest management that incorporates even-aged management, and moderate to heavy partial cutting (uneven-age) is critical to stopping the declining populations.

Trends:

In NY, 92% of the species in this suite are in significant decline. This is the highest percentage of species in decline of any land bird species suite. According to Breeding Bird Survey data during the period from 1966-2002, in NY, several early successional forest/shrub species exhibited precipitous declines, such as: golden-winged warbler 88%, brown thrasher 88 %, Eastern towhee 87%, ruffed grouse 82%, Canada warbler 80%, Northern flicker 80%, field sparrow 75%. and American woodcock 64%.

Post (2004) completed an analysis of Breeding Bird Survey (BBS) data. The early successional forest/shrub bird suite included 24 species. Only 2 species showed increasing trends in NY and survey-wide, with 3 species in USFWS Region

5. Six species showed no significant trend in NY and survey-wide, with 5 species in USFWS Region 5. All three geographic scales showed 67 % (16/24) of the species in this suite were declining. The vast majority of the species in this suite have been declining at significant levels since 1966.

An analysis of the just the species in this habitat suite (CWCS) is provided in Table 1.

Table 1

BBS TREND DATA FOR EARLY SUCCESSIONAL FOREST AND SHRUB BIRDS

Species	Total percent loss in NY, 1966-2002	NY (1966-2002, % change per year)	USFWS Region 5	Survey Wide
Alder/Willow flycatcher*		+ 1.1	+ 1	ns (-.1)
American woodcock***	64%	- 2.8	- 2.3	- 2.3
Black and white warbler*	46%	- 1.7	- 2	ns (-.1)
Blue-winged warbler		ns	ns	ns
Brown thrasher**	88%	- 5.8	- 2.9	- 1.2
Canada warbler*	80%	- 4.4	- 2.5	- 1.6
Chestnut-sided warbler*	30%	- 0.9	- 0.6	- 0.6
Eastern towhee*	87%	- 5.7	- 3.1	- 1.8
Field sparrow*	75%	- 4	- 3.8	- 3.1
Golden-winged warbler**	88%	- 5.8	- 7.2	- 2.1
Northern flicker*	80%	-4.3	- 3.3	- 2.5
Ruffed grouse*	82%	-4.7	- 3.8	ns (-1)
Rose-breasted grosbeak*	35%	- 1.2	ns (-.6)	- 0.7
Veery*	35%	- 1.2	- 1.0	- 1.3
Species with positive trend, or no trend (stable)		1	1	0
Species with negative trend		12	11	10
Species with ns trend		0	1	3
% species in decline****		92	87	77

ns = not a statistically significant (p < 0.1) trend (includes abundant species whose trend estimate is close to 0, and species which have larger trend estimates, but which are not detected by BBS in sufficient numbers to determine a significant trend).

* assemblages based on Audubon NY review of several studies in northern hardwood forests in relatively heavily forested areas
** species from BBS species suite listings that were not found in Audubon's study
*** singing ground surveys 1968 - 2003

***** calculated as: number of species declining ÷ total number of species.

Historic distribution and abundance.

Most of the species in this suite were common residents of NY historically. Natural communities such as pine barrens, beaver meadows, and shrub swamps were augmented by American Indian activities which produced large openings in particular along river valleys and lakes. Natural disturbance in the form of fire, wind storms, and insect/disease outbreaks also created large areas of habitat for early successional species. As early human (European) influence expanded more habitat was created. In the first half of the 1900's farmland abandonment created large areas of habitat in parts of NY.

Current distribution and abundance.

As abandoned farms reverted to forest, and increasing habitat loss to human development increased, the amount of habitat declined. More recently the amount of early successional habitat has declined dramatically. In Biological Conservation Region 13, only 43 % of the habitat that was present in the 1970's (Post unpublished) remains today.

SEQR - No Action Alternative:

Species in this group will continue to decline over time as habitat degrades and disappears. Likely that most species will persist in relatively low numbers in future.

Loss of valuable hunting opportunities for grouse and woodcock will be apparent as populations continue to decline. This will lead to further loss of hunters from an already dwindling number.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Prairie warbler (Dendroica discolor)						Migratory
Canada warbler (Wilsonia canadensis)		X			P	Migratory
Ruffed grouse (Bonasa umbellus)					G	Resident
Northern bobwhite (Colinus virginianus)					G	Resident
Brown thrasher (Toxostoma rufum)					P	Migratory
Black-billed cuckoo (Coccyzus erythropthalmus)					P	Migratory
Yellow-breasted chat (Icteria virens)					SC	Migratory
Golden-winged warbler (Vermivora chrysoptera)		X	S4	G4	P SC	Migratory
Blue-winged warbler (Vermivora pinus)			S5	G5	P	Migratory
Willow flycatcher (Empidonax traillii)			S5	G5	P	Migratory
Whip-poor-will (Caprimulgus vociferus)		X	S4	G5	P SC	Migratory
American woodcock (Scolopax minor)			S5	G5	G	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American woodcock (Scolopax minor)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Whip-poor-will (Caprimulgus vociferus)	Allegheny	Allegheny	Decreasing
	Delaware	Lake Champlain	Decreasing
	Lake Champlain	Delaware	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	SW Lake Ontario	Decreasing
	SW Lake Ontario	Susquehanna	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Willow flycatcher (Empidonax traillii)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Blue-winged warbler (Vermivora pinus)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Golden-winged warbler (Vermivora chrysoptera)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Yellow-breasted chat (Icteria virens)	Unknown	Allegheny	Unknown
		Delaware	Unknown
		Lower Hudson - Long Island Bays	Unknown
		SW Lake Ontario	Unknown
		Susquehanna	Stable
		SE Lake Ontario	Unknown
		Lake Erie	Unknown
Black-billed cuckoo (Coccyzus erythropthalmus)	Allegheny	Allegheny	Decreasing
	Delaware	Lake Champlain	Decreasing
	Lake Champlain	Delaware	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Brown thrasher (Toxostoma rufum)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Northern bobwhite (Colinus virginianus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Ruffed grouse (Bonasa umbellus)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Canada warbler (Wilsonia canadensis)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Prairie warbler (Dendroica discolor)		Allegheny	Increasing
		Delaware	Increasing
		Lake Champlain	Increasing
		Lake Erie	Increasing
		Lower Hudson - Long Island Bays	Increasing
		NE Lake Ontario - St. Lawrence	Increasing
		SE Lake Ontario	Increasing
		Susquehanna	Increasing
		SW Lake Ontario	Increasing
		Upper Hudson	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American woodcock (Scolopax minor)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Whip-poor-will (Caprimulgus vociferus)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Willow flycatcher (Empidonax traillii)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blue-winged warbler (Vermivora pinus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	Lower New England Piedmont	Decreasing
	Lower New England Piedmont	High Allegheny Plateau	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Golden-winged warbler (Vermivora chrysoptera)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Yellow-breasted chat (Icteria virens)	Unknown	Great Lakes	Unknown
		High Allegheny Plateau	Unknown
		Western Allegheny Plateau	Unknown
		North Atlantic Coast	Unknown
		Lower New England Piedmont	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Black-billed cuckoo (Coccyzus erythropthalmus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Brown thrasher (Toxostoma rufum)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Northern bobwhite (Colinus virginianus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Ruffed grouse (Bonasa umbellus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Canada warbler (Wilsonia canadensis)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Prairie warbler (Dendroica discolor)		Great Lakes	Increasing
		High Allegheny Plateau	Increasing
		Lower New England Piedmont	Increasing
		North Atlantic Coast	Increasing
		Northern Appalachian/Boreal Forest	Increasing
		St. Lawrence-Lake Champlain Valley	Increasing
		Western Allegheny Plateau	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American woodcock (Scolopax minor)				
	Breeding	Terrestrial	forested	other
	Breeding	Terrestrial	open upland	grasslands
	Feeding	Terrestrial	forested	other
	Roosting/Congregating	Terrestrial	forested	other
	Roosting/Congregating	Terrestrial	open upland	grasslands
Whip-poor-will (Caprimulgus vociferus)				
	Breeding	Terrestrial	barrens/woodlands	other
Willow flycatcher (Empidonax traillii)				
	Breeding	Terrestrial	open upland	other

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Willow flycatcher (Empidonax traillii)				
	Roosting/Congregating	Terrestrial	open upland	other
Blue-winged warbler (Vermivora pinus)				
	Breeding	Terrestrial	open upland	other
	Roosting/Congregating	Terrestrial	open upland	other
Golden-winged warbler (Vermivora chrysoptera)				
	Breeding	Palustrine	mineral soil wetland	other
	Breeding	Terrestrial	open upland	other
	Roosting/Congregating	Terrestrial	open upland	other
Yellow-breasted chat (Icteria virens)				
	Breeding	Terrestrial	open upland	other
Black-billed cuckoo (Coccyzus erythropthalmus)				
	Breeding	Terrestrial	forested	other
Brown thrasher (Toxostoma rufum)				
	Breeding	Terrestrial	forested	other
	Breeding	Terrestrial	open upland	other
Northern bobwhite (Colinus virginianus)				
	Breeding	Terrestrial	barrens/woodlands	shrublands
	Breeding	Terrestrial	open upland	cultural
	Breeding	Terrestrial	open upland	grasslands
	Feeding	Terrestrial	open upland	cultural
Ruffed grouse (Bonasa umbellus)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	other
	Breeding	Terrestrial	forested	southern deciduous
	Feeding	Terrestrial	forested	other
	Hibernating/Overwintering	Terrestrial	forested	northern coniferous
	Nursery/Juvenile	Terrestrial	forested	other
Canada warbler (Wilsonia canadensis)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	forested	other
Prairie warbler (Dendroica discolor)				
	Breeding	Terrestrial	forested	cultural
	Breeding	Terrestrial	forested	other

Goal and Objectives for Early successional forest/shrubland birds

Goal: Halt declines of early successional forest/shrub land bird species, maintain or increase populations of species where possible.

Objective 1 : Develop a management conservation plan for golden-winged warblers, including research to help determine management actions that will benefit this species over blue-winged warblers.

Measure: *Management plan prepared.*

Objective 2 : Develop a management plan that provides guidance on maintaining, enhancing and restoring early successional forest/shrub bird species.

Measure: *Plan completed.*

Objective 3 : Halt declines of all species.

Measure: *BBS trends stabilized.*

Objective 4 : Identify the causes for the decline in Canada warblers and develop a management strategy to halt declines.

Measure: *Research and management plan completed.*

Objective 5 : Implement an outreach program to educate the public and land managers to the benefits and need for early successional habitat including even-aged management.

Measure: *Outreach program implemented.*

Objective 6 : Increase the amount of early successional forest and shrub habitat on public and private land through sound planned management.

Measure: *Acreage of early successional habitats increases over the next 20 years.*

Objective 7 : Precisely monitor trends of all early successional species, in particular those that are not currently adequately monitored.

Measure: *Monitoring protocols developed and implemented.*

Objective 8 : Restore populations of ruffed grouse and American woodcock to 1966 levels.

Measure: *Populations restored to 1966 levels.*

Recommended Actions

Curriculum development:

* Educate public to the benefits and need for early successional habitat including even-aged management.

Easement acquisition:

* Implement a Landowner Incentive Project for early successional birds that will direct $600,000 per year at conserving and creating habitat for early successional forest/shrub birds.

Habitat management:

* Work with Utilities to manage ROWs in a manner that will provide for maximum benefit to early successional species.
* Double the amount of early successional forest and shrub habitat on public and private land through sound planned management.
* Increase early successional management on public and private lands.
* Maintain, restore, and enhance fire adapted ecosystems. Increase use of prescribed fire in fire adapted ecosystems.
* Promote management of Utility ROWs that will provide the maximum benefit to shrub bird species.

Habitat monitoring:

* Precisely monitor trends of all species, in particular those that are not currently adequately monitored.
* Monitor status and trends of golden-winged warblers in areas where they are common, and in particular, along the "front" of blue-winged warbler invasion northward.
* Complete an inventory and analysis for high priority focus species that identifies core habitats (highest abundance) and geographic areas (where appropriate).

Habitat research:

* Determine effects of viburnam leaf beetle on early successional forest/shrub habitats and species utilizing them.
* Develop guidelines for habitat management for golden-winged warblers. Continue to fund John Confers work on this subject and expand to areas north of the blue-wing invasion front.
* Determine if there are management techniques that can favor golden-wings over blue-wings, and in a way where pure golden-wings can be maintained, and implement this management public, private land and on ROWs. Continue to fund John Confers' work on this subject and expand to areas north of the blue-wing invasion front.
* Research into causes for declines of Canada Warbler and potential for forestry to be beneficial by opening up the canopy and promoting ground growth and thickets is needed.

Habitat restoration:

* Restore populations of ruffed grouse and American woodcock to 1966 levels.

Recommended Actions

Other action:

* Develop better mechanisms for directing federal (NRCS and USFWS) funding programs into early successional forest/shrub habitats.
* Develop BMPs for forest management in riparian areas that recognize the critical need maintain, enhance and restore early successional forest/shrub habitat in these areas.

Population monitoring:

* Encourage full completion of BBS routes.
* Develop a long term monitoring program for golden-winged warblers.
* Monitor status and trends of golden-winged warblers in areas where they are common, and in particular, along the “front” of blue-winged warbler invasion northward.

Statewide management plan:

* Develop a management plan that provides guidance on maintaining, enhancing and restoring early successional forest/shrub bird species.
* Identify the causes for the decline in Canada warblers and develop a management strategy to halt declines.
* Develop guidelines for habitat management for golden-winged warblers.

References

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Taxa Group: Bird
Species Group: Forest breeding raptors

Threats:
The Long-eared Owl, which appears to be rare, is most likely to be threatened during the breeding season. It needs both open land (grassland) for hunting and adjacent forest land for breeding (particularly conifer stands). Loss of either of these components will restrict its breeding success.

The Golden Eagle is extirpated as a breeder in this state but is a regular migrant and to some extent, an over-wintering resident.
Threats faced by golden eagles in NY include:
-collision with wind turbines, cell-towers or utility poles
-road-kill or train-kill while scavenging carrion
-the potential for disturbance at cliff-nesting sites by rock climbers, should a nest become established
-death/injury due to intentional or accidental shooting, trapping, lead poisoning or from other contaminants.

For the other species the major threat is the potential loss of relatively large blocks of forest land which are crucial for breeding by all four species. The Red-shouldered, Cooper's and Goshawk all use deciduous or mixed deciduous/coniferous woods; the Sharp-shinned and sometimes the Goshawk use pure conifer whether natural or in plantations. The major cause of contiguous forest loss comes from certain types of timber harvest (ex. clear-cutting). Disturbance around nest sites during the breeding season can also cause nest failure at certain stages of the nest cycle. Illegal collection of eggs and/or young by falconers or traffickers could also be a problem. In the 1960's and 1970's pesticide uptake was suggested as one of the reasons that both Red-shouldered Hawk and Cooper's Hawk populations declined. At present pesticide contamination does not appear to be a problem except possibly in Sharp-shinned Hawks.

Trends:
Because so little is known about Long-eared Owls in NY, there is no trend information available. All forest raptors have increased in most areas as agricultural land has reverted to forest except the Red-shouldered Hawk which continues to be rare along Lakes Erie and Ontario. Conversely the increase in forest land probably caused the elimination of the Golden Eagle as a breeder in the last place it bred in NY, namely the Adirondack Mountains. There has also been a decrease in the occurrence of DDT and its metabolites in the environment that may have assisted in the increasing occurrence of the Cooper's Hawk and the Red-shouldered Hawk.

Golden eagles, although never common as a breeder in NYS, have completely disappeared as a nesting species in NY, to the best of our knowledge, although occasional reports of summer goldens are received and it is possible a nest lurks somewhere in the Adks yet to be found.
Migrant golden eagles are more regularly being reported throughout much of NYS, at hawk-watches and by others. A recent satellite telemetry study of golden eagle fledglings from Labrador, as well as a previous satellite study of young from the Hudson Bay area, revealed extensive through-NYS use/flight-paths of these golden eagles. A well-documented over-wintering site for a pair of adult goldens has been confirmed in Dutchess County, used for more than two decades. Also, within the last two years, DEC has confirmed another annual over-wintering site for a pair of adult golden eagles in Delaware County, one of which was captured and radio-tagged. This bird was found to nest in northern Quebec, returning annually to the same Delaware County, NY wintering area. Use of NYS by wintering and migrant goldens may be on the increase, but it certainly is something we know little about and need to find out more about. The Basins and Ecoregions chosen for this species represent not only breeding areas, but areas known to host migrant and over-wintering goldens.

SEQR - No Action Alternative:
In the case of the Long-eared Owl the No Action Alternative would mean that we would learn nothing more about its

occurrence in NY than we know now and that we would not be able to assess its need for being on the Special Concern list Without surveying for forest raptors and developing timber management techniques to benefit their nesting efforts we would likely see a reduction in most of these species numbers over time as large contiguous blocks of necessary habitat become smaller fragmented woodlots that may not be suitable for successful breeding.

In the case of golden eagles, the no-action alternative would be to fail to understand how this rare New York bird is currently using NYS and what we can potentially do to ensure it's future presence here.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Long-eared owl (Asio otus)		X	S3	G5	P	Unknown
Golden eagle (Aquila chrysaetos)		X	SHB,S1N	G5	E	Migratory
Red-shouldered hawk (Buteo lineatus)			S4B	G5	P SC	Migratory
Northern goshawk (Accipiter gentilis)			S4B,S3N	G5	P SC	Resident
Cooper's hawk (Accipiter cooperii)			S4	G5	P SC	Migratory
Sharp-shinned hawk (Accipiter striatus)			S4	G5	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sharp-shinned hawk (Accipiter striatus)	Allegheny	Allegheny	Increasing
	Delaware	Delaware	Increasing
	Lake Champlain	Lake Champlain	Increasing
	Lake Erie	Lake Erie	Increasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	SE Lake Ontario	SE Lake Ontario	Increasing
	Susquehanna	Susquehanna	Increasing
	SW Lake Ontario	SW Lake Ontario	Increasing
	Upper Hudson	Upper Hudson	Increasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Cooper's hawk (Accipiter cooperii)	Allegheny	Delaware	Increasing
	Delaware	Lake Champlain	Stable
	Lake Champlain	Lake Erie	Increasing
	Lake Erie	Lower Hudson - Long Island Bays	Increasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	Lower Hudson - Long Island Bays	SE Lake Ontario	Increasing
	SE Lake Ontario	Susquehanna	Stable
	Susquehanna	SW Lake Ontario	Increasing
	SW Lake Ontario	Upper Hudson	Increasing
	Upper Hudson		
Northern goshawk (Accipiter gentilis)	NE Lake Ontario - St. Lawrence	Delaware	Increasing
	Lake Champlain	Lake Champlain	Increasing
	Upper Hudson	Lake Erie	Increasing
		NE Lake Ontario - St. Lawrence	Increasing
		SE Lake Ontario	Increasing
		Susquehanna	Increasing
		SW Lake Ontario	Increasing
		Upper Hudson	Increasing
Red-shouldered hawk (Buteo lineatus)	Allegheny	SE Lake Ontario	Decreasing
	Lake Erie	SW Lake Ontario	Decreasing
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Increasing
	Lower Hudson - Long Island Bays	Lake Champlain	Increasing
	SW Lake Ontario	Upper Hudson	Increasing
	Susquehanna	Delaware	Increasing
	Upper Hudson	Susquehanna	Increasing
	Delaware	Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Golden eagle (Aquila chrysaetos)	Upper Hudson	Lake Erie	Unknown
	Delaware	SW Lake Ontario	Unknown
	Lake Champlain	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence	Susquehanna	Unknown
	Susquehanna	Delaware	Unknown
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Decreasing
	SW Lake Ontario	Lake Champlain	Decreasing
	Lake Erie	Upper Hudson	Decreasing
	Allegheny	Lower Hudson - Long Island Bays	Unknown
	Lower Hudson - Long Island Bays		
Long-eared owl (Asio otus)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sharp-shinned hawk (Accipiter striatus)	Great Lakes	Great Lakes	Increasing
	High Allegheny Plateau	High Allegheny Plateau	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	North Atlantic Coast	North Atlantic Coast	Increasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Western Allegheny Plateau	Western Allegheny Plateau	Increasing
Cooper's hawk (Accipiter cooperii)	Great Lakes	Great Lakes	Increasing
	High Allegheny Plateau	High Allegheny Plateau	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	Northern Appalachian/Boreal Forest	North Atlantic Coast	Increasing
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Increasing
	Western Allegheny Plateau	Northern Appalachian/Boreal Forest	Increasing
		Western Allegheny Plateau	Increasing
Northern goshawk (Accipiter gentilis)	Northern Appalachian/Boreal Forest	Great Lakes	Increasing
	St. Lawrence-Lake Champlain Valley	High Allegheny Plateau	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
		Northern Appalachian/Boreal Forest	Increasing
		St. Lawrence-Lake Champlain Valley	Increasing
		Western Allegheny Plateau	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Red-shouldered hawk (Buteo lineatus)	Western Allegheny Plateau	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	Western Allegheny Plateau	North Atlantic Coast	Increasing
		Northern Appalachian/Boreal Forest	Increasing
		St. Lawrence-Lake Champlain Valley	Increasing
		Western Allegheny Plateau	Increasing
Golden eagle (Aquila chrysaetos)	Northern Appalachian/Boreal Forest	Western Allegheny Plateau	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown
	Great Lakes	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Northern Appalachian/Boreal Forest	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Long-eared owl (Asio otus)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	Lower New England Piedmont	Unknown
	Lower New England Piedmont	High Allegheny Plateau	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sharp-shinned hawk (Accipiter striatus)				
	Breeding	Terrestrial	forested	northern coniferous
	Feeding	Terrestrial	forested	cultural
	Feeding	Terrestrial	forested	northern coniferous
	Feeding	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Terrestrial	forested	cultural
	Hibernating/Overwintering	Terrestrial	forested	northern coniferous
	Hibernating/Overwintering	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Terrestrial	forested	southern coniferous
	Hibernating/Overwintering	Terrestrial	forested	southern deciduous
Cooper's hawk (Accipiter cooperii)				
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	southern coniferous
	Breeding	Terrestrial	forested	southern deciduous
	Hibernating/Overwintering	Terrestrial	forested	cultural
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
	Hibernating/Overwintering	Terrestrial	forested	southern coniferous
	Hibernating/Overwintering	Terrestrial	forested	southern deciduous
Northern goshawk (Accipiter gentilis)				
	Breeding	Terrestrial	alpine/mountain	northern deciduous
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Terrestrial	forested	cultural
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
	Hibernating/Overwintering	Terrestrial	forested	northern coniferous
	Hibernating/Overwintering	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Terrestrial	forested	southern coniferous
	Hibernating/Overwintering	Terrestrial	forested	southern deciduous
Red-shouldered hawk (Buteo lineatus)				
	Breeding	Palustrine	mineral soil wetland	deciduous forested
	Breeding	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	forested	northern deciduous
Golden eagle (Aquila chrysaetos)				
	Breeding	Terrestrial	alpine/mountain	cliffs & open talus
	Breeding	Terrestrial	forested	mixed deciduous/coniferous
	Feeding	Terrestrial	open upland	grasslands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Golden eagle (Aquila chrysaetos)				
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
	Hibernating/Overwintering	Terrestrial	open upland	grasslands
Long-eared owl (Asio otus)				
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	open upland	grasslands
	Feeding	Terrestrial	open upland	grasslands
	Hibernating/Overwintering	Terrestrial	forested	northern coniferous
	Hibernating/Overwintering	Terrestrial	forested	southern coniferous
	Roosting/Congregating	Terrestrial	forested	northern coniferous
	Roosting/Congregating	Terrestrial	forested	southern coniferous

Goal and Objectives for Forest breeding raptors

Goal: Ensure viable breeding, migratory and over-wintering populations of all species of "forest dwelling raptors" statewide.

Objective 1 : Build database sufficient to more accurately estimate the statewide population of Long-eared Owls.

Measure: *At least 50 % of the adults and all young will be banded at each nest site.*

Objective 2 : Conduct research on the breeding biology of Goshawks in both conifer plantations and non-plantation conifer stands.

Measure: *Over a 5 year period compare the reproductive success and habitat use of 10 Goshawk nests in both conifer plantations and non-plantation conifer forests.*

Objective 3 : Conduct research on the breeding biology of Sharp-shinned Hawks.

Measure: *Over a five year period locate 10 active nests and follow the nesting cycle from courtship to fall migration.*

Objective 4 : Conduct research on the population biology of the Long-eared Owl using a minimum of 20 nests, over a five year period.

Measure: *Data will be collected that show the habitat type used for nesting and the number of young fledged per nest of all nests found.*

Objective 5 : Conduct taped call surveys for woodland nesting raptors on all N.Y.S.D.E.C. land over a 10 year period.

Measure: *ten percent of forested N.Y.S.D.E.C. land will be surveyed each year using taped calls.*

Objective 6 : Determine migration pathways, site-fidelity, and essential habitats of over-wintering NYS golden eagles.

Measure: *Up to ten golden eagles are captured and satellite-tagged over a ten-year period, and movements compiled and mapped out for use by land managers and biologists.*

Objective 7 : Develop forest cutting strategies that will benefit breeding raptors over a ten year period.

Measure: *Test different cutting regimes and buffers on nests of each raptor species at a minimum of 10 nest sites per species over a 10 year period.*

Objective 8 : Maintain appropriate breeding habitat for Long-eared Owls around the discovered nests sites.

Measure: *At 50 % of the known nest sites conduct active management to maintain both grasslands and adjacent woodland at a stage that is appropriate for successful breeding over a five year period after the initial breeding biology research.*

Objective 9 : Monitor Wind Farms for raptor mortality especially Golden Eagles over a ten year period.

Measure: *Check each wind farm on a yearly basis to record any mortality to raptors.*

Objective 10 : Monitor/investigate the occurrence of Golden Eagles in NY over a ten year period.

Measure: *Compile migration count data from the Hawk migration sites around NY, compile sightings, and monitor known and suspected over-wintering areas on a yearly basis, and investigate any breeding season sightings of birds.*

Objective 11 : Using both Department staff and interested birders, survey appropriate habitat for breeding and overwintering Long-eared Owls across the state over a 10 year period.

Measure: *Within each watershed approximately 10% of the potential habitat will be surveyed each year.*

Recommended Actions

Recommended Actions

Habitat management:

* Habitat management for all these species (except the Golden Eagle which is effectively extirpated as a breeder) is largely unknown it is therefore important that we experiment with different management techniques in order to find out what will work. This means trying different cutting regimes and different buffer distances (and potentially fire management where appropriate). We should do this in both hardwoods and conifers (plantations and native). At the moment we have an opportunity to experiment with Goshawk habitat on some Region 7 State Forests where timber harvest of red pine stands is planned and where we know that some Goshawk nests occur.

Life history research:

* Initiate a live-trapping/radio-tagging program for golden eagles in NYS to determine migratory pathways, site fidelity, and essential habitats.

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Taxa Group: Bird
Species Group: Freshwater marsh nesting birds

Threats:
Loss, degradation, isolation, and fragmentation of habitat via drainage for agriculture or development are the main factors cited as causes for marshbird population declines. Habitat loss has left many localized marshes that were too small by themselves, or were not part of larger marsh complexes, unsuitable for marshbirds. Human disturbance is often cited as a potential threat, which can expose marshbird chicks to adverse weather or destroy nests. Marshbirds sometimes die of botulism, but this disease or the various parasites harbored by these species do not seem to be major causes of mortality. Current federal and state regulations appear to provide marshbirds, themselves, adequate protection throughout their breeding ranges, though habitat protection is more varied and questionable. The species are protected under the Migratory Bird Treaty Act in the US, the Migratory Bird Convention Act in Canada, and the Convention for the Protection of Migratory Birds and Game Mammals in Mexico. Section 404 of the Clean Water Act and the Swampbuster provisions of the Food Security Act of 1985, as well as the New York State Wetlands Law of 1974 provide some protection for marshbird breeding habitats, although these are not adequate to prevent all wetland losses. Siltation and runoff from development and agriculture may negatively impact prey species. Water level management on Lake Ontario and other larger water bodies can alter marsh habitat and decrease the quality of historically utilized sites. In other cases, lack of stochastic events which produce a flushing effect may negatively impact marshbirds by promoting large monotypic stands of emergent vegetation. In such cases active management of water levels may benefit species. Contaminant levels appear to have declined noticeably from those found in the 1970s and early 1980s. Direct chemical toxicity is generally not a problem, but may reduce favored insect/fish foods. While generally not a serious concern, a large oil spill where numbers of individuals congregate during migration or wintering might have serious consequences. Small, localized breeding populations are extremely vulnerable to stochastic events, such as storms, habitat loss, or human disturbance. Invasive exotic plants, such as purple loosestrife crowd out native emergents and form stands too dense for nesting marshbirds. An increase in feral Mute Swan populations may negatively impact Black Tern and other marshbirds. Introduction of piscivorous predatory fish to rivers and lakes in Panama and other locations in the late 1960s may reduce populations of small fish prey. Current regulatory mechanisms are inadequate to protect the species that migrate to central and south America and their habitats on the wintering range.

Trends:
Although the Black Tern and other marsh birds appear to have sharply declined in numbers in North America since the beginning of the BBS in 1966, many populations appear to have leveled off or risen slightly in the 1990s. The highly secretive nature of many marsh birds makes detection difficult when utilizing standard BBS survey methodology. Standardized marshbird specific methodologies must be developed and implemented regionally and continentally. Marshbird species still occupy most of their former range continent-wide. Nevertheless, because of the severity of the earlier declines, these species still warrant serious concern. Specifically, conservation efforts should be undertaken to monitor current and historic populations and to continue to reverse declines.

Pied-billed Grebe: Rare to uncommon local breeder; fairly common migrant, more numerous in fall. This species appears to have seriously declined in numbers, potentially due to wetland habitat loss and degradation. The Breeding Bird Atlas project found it to be a locally rare to uncommon breeder in relatively few, but widely distributed blocks in all regions of the state. BBS data indicate an -2.0 annual trend between 1980 and 2002, p=.62. MMP in the Great Lakes region documented a year-to year variation of -15.9, p= .0000, 1995-2001.

American Bittern: Uncommon and declining breeder throughout NYS. The Atlas project showed this species to be widely distributed in the state, though missing from most blocks in the Appalachian Plateau and scarce west of the Finger Lakes. A significant population decline, attributed to habitat loss, was documented between 1940 and 1970 in the Cayuga basin. BBS data indicate an -0.4 annual trend between 1980 and 2002, p= .79. MMP in the Great Lakes region documented a year-to year variation of -10.0, p=.0094, 1995-2001.

Least Bittern: Uncommon to rare breeder of spotty distribution. The Atlas reported its nesting abundance as only uncommon to rare but did find it more widely distributed than described earlier.

King Rail: Vary rare and local breeder in fresh and brackish marshes south of the Adirondacks. During the past 30 years, the King Rail has declined alarmingly, especially in the northern part of its range. New York, at the northern periphery of its breeding range, has witnessed this decline. It formerly bred at several localities on Long Island.

Black Tern: Very local breeder, nearly all extant colonies located on the Great Lakes Plain. A serious decline in the number of active sites and number of breeding pairs has been documented statewide between 1989 and 2004. Statewide breeding pair census documented at a high of 284 in 1991 and a low of 155 in 2001 (surveys conducted in 1989, 1990, 1991, 1994, 1998, 2001). MMP in the Great Lakes region documented a year-to year variation of -18.7, p=.0000, 1995-2001.

Yellow Rail: A rare but probably regular fall migrant, undoubtedly overlooked, and very rare spring migrant. Casual winter visitant. It is significant that breeding bird atlas work in nearby MI and ON, within the primary breeding range for this species, produced relatively few records, fewer yet of confirmed breeding. It is truly an elusive species whose real status remains very little known in NYS.

SEQR - No Action Alternative:

If no action is taken to reduce wetland habitat loss and degradation the negative population trends documented for many marsh-nesting species will continue. Large wetland complexes will likely become fragmented and cease to support viable breeding populations. Invasive species, such as purple loosestrife, will continue to degrade marsh habitats and alter vegetative communities.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Yellow rail (Coturnicops noveboracensis)						Migratory
Black tern (Chlidonias niger)		X	S2B	G4	E	Migratory
King rail (Rallus elegans)			S1B,SZN	G4G5	T	Migratory
Least bittern (Ixobrychus exilis)			S3B,S1N	G5	T	Migratory
American bittern (Botaurus lentiginosus)		X	S4	G4	P SC	Migratory
Pied-billed grebe (Podilymbus podiceps)		X	S3B,S1N	G5	T	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Pied-billed grebe (Podilymbus podiceps)	Allegheny	Upper Hudson	Decreasing
	Delaware	SW Lake Ontario	Decreasing
	Lake Champlain	Susquehanna	Decreasing
	Lake Erie	SE Lake Ontario	Decreasing
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Decreasing
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Decreasing
	SE Lake Ontario	Lake Erie	Decreasing
	Susquehanna	Lake Champlain	Decreasing
	SW Lake Ontario	Delaware	Decreasing
	Upper Hudson	Allegheny	Decreasing
American bittern (Botaurus lentiginosus)	Upper Hudson	Upper Hudson	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Delaware	Delaware	Decreasing
	Allegheny	Allegheny	Decreasing
Least bittern (Ixobrychus exilis)	Lake Erie	Lake Erie	Stable
	SW Lake Ontario	SW Lake Ontario	Stable
	SE Lake Ontario	SE Lake Ontario	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Stable
	Upper Hudson	Upper Hudson	Stable
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
King rail (Rallus elegans)	Lake Erie	Lake Erie	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Black tern (Chlidonias niger)	Lake Erie	Lake Erie	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
		Lake Champlain	Decreasing
Yellow rail (Coturnicops noveboracensis)	SE Lake Ontario	SE Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Lake Erie	Lake Erie	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Pied-billed grebe (Podilymbus podiceps)	High Allegheny Plateau	Great Lakes	Decreasing
	Great Lakes	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American bittern (Botaurus lentiginosus)	Great Lakes	Western Allegheny Plateau	Decreasing
	High Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Decreasing
	Lower New England Piedmont	Northern Appalachian/Boreal Forest	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Lower New England Piedmont	Decreasing
	St. Lawrence-Lake Champlain Valley	High Allegheny Plateau	Decreasing
	Western Allegheny Plateau	Great Lakes	Decreasing
Least bittern (Ixobrychus exilis)	Great Lakes	Great Lakes	Stable
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable
	Lower New England Piedmont	Lower New England Piedmont	Stable
	North Atlantic Coast	North Atlantic Coast	Stable
King rail (Rallus elegans)	Great Lakes	North Atlantic Coast	Decreasing
	Lower New England Piedmont	Great Lakes	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Decreasing
Black tern (Chlidonias niger)	Great Lakes	Great Lakes	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
Yellow rail (Coturnicops noveboracensis)	Great Lakes	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	North Atlantic Coast	Unknown
	North Atlantic Coast	Great Lakes	Unknown
	Lower New England Piedmont	St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Pied-billed grebe (Podilymbus podiceps)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Hibernating/Overwintering	Lacustrine	cold water deep	structure
American bittern (Botaurus lentiginosus)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Breeding	Riverine	coastal plain stream	marsh
	Breeding	Terrestrial	open upland	grasslands
	Hibernating/Overwintering	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Palustrine	mineral soil wetland	emergent marsh
Least bittern (Ixobrychus exilis)				
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Nursery/Juvenile	Palustrine	mineral soil wetland	emergent marsh
King rail (Rallus elegans)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Hibernating/Overwintering	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Palustrine	mineral soil wetland	emergent marsh
Black tern (Chlidonias niger)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Roosting/Congregating	Lacustrine	cold water deep	sand/gravel bottom
Yellow rail (Coturnicops noveboracensis)				
	Breeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Hibernating/Overwintering	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Palustrine	mineral soil wetland	emergent marsh

Goal and Objectives for Freshwater marsh nesting birds

Goal: Maintain breeding populations at or above current levels

Objective 1 : Document abundance, distribution and trend of freshwater and salt marsh bird populations

Measure: *Breeding population estimate, colony distribution, long term trends*

Objective 2 : Identify threats and environmental stressors and identify sub-populations at risk

Measure: *List threats and stressors, assess impacts on productivity, delineate geographic regions and populations at risk*

Objective 3 : Increase availability of suitable marsh bird habitat to support viable populations of native marsh bird species

Measure: *Locations, size, proximity to other suitable habitat*

Objective 4 : Obtain increased knowledge of the breeding ecology, foraging habits, and basic demography of these species

Measure: *Physiology, pathology, productivity, gene flow, locations, habitats, prey species, bioenergetics, immigration/ emigration rates*

Objective 5 : Reduce contaminant levels in the environment and species populations

Measure: *Water, sediment, forage levels, as well as species blood, feather and egg levels, and fledgling success*

Recommended Actions

Curriculum development:

* Utilize education as a tool for reducing wetland loss and the possible detrimental effects of human disturbance.

Fact sheet:

* Promote the establishment of buffer areas around agricultural fields and developments.

Habitat management:

* Restore wetland habitat and improve water level control
* Evaluate the extent to which management actions can reduce nest and chick losses via predator management and water level regulation.
* Promote the use of Farm Bill and Landowner Incentive program funds to manage and restore appropriate habitat.
* Adapt wetland management practices throughout the range of these species so they can simultaneously benefit waterfowl, marsh birds, and other water birds.
* For endangered, threatened or rapidly declining marsh bird species/populations protect all sites currently in use, and all historic sites of suitable habitat.

Habitat monitoring:

* Identify and prepare a catalog of key migratory staging, molting areas, and wintering grounds.

Recommended Actions

* Prepare a catalog, where possible, of breeding sites identifying and mapping sites at a course scale to select sites worthy of monitoring.
* Investigate diet and nutrition in relation to breeding habitat quality and prey populations.

Habitat research:

* Evaluate habitats by a variety of techniques at multiple scales to better understand the micro- and macro habitat features important to nest site selection.
* Conduct controlled experiments to see which management actions are effective locally in producing habitat suitable for marsh birds.
* Further evaluate the effectiveness of artificial nest platforms for increasing nest success or densities of Black Tern, emphasizing placement of platforms where nest substrates appear to be limiting or where terns may be encouraged to nest in areas of low disturbance.

Invasive species control:

* Identify invasive species which have the potential to negatively impact marsh birds and quantify impact.
* Reduce the spread and colonization of new sites by invasive exotic species.
* Where feasible, control invasive species, which are known to have detrimental affects on marsh birds, to reduce negative impact, i.e. promote the implementation of biological controls to combat purple loosestrife.

Life history research:

* Conduct demographic studies at selected sites across the species breeding range to identify "source" and "sink" populations, thus the regions most important for maintaining a breeding population.
* Conduct studies of habitat use, prey availability, and diet at migratory staging and molting areas and wintering grounds to assess possible threats and limiting factors.
* Investigate aspects of behavioral ecology, such as mate selection, mate fidelity, spacing behavior, coloniality, dispersal, and post fledging parental care.
* Periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival.

Modify regulation:

* Concurrently with management actions, efforts should be pursued vigorously to protect the quality and quantity of available wetland habitat and minimize wetland loss.

New legislation:

* Develop and implement a noxious weed law to control the introduction and distribution of invasive exotic species.

New regulation:

* Maintain water quality in nesting marshes and discourage use of pesticides on public lands to prevent reduction of insect populations and contamination of wetlands.

Recommended Actions

Population monitoring:

* Refine monitoring techniques to better detect population trends and determine the cause of these changes.
* Initiate baseline population surveys to determine abundance and distribution and periodically resurvey to detect trends
* Study metapopulation dynamics and demography, focusing on such parameters as survival, age at first breeding, recruitment, dispersal, and the factors that affect them, using color-banded or radio-tagged birds.

Regional management plan:

* Collaborate with existing planning initiative such as the North American Waterbird Plan, Bird Conservation Regional Plans and other regional efforts.

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Species Group: Grassland birds

Threats:
Grassland bird species of greatest conservation need in New York State include upland sandpiper (Bartramia longicauda), grasshopper sparrow (Ammodramus savannarum), bobolink (Dolichonyx oryzivorus), eastern meadowlark (Sturnella magna), northern harrier (Circus cyaneus), short-eared owl (Asio flammeus), sedge wren (Cistothorus platensis), and Henslow’s sparrow (Ammodramus henslowii).

Other bird species that would benefit from efforts to conserve grassland birds include: horned lark (Eremophila alpestris) and vesper sparrow (Pooecetes gramineus), American kestrel (Falco sparverius), savannah sparrow (Passerculus sandwichensis), wintering raptors, ring-necked pheasant (Phasianus colchicus), barn owl (Tyto alba), nesting waterfowl, and killdeer (Charadrius vociferus). American woodcock (Scolopax minor), discussed under Early Successional Bird Species, also utilize grasslands for singing grounds and night roosting. Migrating shorebirds may also make use of some grasslands.

In New York, threats include loss, degradation, and fragmentation of grassland habitats due to: loss of farms, more intensive agriculture, reversion to shrub and forest, human development, and fire suppression.

When looking at this diverse list of species, it would appear to be a daunting task to do research or manage for each of these species separately. A more workable approach is to select “focus” species to be the primary driving force, while trying not to forget the diversity of the group as a whole.

Based on these considerations, the following “focus species” have been identified for New York’s Grassland Bird Conservation Plan (GBCP, to be developed): Upland Sandpiper, Northern Harrier, Grasshopper Sparrow, Henslow's Sparrow, Bobolink, E. Meadowlark, sedge wren, and wintering Short-eared Owl (reference GBCP). “Second Tier” species would include all other grassland species listed in the first paragraph above, and breeding Short-eared Owl.

Grasslands come in a range of types from agricultural hayfields and pastures, to airports and golf courses, to old fields, to pine barrens. Bog, beaver meadows, and other marsh habitats can also provide habitat for some species. Although considered to be one suite of species that utilize grasslands, the specific preferences for habitat can vary greatly. Henslow’s Sparrows utilize older fields, with little shrub cover, but with relatively tall grass and heavy thatch. Upland Sandpipers utilize grasslands with a matrix of vegetative structure; from taller, thicker stands for nesting to shorter more open areas for foraging. Many species, especially Henslow’s Sparrow and Upland Sandpipers, are area sensitive, preferring larger grasslands of at least 75 to 100 or more acres. Short-eared Owls need residual standing cover and high microtus populations in winter for foraging. In order to provide for the needs of all grassland birds, a variety of grassland types and ages will be needed. This will require a variety of habitat management methods be utilized over the landscape to assure that the specific needs of all species are adequately conserved.

The widespread and dramatic declines in most grassland- dependent species in NY makes the conservation of remaining grasslands of substantial size important. The NYS Grassland Group has determined that in order to maintain and conserve grasslands in NY over the long term, the largest, most important core grassland areas need to be identified, and our efforts focused there. This will increase the potential that the larger core grasslands will be the highest priority for funding for research and conservation efforts. Most grasslands of substantial size provide important habitats, however, the viability of small, isolated grasslands over the very long term is probably low. With limited resources and manpower, it is imperative that core, high priority, grasslands be defined and be the first to receive conservation efforts. This will maximize the probability of maintaining viable populations of rare grassland species over the long term. While this delineation process is on going, a draft map of core grassland areas has been prepared.

Economic factors that influence dairy farming will play a key role in the future of grasslands in NY. Probably the most serious threat would arise from failure to address the issue of maintaining the viability of dairy farming, especially smaller "family" farms. Grassland habitats are being lost due to conversion to development, row crops, more intensive agriculture, and reversion to shrublands and forests. As grasslands are lost, many of the remaining grasslands become even more scattered and isolated. This further reduces the ability of these grasslands to function as part of the overall grassland ecosystem. Farming methods that result in more frequent and earlier mowing are a very serious threat. Many of the fire dependent pine barren type communities also support grassland species. Due to fire suppression, many of these habitats have undergone significant changes and no longer support grassland species.

Protecting and managing grasslands is a monumental task that will require considerable amounts of funding. Most farmers can not afford to set aside grasslands until after the nesting season. Active management of grasslands is done through somewhat costly methods such as mowing or burning. Where the funding will come from to pay for the management action is a critical question. Light grazing can also be used as a tool, but in most cases, intensive grazing doesn't provide substantial benefit to most grassland species.

The future of grassland birds in NY relies on finding new mechanisms to conserve grasslands, and making better, more focused use of existing funding sources such as the Farm Bill Programs. Unfortunately, the Northeast has a poor track record for competing with other parts of the country for some of the key program funds, such as the Conservation Reserve Program. The long term ability to conserve grassland birds will probably hinge on our ability to more effectively direct funds from federal subsidy programs into core priority grasslands.

Trends:

Historic distribution and abundance.

Grassland birds have been shown to be an important part of the original avifauna in many parts of the Northeast, and their habitats were greatly enhanced by Indian activities in many places. For most of the past three centuries, most of the Northeast region has undergone major changes in forest cover, due to logging and clearing for agriculture, and then subsequent land abandonment and reforestation. The distribution and abundance of grassland birds expanded with increased clearing of land for agriculture following colonization of NY by European settlers, and then began to decrease as these farms were abandoned and reverted to forest.

Current distribution and abundance.

In the latter part of the 20th century, in much of NY, substantial losses of grassland have occurred due to development, widespread farmland abandonment, and reforestation. Grassland habitats have been declining fairly rapidly in the last few decades. Further, more intensive agricultural practices and the conversion of many grasslands to row crops have resulted in less habitat available for grassland birds. The remaining core grasslands are of conservation concern (Wells and Rosenberg 1999).

Population trends for most grassland bird species have been documented from Breeding Bird Survey (BBS) data. According to Breeding Bird Survey data during the period from 1966-2002, in NY, several grassland species exhibited precipitous declines, such as: Grasshopper sparrow 95%, Henslow's sparrow 94%, Vesper sparrow 93%, Eastern meadowlark 84%, and Savannah sparrow 59%. Several other species are also believed to be in precipitous decline, but are not adequately sampled by BBs to determine a precise trend. Populations of all grassland bird species of concern declined from 0.3 to 15% per year between 1966 and 2002 (Table 1).

Post (2004) completed an analysis of Breeding Bird Survey (BBS) data. Of the 8 grassland species included in analysis, none of them showed a significant increasing trend. In USFWS Region 5 and NY 63 % (5/8) were declining, and the remainder (3) showed no significant trend. Survey-wide, 75 % (6/8) percent of species were declining, with the other 2 species having no significant trend. The vast majority of the species in this suite were declining. The apparent declines for upland sandpiper and northern harrier in NY and USFWS Region 5 are not significant, probably due to inadequate detection on BBS routes.

Henslow's Sparrow declined -25.4 (p=0.005) during the period of 1980-2002.

TABLE 1

Species	Total percent decline in NY, 1966-2002	BBS TREND DATA FOR GRASSLAND BIRDS (1966-2002, % change per year) NY	USFWS Region 5	Survey Wide
Grasshopper sparrow	95%	- 8.2	- 4.8	- 3.6
Henslow's sparrow	94%	- 7.9	-7.5	- 4.6
Vesper sparrow	93%	-7.2	- 5.1	- 4.6
Eastern meadowlark	84%	- 5.0	- 4.3	- 2.9
Savannah sparrow	59%	- 2.5	- 2.1	ns (+ 0.9)
Bobolink		ns (- .4)	ns (-.06)	- 1.6
Upland sandpiper		ns (-5.1)	ns (-2.8)	ns (+.9)
Northern harrier		ns (-3)	ns (-1.3)	- 1.1
Species with positive trend		0	0	0
Species with negative trend		5	5	6
Species with ns trend		3	3	2
% species in decline*		63 (5/8)	63 (5/8)	75 (6/8)

ns = not a statistically significant (p < 0.1) trend (includes abundant species whose trend estimate is close to 0, and species which have larger trend estimates, but which are not detected by BBS in sufficient numbers to determine a significant trend).

* calculated as: number of species declining ÷ total number of species.

SEQR - No Action Alternative:

These species will continue to be a part of NY's avifauna for some time, but in declining numbers and distribution, with eventual extirpation of some species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Dickcissel (Spiza americana)						Migratory
Eastern meadowlark (Sturnella magna)					P	Migratory
Sedge wren (Cistothorus platensis)		X		GS3B,SAN5	T	Migratory
Bobolink (Dolichonyx oryzivorus)			S5	G5	P	Migratory
Henslow's sparrow (Ammodramus henslowii)		X	S3B,SAN	G4	T	Migratory
Grasshopper sparrow (Ammodramus savannarum)			S4	G5	P SC	Migratory

Vesper sparrow (Pooecetes gramineus)		S5	G5	P SC	Migratory
Horned lark (Eremophila alpestris)		S5	G5	P SC	Migratory
Short-eared owl (Asio flammeus)	X	S2	G5	E	Resident
Upland sandpiper (Bartramia longicauda)	X	S3B	G5	T	Migratory
Northern harrier (Circus cyaneus)	X	S3B,S3N	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern harrier (Circus cyaneus)	Unknown	SW Lake Ontario	Unknown
		Susquehanna	Unknown
		SE Lake Ontario	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Lower Hudson - Long Island Bays	Decreasing
		Lake Erie	Unknown
		Allegheny	Unknown
		Delaware	Unknown
		Upper Hudson	Unknown
		Lake Champlain	Unknown
Upland sandpiper (Bartramia longicauda)	Unknown	Delaware	Decreasing
		Lake Champlain	Decreasing
		Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		SE Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SW Lake Ontario	Decreasing
		Upper Hudson	Decreasing
		Allegheny	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Short-eared owl (Asio flammeus)	Unknown	Lake Champlain	Unknown
		Lake Erie	Unknown
		Lower Hudson - Long Island Bays	Decreasing
		NE Lake Ontario - St. Lawrence	Unknown
		SE Lake Ontario	Unknown
		Susquehanna	Unknown
		SW Lake Ontario	Unknown
Horned lark (Eremophila alpestris)	Unknown	Delaware	Decreasing
		Lake Champlain	Decreasing
		Lake Erie	Decreasing
		Upper Hudson	Decreasing
		SW Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SE Lake Ontario	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		Allegheny	Decreasing
Vesper sparrow (Pooecetes gramineus)	Unknown	Delaware	Decreasing
		Lake Champlain	Decreasing
		Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		SE Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SW Lake Ontario	Decreasing
		Upper Hudson	Decreasing
		Allegheny	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Grasshopper sparrow (Ammodramus savannarum)	Unknown	Allegheny	Decreasing
		Delaware	Decreasing
		Lake Champlain	Decreasing
		Lake Erie	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		SE Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SW Lake Ontario	Decreasing
		Upper Hudson	Decreasing
Henslow's sparrow (Ammodramus henslowii)	Unknown	Allegheny	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Lake Erie	Decreasing
		SW Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SE Lake Ontario	Decreasing
Bobolink (Dolichonyx oryzivorus)	Unknown	SW Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SE Lake Ontario	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		Lake Erie	Decreasing
		Lake Champlain	Decreasing
		Delaware	Decreasing
		Allegheny	Decreasing
		Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sedge wren (Cistothorus platensis)	Allegheny	Allegheny	Unknown
	Delaware	Lake Champlain	Unknown
	Lake Champlain	Lake Erie	Unknown
	Lake Erie	NE Lake Ontario - St. Lawrence	Unknown
	NE Lake Ontario - St. Lawrence	SE Lake Ontario	Unknown
	Lower Hudson - Long Island Bays	Susquehanna	Unknown
	SE Lake Ontario	SW Lake Ontario	Unknown
	Susquehanna	Upper Hudson	Unknown
	SW Lake Ontario		
	Upper Hudson		
Eastern meadowlark (Sturnella magna)	Unknown	Delaware	Decreasing
		Upper Hudson	Decreasing
		SW Lake Ontario	Decreasing
		Susquehanna	Decreasing
		SE Lake Ontario	Decreasing
		NE Lake Ontario - St. Lawrence	Decreasing
		Lower Hudson - Long Island Bays	Decreasing
		Lake Erie	Decreasing
		Lake Champlain	Decreasing
		Allegheny	Decreasing
Dickcissel (Spiza americana)	Unknown	Allegheny	Unknown
		Lake Erie	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Northern harrier (Circus cyaneus)	Unknown	Great Lakes	Unknown
		High Allegheny Plateau	Unknown
		Lower New England Piedmont	Unknown
		North Atlantic Coast	Unknown
		Northern Appalachian/Boreal Forest	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
		Western Allegheny Plateau	Unknown
Upland sandpiper (Bartramia longicauda)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Lower New England Piedmont	Decreasing
		North Atlantic Coast	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Unknown	Decreasing
Short-eared owl (Asio flammeus)	Unknown	Great Lakes	Unknown
		High Allegheny Plateau	Unknown
		Lower New England Piedmont	Unknown
		North Atlantic Coast	Unknown
		Northern Appalachian/Boreal Forest	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
		Western Allegheny Plateau	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Horned lark (Eremophila alpestris)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Western Allegheny Plateau	Decreasing
		North Atlantic Coast	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
Vesper sparrow (Pooecetes gramineus)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Lower New England Piedmont	Decreasing
		Western Allegheny Plateau	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		North Atlantic Coast	Decreasing
Grasshopper sparrow (Ammodramus savannarum)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Lower New England Piedmont	Decreasing
		North Atlantic Coast	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Western Allegheny Plateau	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Henslow's sparrow (Ammodramus henslowii)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Western Allegheny Plateau	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
Bobolink (Dolichonyx oryzivorus)	Unknown	Great Lakes	Decreasing
		High Allegheny Plateau	Decreasing
		Western Allegheny Plateau	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		North Atlantic Coast	Decreasing
		Lower New England Piedmont	Decreasing
Sedge wren (Cistothorus platensis)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Western Allegheny Plateau	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern meadowlark (Sturnella magna)	Unknown	Western Allegheny Plateau	Decreasing
		St. Lawrence-Lake Champlain Valley	Decreasing
		Northern Appalachian/Boreal Forest	Decreasing
		North Atlantic Coast	Decreasing
		Lower New England Piedmont	Decreasing
		High Allegheny Plateau	Decreasing
		Great Lakes	Decreasing
Dickcissel (Spiza americana)	Unknown	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern harrier (Circus cyaneus)				
	all	Lacustrine	warm water shallow	other
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	mineral soil wetland	meadow
	all	Terrestrial	open upland	grasslands
Upland sandpiper (Bartramia longicauda)				
	Breeding	Terrestrial	open upland	grasslands
	Feeding	Terrestrial	open upland	grasslands
	Roosting/Congregating	Terrestrial	open upland	grasslands
Short-eared owl (Asio flammeus)				
	all	Palustrine	mineral soil wetland	meadow
	all	Terrestrial	open upland	grasslands
Horned lark (Eremophila alpestris)				
	Breeding	Terrestrial	open upland	beach/shoreline
	Breeding	Terrestrial	open upland	cultural
	Breeding	Terrestrial	open upland	grasslands
Vesper sparrow (Pooecetes gramineus)				
	Breeding	Terrestrial	open upland	cultural
	Breeding	Terrestrial	open upland	grasslands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Grasshopper sparrow (Ammodramus savannarum)				
	Breeding	Terrestrial	open upland	grasslands
Henslow's sparrow (Ammodramus henslowii)				
	Breeding	Terrestrial	open upland	grasslands
Bobolink (Dolichonyx oryzivorus)				
	Breeding	Terrestrial	open upland	grasslands
Sedge wren (Cistothorus platensis)				
	Breeding	Palustrine	mineral soil wetland	meadow
	Breeding	Terrestrial	open upland	grasslands
Eastern meadowlark (Sturnella magna)				
	Breeding	Terrestrial	open upland	grasslands
Dickcissel (Spiza americana)				
	all	Terrestrial	open upland	grasslands
	Breeding	Terrestrial	barrens/woodlands	cultural
	Breeding	Terrestrial	open upland	grasslands

Goal and Objectives for Grassland birds

Goal: Maintain viable breeding populations of grassland bird species, and provide sufficient habitat to support wintering populations of short-eared owl and northern harrier.

Objective 1 : Coordinate research, management, and conservation efforts to more effectively conserve NY's grassland birds.

Measure: *A comprehensive Grassland Bird Conservation Plan is completed, and all interested partners communicate regularly to develop and implement strategies for grassland bird conservation.*

Objective 2 : Determine population status (distribution, abundance, trend) for all grassland species, including any that are not adequately sampled by BBS.

Measure: *Monitoring protocols are developed and implemented, and population status of all species is known.*

Objective 3 : Determine the amount of habitat needed, and the cost of conserving that area as productive grasslands, to support the full array of grassland bird diversity.

Measure: *Cost to conserve adequate habitat is determined.*

Objective 4 : Maintain an adequate number of focus areas with adequate habitat within each focus area to maintain viable populations of the greatest diversity of grassland species as possible.

Measure: *Focus areas are identified and adequate acreages of suitable habitat within those areas are conserved.*

Objective 5 : Maintain self-sustaining populations of as many grassland bird species in New York as possible as part of the biodiversity of the state for at least the next 20 years.

Measure: *Populations of all or most species are still present in New York in 2025.*

Objective 6 : Maximize the amount of applicable federal financial incentives (e.g., NRCS, USFWS programs), as well as state and other funding sources, into core priority grassland areas.

Measure: *Funding is directed into core grassland areas.*

Recommended Actions

Easement acquisition:

* Identify ownership of grasslands in core focus areas, and focus Landowner Incentive Program (LIP) funding for use in conserving the most important privately-owned grasslands in the state, and distribute $400,000 per year from LIP to conserve priority grasslands.

Habitat management:

* Develop habitat management guidelines and action plans for priority focus grassland bird species.

Habitat research:

* Evaluate the effects of specific farming and management practices, such as: timing of mowing, intensity of grazing, frequency of mowing, mowing versus haying versus prescribed fire, and width of buffer strips on productivity of grassland birds.

Other acquisition:

* Incorporate priority grassland focus areas into the NYS Open Space Plan

Other action:

* Work with public land managers, including NRCS, USFWS, DEC and others, to better direct funding and other resources to the highest priority areas and projects for grassland habitat management.

  The ability to focus funding sources in core priority grasslands will be key. If the funding sources from National Resource Conservation Service (NRCS) can not be adequately focused in priority areas, then this will cripple the ability to conserve the most critical grassland areas and will result in continued declines in grassland birds even within these focus areas.

Recommended Actions

* Develop an outreach program to educate the public and land managers on the need for, and wildlife benefits of, grasslands. Also provide technical guidance on what and how to benefit grassland species.

  Outreach to private landowners will be a key first step to educate the public about the importance of their lands to grassland birds. So much of this habitat exists on private lands that their cooperation will be the ultimate deciding factor on whether species declines can be halted. Their cooperation at the level needed for meaningful change will probably hinge on some form of subsidies.

Population monitoring:

* Develop and implement supplemental monitoring programs for grassland bird species that are not adequately sampled by BBS to determine precise population trends and evaluate effectiveness of conservation efforts. Use long term trend data to determine effectiveness of grassland conservation efforts.
* Complete inventory of potential grassland habitat for species present, distribution, and relative abundance of priority species.

Statewide management plan:

* Complete a comprehensive Grassland Bird Conservation Plan that coordinates research, management, and conservation efforts to more effectively conserve NY's grassland birds.

  Identify priority species and delineate priority focus areas for conservation and management.

References

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Taxa Group: Bird
Species Group: High Altitude Conifer Forest Birds

Threats:
Bicknell’s thrush (Catharus bicknelli), a NYS Special Concern Species, is the focal species for this habitat suite. Other species, such as blackpoll warbler, also occupy this habitat type and will benefit from conservation efforts.

Globally, Bicknell’s thrush have a relatively limited breeding range, and narrow habitat preferences. This results in a relatively small overall population size. These factors make Bicknell's thrush potentially very vulnerable to habitat loss or degradation.

In NY the threats include: acid rain, global warming, disease and insect outbreaks that affect high elevation conifers. Biggest threat could be on wintering grounds.

Long term viability of these species as a breeder in NY needs to be assessed. Some reports suggest that global warming may result in the loss of virtually all of the Bicknell's thrush habitat in NY.

In NY, Bicknell’s thrush prefers high altitude regenerating coniferous forests and have been confirmed in the Adirondacks and Catskills only. While population estimates are rough, NY certainly has a substantial (perhaps even up to 40-50%) portion of the world’s population. In the Adirondacks this species is found primarily above 2800 feet, and in the Catskills it is found primarily above 3500 feet. Regenerating spruce/fir “waves” (regenerating thickets) are a typical preferred habitat. The distribution of this species has been the subject of substantial study, but this species is not adequately monitored to determine long term trends, hence we don’t have any clear indications about the status of the population in NY. A monitoring program is needed to determine long term trends.

In NY, loss of breeding habitat has not been proven to be a threat in large part because almost all of the peaks with known breeding occurrences are on state land and protected by forest preserve regulations. Degradation of habitat as a result of acid rain and global warming are likely factors that will affect future populations but these global environmental issues have to be addressed at higher levels of policy outside of NY.

There is considerable concern over the status of the wintering grounds in the Dominican Republic, which are suffering severe losses from human alteration. Losses of wintering habitat could result in population losses regardless of the status of breeding habitat. Conserving breeding habitat may not offset the declines, if the cause of the decline is loss of wintering habitat.

Ski area development is often suggested as a potential threat. However, ski trail development has not been shown to always have a negative impact. It certainly can have negative impacts, but potential effects will vary with a number of variables, including: patch size of habitat, size of area affected, width of trail, and trail design (e.g., “glading” which removes most of understory is considered to be a negative) can all be important factors. Narrow ski trails where the vegetation on the edges is feathered back (i.e., kept in a young regenerating state) can actually support high densities of breeding Bicknell's Thrush.

More research is needed on this species breeding strategies, and habitat requirements. Long term monitoring to determine population trends is high priority.

Acid rain is a potential threat. Acid rain can reduce the vitality or outright kill conifer forests, can reduce prey quantity, and could be reducing populations of land snails which are an important source of calcium during the breeding season. Global warming could also have a significant detrimental impact on high elevation conifer forests, potentially greatly reducing the amount of preferred habitat in NY.

The vast majority of the distribution of Bicknell's in NY is found within the NYS Forest Preserve. No logging is allowed there, which prevents most almost all human development that could reduce habitat but also means little active habitat management could be accomplished. This means natural processes (and in very limited areas ski areas) will have to provide the early regenerating fir/spruce waves preferred by Bicknell's. The Olympic Regional Development Authority at Whiteface is working with interested parties, including DEC, in regards to expansion of that ski area.

Trends:

Not well known. Vermont Institute of Natural Science has developed a Mountain Bird watch Program which has determined distribution (peaks occupied), but no reliable trend data is available. Acid rain and global warming may lead to long term loss and degradation of habitat leading to declines.

SEQR - No Action Alternative:

Uncertain. While NY has a high percentage of the worlds population of Bicknell's thrush, it appears that the most serious issues facing this species will be resolved outside of NY. Problems on the wintering range and the long term effects of acid rain and global warming could result in declines or extirpation of this species (in NY).

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bicknell's thrush (Catharus bicknelli)		X	S2S3B	G4	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bicknell's thrush (Catharus bicknelli)	Unknown	Lake Champlain	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bicknell's thrush (Catharus bicknelli)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bicknell's thrush (Catharus bicknelli)				
	Breeding	Terrestrial	forested	northern coniferous
	Breeding	Terrestrial	forested	other

Goal and Objectives for High Altitude Conifer Forest Birds

Goal: Maintain Bicknell's thrush as a viable breeding population for 20 years.

Objective 1 : Develop active management recommendations for this species.

Measure: *Recommended management determined and agreed to by species and forest management experts.*

Objective 2 : Evaluate the long term viability of this species as a part of NY's breeding fauna.

Measure: *Evaluation completed.*

Objective 3 : Monitor long-term population trend.

Measure: *Monitoring plan implemented.*

Objective 4 : Obtain current and reliable data to determine the distribution and abundance of Bicknell's thrush in New York.

Measure: *Reliable status information available.*

Recommended Actions

Habitat research:

* Develop a study to determine if active management (creation of habitat, such as regenerating fir waves) can be an effective management tool.

Other action:

* Evaluate the long term viability of this species as a part of NY's breeding fauna.

Population monitoring:

* Continue the Mountain Birdwatch monitoring protocol on all Adirondack and Catskill peaks where Bicknell's thrush are known to occur; implement other long term monitoring if needed to determine population trend.

Recommended Actions

Statewide management plan:

* Develop a management plan for high elevation birds, including Bicknell's thrush.

References

Vermont Institute of Natural Sciences. 2004. Mountain Birdwatch website: http://www.vinsweb.org/cbd/mtn_birdwatch.html

The Atlas of Breeding Birds in NYS. Andrle and Carroll, editors. Cornell University Press. Bull's Birds of NYS. 1998. Emanuel Levine, editor. Comstock Publishing.

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Taxa Group: Bird
Species Group: Loggerhead Shrike

Threats:
The causes of declines in loggerhead shrike populations, and present and future threats are poorly understood. However, there is general agreement among most shrike biologists that the loss, fragmentation, and degradation of suitable habitat (both in the breeding range and wintering range) are the major underlying causes of declines in loggerhead shrike populations (Pruitt 2000). A combination of other factors are probably limiting the ability of shrike populations to recover from declines. Other likely factors include nest predation, exposure to pesticides, collisions with vehicles, adverse weather/climate change, and interspecific competition (Pruitt 2000). Loss of breeding habitat and collisions with vehicles are clearly major factors in the decline of the loggerhead shrike in New York (Novak 1989. Pruitt 2000). A more recent threat identified in birds in Ontario is that loggerhead shrikes are apparently quite susceptible to West Nile Virus. In addition, Ontario work seems to be more clearly substantiating that shrike pairs tend to prefer to nest close to other pairs, a situation that would more firmly implicate habitat fragmentation as an important factor in the decline.

Trends:
Based on North American Breeding Bird Survey data, the loggerhead shrike is one of the most persistently declining species surveyed by BBS, with an average rate of decline of 3.7% per year survey wide during the 1966-1998 period. These declines are prevalent across most states, provinces, and physiographic strata and most north central and northeastern states do not have enough observations to provide adequate statistical analysis (Pruitt 2000).

The loggerhead shrike is already extirpated from New England and is essentially extirpated as a breeding species from New York. The last record of confirmed breeding for the loggerhead shrike in NY was in 1988. No records of probable (or confirmed) breeding have been recorded in New York during the current Atlas 2000 Breeding Bird Atlas effort covering the years 2000-2004. Migration records have also declined to the point of extirpation. Although still reported as both a spring and fall migrant on an annual basis through the late 1990s, in recent years it has not even been reported annually in the state during both the spring and fall seasons.

National Audubon Society Christmas Bird Count data reveal that wintering populations, like breeding populations, are declining. From 1959-1988, the loggerhead shrike declined at a rate of 1.7% annually survey wide (Pruitt 2000).

SEQR - No Action Alternative:
With no action the loggerhead shrike will remain essentially extirpated as a breeding species, as well as a very rare migrant in New York State. With no action the only likely scenario under which the species would begin breeding in the state again or increase in numbers during migration would be the result of significant success with the captive breeding and release program that was initiated in Ontario in 1997. If the Ontario program leads to an increase in the breeding population in that province, it could be expected that New York would see an increase in sightings of migrants as they pass through to nesting sites in Ontario with perhaps occasional individuals short-stopping and remaining to nest in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Loggerhead shrike (Lanius ludovicianus)		X	S1B,SZN	G4	E	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Loggerhead shrike (Lanius ludovicianus)	Lake Champlain	Unknown	Decreasing
	Lake Erie		
	Lower Hudson - Long Island Bays		
	NE Lake Ontario - St. Lawrence		
	SE Lake Ontario		
	Susquehanna		
	SW Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Loggerhead shrike (Lanius ludovicianus)	Great Lakes	Unknown	Decreasing
	High Allegheny Plateau		
	Lower New England Piedmont		
	St. Lawrence-Lake Champlain Valley		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Loggerhead shrike (Lanius ludovicianus)				
	Breeding	Terrestrial	open upland	cultural
	Feeding	Terrestrial	open upland	grasslands

Goal and Objectives for Loggerhead Shrike

Goal: Determine the feasibility of restoring a breeding population of loggerhead shrikes to New York State.

Objective 1 : Compare the acreage of suitable habitat in several selected areas in New York with the acreage in the three remaining loggerhead shrike core breeding areas in Ontario in order to determine if New York areas may be suitable for a release effort.

Measure: *Data on acreage in pasture, hay, row crops, woodlots, road density, etc. for three areas in Ontario and several areas in NY.*

Objective 2 : Conduct a more detailed, on-the ground examination of one or more areas in NY that appear to have suitable habitat for release of birds and determine landowner interest and support for such a program.

Measure: *Database/map of farms with suitable shrike breeding habitat. Database of supportive landowners.*

Objective 3 : Evaluate the Canadian Wildlife Service Loggerhead Shrike captive breeding and release efforts with respect to the potential to apply these techniques to New York

Measure: *One measure would be a site visit (or visits) to the Ontario breeding/release facilities with a trip report documenting how a similar facility could be developed for New York.*

Objective 4 : Monitor the overall success of the Ontario breeding and release effort.

Measure: *One measure would be to see an increase in migrant birds passing though New York, including at least some color banded birds (though not all could be expected to be banded as shrikes are known to remove bands).*

Recommended Actions

Captive breeding:

* Research/learn the techniques employed in Ontario in their captive breeding efforts and either support those efforts in exchange for release of birds in New York or develop a similar program in New York. Work cooperatively with the Eastern Loggerhead Shrike Recovery Team in Canada on this process.

Easement acquisition:

* Cooperative agreements or easements may be required or desirable in areas that may be suitable for a release effort.

Fact sheet:

* Prior to any release of birds a fact sheet and landowner educational effort similar to that employed in Ontario should be developed to develop support or acceptance among the local landowners as most shrikes would occur on private lands.

Habitat management:

* Determine whether specific habitat management such as planting of hedgerows, removal of shrubs in pastures, or former pastures, where they have become too dense, etc. may be desirable or necessary in some areas prior to any release efforts.

Recommended Actions

Habitat research:

* Examine habitat data on the three core breeding areas in Ontario and evaluate several areas in New York for similar characteristics. Habitat data should include acreage in various cover types and road density information. Work cooperatively with the Eastern Loggerhead Shrike Recovery Team in Canada on this process.

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Taxa Group: Bird

Species Group: Osprey

Threats:

Habitat loss/alteration, human activity/disturbance, changes in the fish prey base, contaminant effects, and mortality.

Osprey habitat is estuaries/lakes and are often associated with salt marshes. Loss of marsh habitat and degradation of estuaries and their baitfish has happened over the last 50 years.

Menhaden and winter flounder are arguably the most important food fish for NY coastal nesting ospreys. Both stocks have declined precipitously over the past decade or so.

Trends:

The osprey has made a good recovery since the DDT induced decline caused by eggshell thinning back in the 1950's and 1960's.There has been enough of an improvement to see its status in New York State change from endangered to threatened to a species of special concern. However, there still remain areas of real concern, even on Long Island, its stronghold in the state. Some island sub- populations have shown declines in recent years (e.g. Gardiner's Island), and there is speculation that changes in the fisheries and the increasing cormorant population may be playing a role. The other major population, in the Adirondacks, appears to be holding steady with some apparently weather- related fluctuations in young production.

SEQR - No Action Alternative:

Without continued protection and management this species will suffer. Many of the nests are on artificial platforms that need periodic replacement.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Osprey (Pandion haliaetus)			S4B	G5	P SC	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Osprey (Pandion haliaetus)	Allegheny	Allegheny	Increasing
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Stable
	Lake Champlain	Lake Champlain	Stable
	Lake Erie	Lower Hudson - Long Island Bays	Stable
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Increasing
	NE Lake Ontario - St. Lawrence	SE Lake Ontario	Increasing
	Upper Hudson	Upper Hudson	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Osprey (Pandion haliaetus)	Great Lakes	Great Lakes	Increasing
	Lower New England Piedmont	High Allegheny Plateau	Increasing
	North Atlantic Coast	Lower New England Piedmont	Stable
	Northern Appalachian/Boreal Forest	North Atlantic Coast	Stable
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Stable
		St. Lawrence-Lake Champlain Valley	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Osprey (Pandion haliaetus)				
	Breeding	Estuarine	unknown	unknown
	Breeding	Lacustrine	unknown	unknown
	Breeding	Marine	unknown	unknown
	Breeding	Palustrine	unknown	unknown
	Breeding	Riverine	unknown	unknown
	Breeding	Terrestrial	barrens/woodlands	unknown
	Breeding	Terrestrial	open upland	unknown

Goal and Objectives for Osprey

Goal: To ensure the perpetuation of the osprey in suitable habitat throughout New York State.

Objective 1 : Restore salt marsh habitat.

Measure: *Restore sustainable populations of prey base, particularly menhaden and winter flounder.*

Objective 2 : Establish at least 815 osprey territorial pairs as follows: 500 pairs in the North Atlantic Coast ecoregion, 100 in the Northern Appalachian-Boreal Forest ecoregion, 80 in the St. Lawrence/Champlain Valley ecoregion, 50 each (cont. in objective below)

Measure: *Osprey nests are periodically identified, monitored, managed, productivity determined, and mapped as determined to be necessary.*

Objective 3 : Ensure definitive protection for a minimum of half of the territorial pairs listed above in each region, e.g. at least 250 in the North Atlantic Coast ecoregion, 50 in the Northern Appalachian-Boreal Forest ecoregion, etc.

Measure: *The minimum number of osprey territories in each ecoregion will be protected in perpetuity.*

Objective 4 : Protect extant salt marsh.

Measure: *Acreage of Spartina dominated salt marsh.*

Objective 5 : in the Great Lakes and High Allegheny Plateau ecoregions, and 15 in the Lower New England/Northern Piedmont ecoregion, and 20 in the Western Allegheny Plateau.

Measure:

Recommended Actions

Development rights acquisition:

* Pursue conservation easements or outright purchase of essential osprey habitats.

Easement acquisition:

* Pursue conservation easements or outright purchase of essential osprey habitats.

Educational signs:

* Develop signs/displays and post where appropriate in essential habitat areas to inform the public of the need to protect the species and limit disturbance.

Recommended Actions

Fact sheet:

* Develop materials and post where appropriate in essential habitat areas to inform the public of the need to protect the species and limit disturbance.

Habitat management:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential osprey habitat or its use. Osprey nest platforms should be maintained and new ones placed when appropriate.
  Encourage restoration and protection of Long Island salt marsh habitat through coordination with local NGO's and existing management plans.

Habitat monitoring:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential osprey habitat.

Habitat research:

* Conduct studies into habitat quality involving changes in fisheries populations, possible impact of increasing cormorant populations, etc. Support marine fishery investigations/research into critical forage species in the coastal region, i.e. winter flounder and menhaden.

Life history research:

* Record notable new aspects of the species' ecology, especially pertaining to any local declines.

Other acquisition:

* Pursue conservation easements or purchase of essential osprey habitat.

Other action:

* Ensure that information on all new osprey nests are submitted to the Natural Heritage Program as appropriate.

Other management plan:

* Prepare individual management plans as necessary.

Population monitoring:

* Annually or periodically monitor the population (or certain regions of the population) to maintain a feel for the number of territorial pairs and reproductive outcome.

Private fee acquisition:

* Pursue conservation easements or purchase of essential habitat.

Recommended Actions

State fee acquisition:

* Pursue conservation easements or purchase of essential habitat.

State land unit management plan:

* Ensure needs of ospreys are incorporated into all UMPs where suitable habitat may exist.

Statewide baseline survey:

* Periodically monitor the population and its reproductive outcome.

References

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Taxa Group: Bird
Species Group: Peregrine Falcon

Threats:
Habitat disturbance/loss, human activity/disturbance, contaminant effects, limitations in nest sites and food supply, lack of legal protection of habitat, collisions and shooting.

Trends:
The peregrine falcon has made a good comeback in New York State and elsewhere since the nationwide restoration program began in the mid- 70's. While the species had become extirpated as a breeder in NY by the early 1960's, we now have close to 50 pairs. Many of those pairs depend on intensive management to insure their success, due to their location on bridges and buildings. Necessary maintenance (e.g. painting, sandblasting, etc.) and other work at these sites requires careful planning so as not to impede the production of young. Without the cooperation obtained annually from bridge authorities and building owners, many of these sites would fail. Nest boxes placed at many of the urban sites to increase productivity require periodic maintenance/replacement. In the Adirondacks, cliff closures are required near some nest sites to protect the birds from undue disturbance during critical time periods. Recreational cliff climbing has increased in popularity. Today's peregrine population needs help from wildlife managers and others if it is to continue to prosper.

SEQR - No Action Alternative:
The population would likely decline if no action is taken. Millions of dollars have been spent over many years to restore this species to NY and the rest of the eastern US, where it was totally extirpated as a breeding bird by the early 1960's. All of this work could be in jeopardy without continued protection, management and research.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Peregrine falcon (Falco peregrinus)			S3B	G4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Peregrine falcon (Falco peregrinus)	Delaware	Delaware	Increasing
	Lake Champlain	Lake Champlain	Increasing
	Lower Hudson - Long Island Bays	Lake Erie	Stable
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Increasing
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Increasing
	Susquehanna	SE Lake Ontario	Increasing
	Upper Hudson	Susquehanna	Stable
		SW Lake Ontario	Stable
		Upper Hudson	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Peregrine falcon (Falco peregrinus)	Great Lakes	Great Lakes	Increasing
	High Allegheny Plateau	High Allegheny Plateau	Stable
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	North Atlantic Coast	North Atlantic Coast	Increasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Peregrine falcon (Falco peregrinus)				
	Breeding	Terrestrial	alpine/mountain	cliffs & open talus
	Breeding	Terrestrial	open upland	cultural

Goal and Objectives for Peregrine Falcon

Goal: To ensure the future existence of the peregrine falcon throughout New York State.

Objective 1 : Champlain Valley and High Allegheny Plateau regions, and at least 15 in the Great Lakes region.

Measure:

Objective 2 : Ensure definitive protection for a minimum of half of the territorial pairs listed above in each region, e.g. at least 25 each in the Northern Appalachian-Boreal Forest and the Lower New England-Piedmont region, etc.

Measure: *The minimum number of peregrine falcon territories in each ecoregion will be protected in perpetuity.*

Objective 3 : Establish 180 territorial pairs as follows: at least 50 each in the Northern Appalachian-Boreal Forest and the Lower New England-Northern Piedmont regions, at least 25 in the North Atlantic Coast region, at least 20 each in the St. Lawrence-(see below)

Measure: *Peregrine falcon nests are annually identified, monitored, managed, productivity determined, and mapped.*

Recommended Actions

Development rights acquisition:

* Pursue conservation easements or outright purchase of essential peregrine falcon habitats.

Easement acquisition:

* Pursue conservation easements or outright purchase of essential peregrine falcon habitats.

Educational signs:

* Develop signs/displays and post where appropriate in essential habitat areas to inform the public of the need to protect the species and limit disturbance.

Fact sheet:

* Develop materials and post where appropriate in essential habitat areas to inform the public of the need to protect the species and limit disturbance.

Habitat management:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential peregrine falcon habitat or its use. Place nest boxes on bridges and buildings where appropriate, and maintain and replace as necessary. Promote the construction of nesting towers where appropriate.

Recommended Actions

Habitat monitoring:

* Review and comment on any plans to ensure that any proposed actions would not be detrimental to essential peregrine falcon habitat or its use.

Habitat research:

* Conduct radio-telemetry studies as well as field observations to determine essential peregrine falcon habitat.

Life history research:

* Through population monitoring and banding, determine site-fidelity, turnover, migration and wintering movements, home-ranges, mortality, longevity, etc. of peregrine falcons.

Other acquisition:

* Pursue conservation easements or purchase of essential peregrine falcon habitat.

Other action:

* Ensure that all new peregrine falcon information is submitted to the Natural Heritage /BCD database.

Other management plan:

* Prepare individual management plans as necessary.

Population monitoring:

* Annually monitor and determine the number of territorial peregrine falcons and their reproductive outcome. Collect eggs and carcasses for analysis. Rehabilitate injured birds for release when possible.
* Gather wintering information when possible.

Private fee acquisition:

* Pursue conservation easements or purchase of essential peregrine falcon habitat.

State fee acquisition:

* Pursue conservation easements or purchase of essential peregrine falcon habitat.

State land unit management plan:

* Ensure needs of peregrine falcons are incorporated into all UMPs where suitable habitat may occur.

Statewide baseline survey:

* Annually monitor and determine the number of territorial peregrine falcons and their reproductive outcome.

Recommended Actions

Web page:

* Keep the webpage current .

References

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Andrle, R.F., and J.R. Carroll, eds. 1988. The atlas of breeding birds in New York State. Cornell Univ. Press, Ithaca, NY.

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Taxa Group: Bird
Species Group: Salt marsh breeding birds

Threats:

Habitat loss due to erosion, development, and sea level rise. Habitat loss is also occurring by fragmentation by ditching and conversion of Spartina marsh into other vegetative types. Habitat conversion by the invasive Phragmites reed is occurring on many areas of high marsh and along the upland borders and edges of many of the interior mosquito control ditches. Mosquito control efforts can negatively impact the Spartina marsh habitat, especially when intact stands of Spartina are converted to open water pools for mosquito control. Some species are also threatened by increased human disturbance of nesting activities. For the Black Rail, Laughing Gull, Forster's Tern, and Gull-billed Tern the breeding distributions within New York State are extremely limited and could easily be threatened by a very local event such as an oil spill, severe storm, plane crash, boat accident, and the associated recovery efforts. Laughing Gulls in particular are at risk since the main breeding colony is located just off the end of the runway at JFK airport and experience harassment and control activities associated with reducing bird/aircraft strikes.

Trends:

Population trends vary among species of salt-marsh nesting birds, but are poorly known for most species. Most are stable or possibly increasing with the exception of the two species of sparrows which are likely declining.

Due to their secretive nature and ability to elude detection, Black and Clapper rail population trends are difficult to assess.

Seaside Sparrow and Saltmarsh Sharp-tailed Sparrow are declining as their habitat is lost.

Laughing Gull population is stable recently after declining slightly due to control efforts to reduce air strike hazards at JFK airport.

Willet numbers seem to be increasing as the species expands into the region after first starting to breed on Long Island in 1966.

Gull-billed Tern numbers are stable and low. This species is at the extreme edge of its range and has shown no signs of significantly increasing its population on Long Island.

Forster's Tern numbers have fluctuated greatly throughout the years, after first breeding in 1989, but seem to have shown marked increases in recent years. Some of this may be actual variation in population size, but much of it may be due to the difficulty in separating this species from the more numerous Common Tern with which it often shares colonies.

SEQR - No Action Alternative:

If no action is taken to prevent the continued loss and conversion of salt marsh habitat it is likely that the populations of several of these species will continue to decline, possibly to the point of being extirpated. Without restoration of high marsh areas to remove Phragmites invasions and allow the Spartina marsh to migrate inland with sea level rise, the increased erosion and habitat fragmentation will slowly and surely eliminate this habitat type from the state. Many areas of salt marsh habitat will be prevented from migrating inland as the sea level rises by the existing bulkheading and fill deposition along the upland borders of the marsh.

Some species, like Laughing Gull, Forster's Tern, Gull-billed Tern, and Willet may be able to adapt to the remaining available habitat, or shift to other habitat types such as beaches, or man-made structures and rooftops. Others like the rails and sparrows seem to need habitat block size to exceed a certain threshold to establish and maintain a breeding population. Once the habitat size drops below the necessary threshold, the species often disappears from that block.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Willet (Catoptrophorus semipalmatus)			S1	G5	P	Migratory
Forster's tern (Sterna forsteri)			S1	G5	P	Migratory
Gull-billed tern (Sterna nilotica)			S1	G5	P	Migratory
Laughing gull (Larus atricilla)			S1	G5	P	Migratory
Seaside sparrow (Ammodramus maritimus)			S2S3	G4	P SC	Migratory
Saltmarsh sharp-tailed sparrow (Ammodramus cau		X	S3	G4	P	Migratory
Black rail (Laterallus jamaicensis)			S1B	G4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Black rail (Laterallus jamaicensis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Saltmarsh sharp-tailed sparrow (Ammodramus caudacut	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Seaside sparrow (Ammodramus maritimus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Laughing gull (Larus atricilla)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Gull-billed tern (Sterna nilotica)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
Forster's tern (Sterna forsteri)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Increasing
Willet (Catoptrophorus semipalmatus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Black rail (Laterallus jamaicensis)	North Atlantic Coast	North Atlantic Coast	Unknown
Saltmarsh sharp-tailed sparrow (Ammodramus caudacut	North Atlantic Coast	North Atlantic Coast	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Seaside sparrow (Ammodramus maritimus)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Lower New England Piedmont		
Laughing gull (Larus atricilla)	North Atlantic Coast	North Atlantic Coast	Decreasing
Gull-billed tern (Sterna nilotica)	North Atlantic Coast	North Atlantic Coast	Unknown
Forster's tern (Sterna forsteri)	North Atlantic Coast	North Atlantic Coast	Increasing
Willet (Catoptrophorus semipalmatus)	North Atlantic Coast	North Atlantic Coast	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Black rail (Laterallus jamaicensis)				
	all	Estuarine	intertidal	emergent marsh
	all	Marine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	mudflats
	Hibernating/Overwintering	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Estuarine	intertidal	emergent marsh
	Roosting/Congregating	Estuarine	intertidal	emergent marsh
Saltmarsh sharp-tailed sparrow (Ammodramus caudacutus)				
	all	Estuarine	intertidal	emergent marsh
	all	Marine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Marine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	emergent marsh

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Saltmarsh sharp-tailed sparrow (Ammodramus caudacutus)				
	Feeding	Marine	intertidal	emergent marsh
	Hibernating/Overwintering	Estuarine	intertidal	emergent marsh
	Hibernating/Overwintering	Marine	intertidal	emergent marsh
	Roosting/Congregating	Estuarine	intertidal	emergent marsh
	Roosting/Congregating	Marine	intertidal	emergent marsh
Seaside sparrow (Ammodramus maritimus)				
	all	Estuarine	intertidal	emergent marsh
	all	Marine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Marine	intertidal	emergent marsh
Laughing gull (Larus atricilla)				
	Breeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	deep subtidal	pelagic
	Feeding	Marine	intertidal	emergent marsh
	Feeding	Marine	intertidal	shoreline
	Feeding	Marine	shallow subtidal	pelagic
	Feeding	Terrestrial	coastal	beach/shoreline
	Feeding	Terrestrial	coastal	cultural
Gull-billed tern (Sterna nilotica)				
	Breeding	Estuarine	cultural	shoreline
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Terrestrial	coastal	beach/shoreline
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	deep subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
Forster's tern (Sterna forsteri)				
	Breeding	Estuarine	cultural	shoreline
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Terrestrial	coastal	beach/shoreline
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	deep subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
Willet (Catoptrophorus semipalmatus)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Willet (Catoptrophorus semipalmatus)				
	Breeding	Estuarine	cultural	shoreline
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	sand/gravel
	Breeding	Estuarine	intertidal	shoreline
	Breeding	Marine	intertidal	emergent marsh
	Breeding	Marine	intertidal	sand/gravel
	Breeding	Marine	intertidal	shoreline
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	coastal	dunes
	Breeding	Terrestrial	coastal	sand/gravel bar
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Estuarine	intertidal	sand/gravel
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Estuarine	shallow subtidal	mud
	Feeding	Estuarine	shallow subtidal	sand/gravel
	Feeding	Marine	intertidal	emergent marsh
	Feeding	Marine	intertidal	emergent marsh
	Feeding	Marine	intertidal	mudflats
	Feeding	Marine	intertidal	sand/gravel
	Feeding	Marine	intertidal	shoreline
	Feeding	Marine	shallow subtidal	mud
	Feeding	Marine	shallow subtidal	sand/gravel
	Feeding	Terrestrial	coastal	beach/shoreline
	Feeding	Terrestrial	coastal	dunes
	Feeding	Terrestrial	coastal	sand/gravel bar

Goal and Objectives for Salt marsh breeding birds

Goal: Stabilize or increase breeding populations relative to current levels

Objective 1 : Determine basic population demographics.

Measure: *adult/juvenile mortality, recruitment, movement.*

Objective 2 : Determine current population levels and trends

Measure: *State, Federal and NGO surveys and censuses with standardized protocol*

Objective 3 : Develop a systematic, long-term and comprehensive monitoring program

Measure: *Distribution, trends*

Objective 4 : Identify focus areas for management and restoration activities

Measure: *Location, present habitat characteristics, Management/Restoration actions needed.*

Objective 5 : Identify important breeding and foraging areas

Measure: *Location, Habitat characteristics, threats*

Objective 6 : Protect extant salt marsh.

Measure: *Acreage and distribution of marsh.*

Objective 7 : Restore salt marsh habitat

Measure: *Representation of ecological communities, such as high and low marsh, tidal creeks, pannes, and mudflats, and indicator species.*

Recommended Actions

Habitat management:

* Develop coordinated and specific habitat management and restoration projects for identified focus areas.
* Integrate bird conservation interests in agency planning, management, research, restoration and permitting actions, within the context of agency missions.
* Protect extant salt marsh habitat through:
  1. Developing and implementing a salt marsh management and restoration plan.
  2. Mapping extant salt marshes in the Lower Hudson/Long Island Bays Watershed.
  3. Implementing a "no net increase" in shoreline armoring for all estuaries, bays and harbors in the watershed.
  4. Protecting land and requiring upland buffers associated with salt marsh habitat.
  5. Establishing vegetated buffers landward of salt marshes.
  6. Protecting salt marsh platforms of shoals and flats created by temporary barrier island breaches and overwash fans.
  7. Modifying tidal wetlands laws, regulations and policies to address seas level rise.

Habitat monitoring:

* Regularly monitor status and trends of salt marsh habitat through aerial surveys and site-based monitoring.

Recommended Actions

Habitat research:

* Identify strategies and develop a plan for slowing the loss of emergent tidal salt marsh to erosion, fragmentation, and invasive species.

Habitat restoration:

* Alternative methods of mosquito control should be investigated to allow the modification of mosquito ditching to restore native ecological habitats, by allowing vegetated tidal wetlands to take precedence over mosquito control efforts in some areas. Mosquito ditches should be removed/closed when possible.
* Financial incentives for landowners to remove bulkheads and plant native vegetation in an upland buffer area to protect salt marshes.
* Work with State, Federal, Local, and NGOs to identify tidal wetlands and fund their restoration to intact emergent salt marsh. Develop coordinated and specific habitat restoration projects for identified focus areas.
* Develop NYS guidelines for salt marsh restoration. The guidelines should include information on the following:
  1. Phragmites control.
  2. Reconnecting disjunct or fragmented salt marshes.
  3. Reducing nutrient loading into salt marshes from road run-off, septic systems, fertilizers, etc.
  4. Naturalizing and softening the shoreline.
  5. Natural and "soft" alternatives to bulkheads.

Invasive species control:

* Develop plan for addressing habitat loss to invasive Phragmites reed.

Life history research:

* Identify critical habitat components for supporting each species.

Population monitoring:

* Initiate statewide, comprehensive salt marsh-breeding bird survey for Seaside Sparrow, Salt marsh Sharp-tailed Sparrow, Black Rail, and Clapper Rail. Resurvey active sites annually, and all habitat sites every 5 years. Continue annual tern surveys and gull surveys every three years as part of Long Island Colonial Waterbird Survey.

Statewide baseline survey:

* Initiate statewide, comprehensive salt marsh-breeding bird survey for Seaside Sparrow, Salt marsh Sharp-tailed Sparrow, Black Rail, and Clapper Rail.

Statewide management plan:

* Develop coordinated, statewide management plan that takes into consideration differences in habitat needs, species distribution, life histories, and human impacts.

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Taxa Group: Bird
Species Group: Transient shorebirds

Threats:
Population status and conservation needs of transient shorebirds (species that pass through, but don't breed in NY) are poorly known. Basic natural history information is lacking for many of these species, and there are no reliable population estimates or indices for most. In addition to this lack of information, these species face a variety of threats during migration and winter periods, especially outside of New York.

Potential threats include: direct loss, degradation and/or human disturbance of important foraging areas (for migration and winter) throughout the western hemisphere; possible direct losses of birds to hunting in some nations where protective legislation and/or enforcement are lacking; and effects of environmental contaminants such as oil spills and pesticide use.

Specific activities that may affect shorebird foraging areas include beach nourishment, sand mining, water pollution, shoreline armoring/use of bulkheads, off-road vehicle use, motorboat use in shallow coastal waters, and other recreational activities.

Trends:
More reliable data are needed to quantify population trends, but the U.S. Shorebird Conservation Plan (USSCP) identified nearly all of these species as declining or severely declining in population size, or have a low population size (e.g., purple sandpiper - 15,000 birds range-wide) and trend unknown.

SEQR - No Action Alternative:
Without the recommended actions, many of these species will remain at risk of short or long-term population declines in New York and throughout their range.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Dunlin (Calidris alpina)					P	Migratory
Semipalmated sandpiper (Calidris pusilla)					P	Migratory
Sanderling (Calidris alba)					P	Migratory
Ruddy turnstone (Arenaria interpres)					P	Migratory
Greater yellowlegs (Tringa melanoleuca)					P	Migratory
American golden-plover (Pluvialis dominica)					P	Migratory
Black-bellied plover (Pluvialis squatarola)					P	Migratory
Buff-breasted sandpiper (Tryngites subruficollis)			SNRN	G4	P	Migratory
Short-billed dowitcher (Limnodromus griseus)			SNRN	G5	P	Migratory
Red knot (Calidris canutus)		X	SNRN	G5	P	Migratory

Purple sandpiper (Calidris maritima)	SNRN	G5	P	Migratory
Marbled godwit (Limosa fedoa)	SNRN	G5	P	Migratory
Hudsonian godwit (Limosa haemastica)	SNRN	G4	P	Migratory
Whimbrel (Numenius phaeopus)	SNRN	G5	P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Whimbrel (Numenius phaeopus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
Hudsonian godwit (Limosa haemastica)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
Marbled godwit (Limosa fedoa)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Purple sandpiper (Calidris maritima)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Red knot (Calidris canutus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Short-billed dowitcher (Limnodromus griseus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Buff-breasted sandpiper (Tryngites subruficollis)	SE Lake Ontario	Lake Erie	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	SE Lake Ontario	Unknown
	Lake Erie	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Black-bellied plover (Pluvialis squatarola)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
American golden-plover (Pluvialis dominica)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Lake Erie	Lake Erie	Unknown
Greater yellowlegs (Tringa melanoleuca)	Lower Hudson - Long Island Bays	Lake Erie	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Lake Erie	Lake Erie	Unknown
Ruddy turnstone (Arenaria interpres)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Sanderling (Calidris alba)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Semipalmated sandpiper (Calidris pusilla)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Dunlin (Calidris alpina)	SE Lake Ontario	SW Lake Ontario	Unknown
	Lower Hudson - Long Island Bays	SE Lake Ontario	Unknown
	SW Lake Ontario	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Whimbrel (Numenius phaeopus)	Great Lakes	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Hudsonian godwit (Limosa haemastica)	Great Lakes	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Marbled godwit (Limosa fedoa)	North Atlantic Coast	North Atlantic Coast	Unknown
Purple sandpiper (Calidris maritima)	North Atlantic Coast	North Atlantic Coast	Unknown
Red knot (Calidris canutus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Short-billed dowitcher (Limnodromus griseus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Buff-breasted sandpiper (Tryngites subruficollis)	Lower New England Piedmont	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Lower New England Piedmont	Unknown
Black-bellied plover (Pluvialis squatarola)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American golden-plover (Pluvialis dominica)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Greater yellowlegs (Tringa melanoleuca)	Great Lakes	Great Lakes	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Ruddy turnstone (Arenaria interpres)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Sanderling (Calidris alba)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Semipalmated sandpiper (Calidris pusilla)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Dunlin (Calidris alpina)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Whimbrel (Numenius phaeopus)				
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Terrestrial	coastal	beach/shoreline
Hudsonian godwit (Limosa haemastica)				
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Palustrine	mineral soil wetland	other
Marbled godwit (Limosa fedoa)				
	Feeding	Estuarine	intertidal	mudflats
Purple sandpiper (Calidris maritima)				
	Feeding	Estuarine	intertidal	rocky

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Purple sandpiper (Calidris maritima)				
	Feeding	Marine	intertidal	rocky
Red knot (Calidris canutus)				
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Marine	intertidal	sand/gravel
Short-billed dowitcher (Limnodromus griseus)				
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Marine	intertidal	shoreline
Buff-breasted sandpiper (Tryngites subruficollis)				
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Terrestrial	open upland	cultural
	Feeding	Terrestrial	open upland	grasslands
Black-bellied plover (Pluvialis squatarola)				
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Terrestrial	coastal	beach/shoreline
American golden-plover (Pluvialis dominica)				
	Feeding	Terrestrial	open upland	cultural
	Feeding	Terrestrial	open upland	grasslands
Greater yellowlegs (Tringa melanoleuca)				
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
	Feeding	Terrestrial	coastal	beach/shoreline
Ruddy turnstone (Arenaria interpres)				
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Marine	intertidal	shoreline
	Feeding	Terrestrial	coastal	beach/shoreline
Sanderling (Calidris alba)				
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Marine	intertidal	shoreline
	Feeding	Terrestrial	coastal	beach/shoreline
Semipalmated sandpiper (Calidris pusilla)				
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Marine	intertidal	shoreline
	Feeding	Palustrine	mineral soil wetland	pond/lake shore
Dunlin (Calidris alpina)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Dunlin (Calidris alpina)				
	Feeding	Estuarine	intertidal	mudflats
	Feeding	Estuarine	intertidal	shoreline
	Feeding	Marine	intertidal	shoreline
	Feeding	Palustrine	mineral soil wetland	pond/lake shore

Goal and Objectives for Transient shorebirds

Goal: To maintain or enhance transient (non-breeding) shorebird populations that regularly occur in New York.

Objective 1 : Develop a conservation plan for transient (non-breeding) shorebirds that regularly occur in New York, to include objectives and actions that we can assist with, both inside and outside of New York State.

Measure: *A written plan is developed which identifies objectives and actions that New York can assist with to sustain shorebird resources that regularly occur in New York State.*

Objective 2 : Identify and delineate important foraging areas and resources used by transient shorebirds in New York.

Measure: *Important areas are delineated and mapped, and critical habitat features (e.g., food items, substrates) and timing of use are described.*

Objective 3 : Initiate annual shorebird monitoring programs, using established protocols, at 5-10 locations in New York State.

Measure: *Number of monitoring sites with observers and procedures identified.*

Objective 4 : Protect important foraging areas from permanent loss, degradation or adverse human disturbance, especially during critical periods, to ensure that essential energy needs are met to sustain high productivity and survival of these birds.

Measure: *Important foraging areas remain available and productive for use by significant numbers of shorebirds during critical migration periods.*

Objective 5 : Support or participate in shorebird conservation efforts throughout the Western Hemisphere that would benefit populations that regularly occur in New York.

Measure: *New York is an active participant in, or supporter of, regional and international shorebird conservation initiatives.*

Recommended Actions

Fact sheet:

* Develop educational materials about conservation needs of shorebirds in New York, and promote habitat protection measures.

Habitat management:

* As important foraging areas become known, identify potential threats and protect those habitats (i.e., beaches, tidal flats, shoals, etc.) from permanent alteration, degradation or adverse human disturbances. Management may include acquisition, easements, establishing seasonal use restrictions, and posting or fencing, etc. as is currently done for beach-nesting birds.

Habitat research:

* Conduct field studies to document ecology of transient shorebirds on Long Island, including important food items, habitat use (e.g., importance of tidal flats) and time/activity budgets.
* Compile data and input from birders to derive a map showing important shorebird foraging and resting areas in New York.

Other action:

* Provide technical support, funding, or political support as needed, to further international shorebird conservation efforts.

Population monitoring:

* Identify specific locations, procedures, and observers (volunteer or other) for conducting annual shorebird surveys at 5-10 locations in New York, and initiate surveys as soon as possible.

State land unit management plan:

* On State-owned or other public lands, ensure that management plans consider shorebird needs and appropriately restrict site development and seasonal uses that may adversely affect critical shorebird foraging areas.

Statewide management plan:

* Develop a conservation plan for transient (non-breeding) shorebirds that regularly occur in New York, to include objectives and actions that we can assist with both inside and out of New York State.

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Shorebird Management Manual (Helmers, 1992)

Bull's Birds of New York State (Levine, 1998)

Migratory Shorebirds of New York State: a Preliminary Assessment of Occurrence Data (draft report by Schneider, 2003)

Draft Shorebird Conservation Management Plan Outline - Proposal Notes (Gawalt, 2004)

Western Hemisphere Shorebird Reserve Network, Draft Strategic Plan: 2004-2008 (Duncan, 2004)

U.S. Shorebird Conservation Plan (Browne et al. 2001) - available at www.manomet.org

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Taxa Group: Bird
Species Group: Wintering waterbirds

Threats:
Collectively, population status and habitat requirements of migratory waterfowl and waterbirds that winter in New York are poorly understood. Basic natural history information is lacking for many of these species, and there are few reliable population estimates or indices for most. In addition to this lack of information, these species face a variety of threats during migration and winter periods in New York and elsewhere.

The greatest potential threats to this group as a whole include: loss of habitat to coastal and offshore developments or activities that may result in large scale alteration of bay or ocean substrates (e.g., dredging, sand mining, development of barrier islands, scouring of littoral areas by commercial shellfish harvesting, etc.); potential impacts of wind energy or offshore oil developments though loss of habitat or direct mortality from collisions with structures, spills, or intensive human disturbance; diseases such as Type E botulism (in the Great Lakes) and brown tide, which has devastated eelgrass beds on Long Island; entanglement in offshore fishing gear, exposure to oil spills or contaminants, and over harvest of hunted species. Species that use coastal marshes and tidal flats also face long-term loss of habitat due to rising sea levels.

Potentially larger threats to seabirds may be global warming and other large-scale environmental changes, especially those affecting ocean currents. These changes are likely to cause northward shifts in species' ranges and may result in elimination of low-lying colonies (outside of New York) and changes in oceanographic features that are exploited by marine birds for feeding.

Trends:
Several million individuals of more than 65 species of waterfowl, sea birds and other water birds occur in eastern U.S. waters during migration or winter. How many of these winter in New York is unknown. Although more reliable data are needed, analysis of existing survey and harvest data along with new surveys and studies conducted during the 1990s indicate population declines for 10 of the 15 North American sea duck species, including some that regularly occur in New York. Winter waterfowl counts in New York indicate no significant trend for most species since the 1970s, but annual counts fluctuate widely from year to year making detection of trends difficult. Most other wintering waterbirds are believed to be stable or increasing in the eastern U. S. (Nisbet 1995).

SEQR - No Action Alternative:
Without the above actions, many of the above species will remain at risk of excessive mortality or reduced productivity, leading to long-term population declines in New York and throughout their range.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Red-necked phalarope (Phalaropus lobatus)					P	Migratory
Greater scaup (Aythya marila)			SNRN	G5	G	Migratory
Common eider (Somateria mollissima)					G	Migratory
Harlequin duck (Histrionicus histrionicus)		X			P	Migratory

Surf scoter (Melanitta perspicillata)			G	Migratory
White-winged scoter (Melanitta fusca)			G	Migratory
Black scoter (Melanitta nigra)			G	Migratory
Long-tailed duck (Clangula hyemalis)			G	Migratory
Atlantic brant (Branta bernicla)	SNRN	G5	G	Migratory
Horned grebe (Podiceps auritus)			P	Migratory
Razorbill (Alca torda)				Migratory
Northern pintail (Anas acuta)			U	Migratory
Lesser scaup (Aythya affinis)				Migratory
Cory's shearwater (Calonectris diomedea)				Migratory
Greater shearwater (Puffinus gravis)				Migratory
Little gull (Larus minutus)				Migratory
Bonaparte's gull (Larus philadelphia)				Migratory
Thayer's gull (Larus thayeri)				Migratory
Red-throated loon (Gavia stellata)			P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic brant (Branta bernicla)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
Greater scaup (Aythya marila)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Lake Erie	Lake Erie	Increasing
Common eider (Somateria mollissima)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Increasing
Harlequin duck (Histrionicus histrionicus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Stable
Surf scoter (Melanitta perspicillata)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
White-winged scoter (Melanitta fusca)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Unknown Unknown
Black scoter (Melanitta nigra)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Unknown Unknown
Long-tailed duck (Clangula hyemalis)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays NE Lake Ontario - St. Lawrence SE Lake Ontario SW Lake Ontario Lake Erie	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays Lower Hudson - Long Island Bays SE Lake Ontario SW Lake Ontario Lake Erie	Unknown Unknown Unknown Unknown Unknown Unknown
Red-throated loon (Gavia stellata)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays NE Lake Ontario - St. Lawrence SE Lake Ontario SW Lake Ontario Lake Erie	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays NE Lake Ontario - St. Lawrence SE Lake Ontario SW Lake Ontario Lake Erie	Unknown Unknown Unknown Unknown Unknown Unknown
Horned grebe (Podiceps auritus)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays NE Lake Ontario - St. Lawrence SE Lake Ontario SW Lake Ontario Lake Erie	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays NE Lake Ontario - St. Lawrence SE Lake Ontario SW Lake Ontario Lake Erie	Unknown Unknown Unknown Unknown Unknown Unknown
Red-necked phalarope (Phalaropus lobatus)	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Unknown Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern pintail (Anas acuta)	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Unknown
	Lower Hudson - Long Island Bays	SW Lake Ontario	Unknown
	SW Lake Ontario	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Unknown
Lesser scaup (Aythya affinis)	Lower Hudson - Long Island Bays	SE Lake Ontario	Stable
	SE Lake Ontario	SW Lake Ontario	Stable
	SW Lake Ontario	Lower Hudson - Long Island Bays	Stable
	Lake Erie	Lake Erie	Stable
Cory's shearwater (Calonectris diomedea)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Greater shearwater (Puffinus gravis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Little gull (Larus minutus)	SW Lake Ontario	SW Lake Ontario	Unknown
	Lake Erie	Lake Erie	Unknown
Bonaparte's gull (Larus philadelphia)	SW Lake Ontario	Lake Erie	Unknown
	Lake Erie	SW Lake Ontario	Unknown
Thayer's gull (Larus thayeri)	SW Lake Ontario	SW Lake Ontario	Unknown
	Lake Erie	Lake Erie	Unknown
Razorbill (Alca torda)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Atlantic brant (Branta bernicla)	North Atlantic Coast	North Atlantic Coast	Stable
Greater scaup (Aythya marila)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Great Lakes	Great Lakes	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Common eider (Somateria mollissima)	North Atlantic Coast	North Atlantic Coast	Increasing
Harlequin duck (Histrionicus histrionicus)	North Atlantic Coast	North Atlantic Coast	Stable
Surf scoter (Melanitta perspicillata)	North Atlantic Coast	North Atlantic Coast	Unknown
White-winged scoter (Melanitta fusca)	North Atlantic Coast	North Atlantic Coast	Unknown
Black scoter (Melanitta nigra)	North Atlantic Coast	North Atlantic Coast	Unknown
Long-tailed duck (Clangula hyemalis)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Red-throated loon (Gavia stellata)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Horned grebe (Podiceps auritus)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Red-necked phalarope (Phalaropus lobatus)	North Atlantic Coast	North Atlantic Coast	Unknown
Northern pintail (Anas acuta)	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
Lesser scaup (Aythya affinis)	Great Lakes	Great Lakes	Stable
	North Atlantic Coast	North Atlantic Coast	Stable
Cory's shearwater (Calonectris diomedea)	North Atlantic Coast	North Atlantic Coast	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Greater shearwater (Puffinus gravis)	North Atlantic Coast	North Atlantic Coast	Unknown
Little gull (Larus minutus)	Great Lakes	St. Lawrence-Lake Champlain Valley	Unknown
	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown
Bonaparte's gull (Larus philadelphia)	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown
	Great Lakes	St. Lawrence-Lake Champlain Valley	Unknown
Thayer's gull (Larus thayeri)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Great Lakes	Great Lakes	Unknown
Razorbill (Alca torda)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Atlantic brant (Branta bernicla)				
	Feeding	Estuarine	intertidal	other
	Feeding	Estuarine	shallow subtidal	other
	Feeding	Terrestrial	open upland	cultural
Greater scaup (Aythya marila)				
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown
	Hibernating/Overwintering	Estuarine	shallow subtidal	unknown
	Hibernating/Overwintering	Lacustrine	cold water deep	unknown
	Hibernating/Overwintering	Lacustrine	warm water deep	unknown
Common eider (Somateria mollissima)				
	Hibernating/Overwintering	Marine	deep subtidal	rocky
	Hibernating/Overwintering	Marine	shallow subtidal	rocky
Harlequin duck (Histrionicus histrionicus)				
	Hibernating/Overwintering	Marine	deep subtidal	rocky
	Hibernating/Overwintering	Marine	shallow subtidal	rocky

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Surf scoter (Melanitta perspicillata)				
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
White-winged scoter (Melanitta fusca)				
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
Black scoter (Melanitta nigra)				
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
Long-tailed duck (Clangula hyemalis)				
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown
	Hibernating/Overwintering	Lacustrine	cold water deep	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
Red-throated loon (Gavia stellata)				
	Feeding	Lacustrine	cold water deep	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
Horned grebe (Podiceps auritus)				
	Hibernating/Overwintering	Lacustrine	cold water deep	unknown
	Hibernating/Overwintering	Marine	deep subtidal	unknown
Red-necked phalarope (Phalaropus lobatus)				
	Feeding	Estuarine	shallow subtidal	unknown
	Feeding	Marine	deep subtidal	unknown
Northern pintail (Anas acuta)				
	Feeding	Palustrine	mineral soil wetland	emergent marsh
	Feeding	Terrestrial	open upland	other
Lesser scaup (Aythya affinis)				
	Feeding	Estuarine	shallow subtidal	unknown
	Feeding	Lacustrine	cold water deep	unknown
	Feeding	Lacustrine	warm water deep	unknown
Cory's shearwater (Calonectris diomedea)				
	Hibernating/Overwintering	Marine	deep subtidal	pelagic
	Hibernating/Overwintering	Marine	deep subtidal	pelagic
Greater shearwater (Puffinus gravis)				
	Hibernating/Overwintering	Marine	deep subtidal	pelagic
Little gull (Larus minutus)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Little gull (Larus minutus)	Hibernating/Overwintering	Riverine	deepwater river	rocky bottom
Bonaparte's gull (Larus philadelphia)	Hibernating/Overwintering	Riverine	deepwater river	rocky bottom
Thayer's gull (Larus thayeri)	Hibernating/Overwintering	Riverine	deepwater river	rocky bottom
Razorbill (Alca torda)	Hibernating/Overwintering	Marine	deep subtidal	pelagic

Goal and Objectives for Wintering waterbirds

Goal: Maintain or increase populations of non-breeding waterfowl/water birds that migrate through or winter in New York.

Objective 1 : As important habitats become known, protect those areas from permanent loss or excessive human disturbances that could diminish their value to migrating or wintering waterfowl/water birds.

Measure: *Continued use by wintering waterfowl/water birds of important foraging and resting areas.*

Objective 2 : Develop more reliable population monitoring programs for migrating or wintering waterfowl/water birds that regular occur in New York.

Measure: *Periodic estimates of population size or trends for each of the above species.*

Objective 3 : Document important foraging and resting areas for migrating and wintering waterfowl/water birds in New York State.

Measure: *Maps delineating regular fall and winter concentration areas for all species.*

Objective 4 : Identify and estimate major causes of mortality (e.g., harvest, disease, oil spills, entanglement, etc.) that could affect populations of migrating or wintering waterfowl/water birds that regular occur in New York.

Measure: *Documentation of mortality causes, and estimates of annual or periodic losses due to major mortality factors.*

Recommended Actions

Recommended Actions

Habitat management:

* Protect important waterfowl/water bird foraging areas from long-term destruction or development, excessive human disturbance, oil spills, environmental contaminants, and other potential impacts, through environmental permit reviews, etc.

Habitat research:

* Characterize and map important foraging areas (e.g., submerged aquatic vegetation, mussel beds) for waterfowl/water birds wintering on Long Island.
* Document habitats used by northern pintails during spring migration and staging in the St. Lawrence Valley and Lake Plains regions of New York.

Life history research:

* Determine contaminant levels (e.g., mercury, other metals, PCBs, other organochlorines) in samples of the above waterfowl/water birds wintering in New York to assess potential impacts on reproduction or survival. Obtain samples as opportunities arise.
* Document and estimate annual mortality of waterfowl/water birds in New York associated with Type E botulism and other major mortality factors, as opportunities arise.

Modify regulation:

* Establish hunting regulations that will ensure long-term conservation of waterfowl populations migrating through or wintering in New York.
* Reduce or modify ocean dumping and disposal practices that may damage important water bird habitats or result in debris (e.g., lead, plastics) that can cause waterbird mortality.

Other action:

* Because most of the species in this group non-breeding visitors to the eastern U.S., NY should provide technical, financial or political support as needed, to further international waterfowl/water bird conservation efforts.

Regional management plan:

* Work with regional marine resource managers to identify common interests and potential conflicts (e.g., commercial fishing/shell fishing techniques, aquaculture development, entanglement, oil spill response plans) with needs of wintering water birds. More intensive studies are needed of interactions between commercial fisheries and seabirds.

Statewide baseline survey:

* Cooperate in development and conduct of baseline surveys or monitoring programs to determine population status of wintering waterfowl/water birds species in New York and/or eastern North America, at 10-year (or more frequent) intervals.

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Comprehensive Wildlife Conservation Strategy

Appendix A2:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Crustacea/Meristomata

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Crustacea/Meristomata
Species Group: American lobster

Threats:
The American lobster population in New York faces a number of serious threats. Any single one of the stressors may not be fatal, but in combination they are potentially very harmful. In Long Island Sound (LIS), fishing effort increased dramatically as the lobster population increased in the 1990's. A large die off occurred to the western LIS lobster population during 1999, and the population has continued to decline through 2003. Fishing effort declined as the population size decreased, but not at the same rate. The number of traps set in LIS is two to three times higher than the 1980's when the lobster population was at a similar size. A large research initiative was conducted to determine the cause (s) of the 1999 die off. Final results indicate that the die off was probably due to a number or factors. During 1999, a combination of high bottom water temperature, low dissolved oxygen, a storm at the end of August that mixed the water column and increased bottom water temperatures 1 - 2 degrees in 24 hours, and paramoeba infection probably combined to cause the lobster die off. Research suggests that temperature alone could account for the die off, or at least stress the lobsters so they would be more susceptible to hypoxia, ammonia, and paramoeba infection. Lobsters in the east end of Long Island and off the south shore have shown increasing incidence and severity of shell disease.

Trends:
Long Island Sound (LIS) lobster harvest and indices of relative abundance from CT Department of Environmental Protection (CT DEP) increased steadily from the late 1980's to a peak in 1997 or 1998. Landings and indices have declined by 65 to 80% since the peak. CT DEP larval lobster survey indicate that larval abundance in 2002 was the poorest on record. Current lobster abundance in LIS is similar to levels seen in the 1980's.

Fishery Independent survey off Rhode Island has shown a similar decline in lobster catches.

No fishery independent surveys are conducted in the ocean off the south shore of Long Island. Harvest of lobsters has decreased since the late 1990's, but so has effort, so therefore the status of the lobster population in the ocean off Long Island is unclear.

SEQR - No Action Alternative:
It would be detrimental for New York State to take no further actions in monitoring and managing the American lobster in its inshore waters. The current fishery independent lobster trap survey in western Long Island Sound was developed to monitor the resource in the area of the major lobster die off in 1999. This survey needs to be extended for the long term. It is necessary to monitor water and habitat quality to understand seasonal changes in lobster populations related to small and large scale die-offs. Management regulations need to be put into place to protect lobsters from over-harvest during particularly stressful times. Without further research and management, it is possible that the lobster population may continue to decline. It is the responsibility of New York State to do its best to ensure a healthy lobster population for the future.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
American lobster (Homarus americanus)					P	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American lobster (Homarus americanus)	Lower Hudson - Long Island Bays Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight Lower Hudson - Long Island Bays	Unknown Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American lobster (Homarus americanus)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American lobster (Homarus americanus)				
	all	Estuarine	deep subtidal	mud
	all	Estuarine	deep subtidal	rocky
	all	Estuarine	deep subtidal	structure
	all	Marine	cultural	structure
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	structure
	Nursery/Juvenile	Estuarine	shallow subtidal	rocky

Goal and Objectives for American lobster

Goal: Maintain and restore lobster stocks in New York to a population size and structure that is robust and resilient to environmental stress which can support ecosystem function and commercial and recreational fisheries.

Objective 1 : Based on information from the Long Island Sound Health Program and physical and biological monitoring, develop plan to remediate the effects of the Long Island Sound Lobster die if remediation is deemed possible by 2010.

Measure: *Implementation of remediation program.*

Objective 2 : Based on the monitoring recommendations from the Long Island Sound Health Program, develop or continue monitoring of the Long Island Sound Lobster population by 2006.

Measure: *Implementation of lobster monitoring program.*

Objective 3 : Based on the monitoring recommendations from the Long Island Sound Health Program, develop or continue monitoring of the physical environment of Long Island Sound by 2006.

Measure: *Implementation of physical monitoring program.*

Objective 4 : Collect harvest and landings data consistent with the Atlantic Coastal Cooperative Statistics Program (ACCSP).

Measure: *Implement all aspects of the ACCSP program relative to lobster in New York.*

Objective 5 : Develop a monitoring program of the physical environment of the ocean waters off the south shore of Long Island by 2008.

Measure: *Implementation of physical monitoring program.*

Objective 6 : Develop a monitoring of the Lobster population in the ocean waters off the south shore of Long Island by 2008.

Measure: *Implementation of lobster monitoring program.*

Objective 7 : Develop monitoring program for juvenile lobsters in the marine district of New York by 2010.

Measure: *Implementation of juvenile lobster monitoring program*

Recommended Actions

Habitat management:

* Benthic habitat protection and restoration are crucial elements in any lobster conservation and management plan. Aspects of benthic habitat protection and restoration will be included in the final watershed recommendations.
* Improve water quality in Long Island Sound. Research from the Long Island Sound Lobster Health Program indicates that lobsters are stressed by a combination of high water temperature and low dissolved oxygen. Improving bottom dissolved oxygen levels would be beneficial to lobster populations.

Habitat monitoring:

* Develop or continue monitoring of the physical environment of the ocean waters off the south shore of Long Island
* Develop or continue monitoring of the physical environment of Long Island Sound

Recommended Actions

Other action:

* Collect harvest and landings data for lobsters in New York.
* Fishery independent monitoring all life stages of the lobster population both in Long Island Sound and off the south shore of Long Island is recommended

Regional management plan:

* Implement appropriate management measures to meet the ASMFC's targets and thresholds of the lobster FMP

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Taxa Group: Crustacea/Meristomata
Species Group: Blue crab

Threats:
Overwintering mortality

Blue crabs in New York are on the northern extreme of their geographic range and are subject to high mortality in particularly cold winters.

Fishing

Expanding commercial and recreational fisheries may threaten population levels.

Water quality

Contaminants and conditions that contribute to anoxic conditions may affect the health and overall abundance of blue crabs.

Trends:
The limited data available on blue crab populations in the state of New York, based largely on landings reports of commercial fishers, indicate that blue crab abundance is highly variable and appears to be severely affected by environmental factors, particularly water temperature. Populations levels of blue crabs in other Atlantic systems, particularly the Chesapeake, have suffered severe declines in recent years.

SEQR - No Action Alternative:
Blue crab population levels in New York State may decrease like populations in Chesapeake bay without management actions. Without increased monitoring of blue crab populations it will be hard to assess the changes in blue crab population levels.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Blue crab (Callinectes sapidus)					P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Blue crab (Callinectes sapidus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
	Susquehanna		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blue crab (Callinectes sapidus)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Blue crab (Callinectes sapidus)				
	Breeding	Estuarine	shallow subtidal	mud
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Breeding	Estuarine	shallow subtidal	SAV
	Feeding	Estuarine	shallow subtidal	mud
	Feeding	Estuarine	shallow subtidal	rocky
	Feeding	Estuarine	shallow subtidal	sand/gravel
	Feeding	Estuarine	shallow subtidal	SAV
	Feeding	Estuarine	shallow subtidal	structure
	Feeding	Marine	shallow subtidal	mud
	Feeding	Marine	shallow subtidal	rocky
	Feeding	Marine	shallow subtidal	sand/gravel
	Feeding	Marine	shallow subtidal	SAV
	Feeding	Marine	shallow subtidal	structure
	Hibernating/Overwintering	Estuarine	deep subtidal	mud
	Hibernating/Overwintering	Marine	deep subtidal	mud
	Nursery/Juvenile	Estuarine	shallow subtidal	SAV
	Nursery/Juvenile	Estuarine	shallow subtidal	structure
	Nursery/Juvenile	Marine	shallow subtidal	pelagic

Goal and Objectives for Blue crab

Goal: Maintain or increase blue crab population levels while continuing to allow popular recreational and commercial fisheries for blue crab.

Objective 1 : By 2008, identify important habitats in blue crab life history for inclusion in statewide management plan.

Measure: *Identify overwintering habitat and quantify natural winter mortality. Compile existing information about important habitats (e.g.. Submerged aquatic vegetation) for blue crabs in New York.*

Objective 2 : By 2010, incorporate population and habitat data, as well as other pertinent information for blue crabs, into a statewide management.

Measure: *Development of that plan.*

Objective 3 : Continue to monitor sources of mortality for blue crabs.

Measure: *Continue on board commercial monitoring of blue crabs for Hudson River fishers, continue NMFS dealer reports for statewide commercial reporting and fully implement the MRFSS survey for statewide recreational harvest information.*

Recommended Actions

Habitat management:

* Submerged aquatic vegetation and wintering area protection may be crucial elements to any blue crab conservation and management plan. Aspects of submerged aquatic vegetation and wintering area protection will be included in the final statewide management plan.

Habitat research:

* Identify over wintering habitat and determine if winter conditions are the limiting factor for blue crab abundance.

Life history research:

* Identify time and space distribution of blue crab life stages and provide protections for habitats used.

Other action:

* Evaluate the potential public health threat of blue crabs harvested from polluted areas (e.g. Hudson River, NY Harbor).

Population monitoring:

* Continue monitoring of sources of mortality, including recreational and commercial harvest and wasteful sources of mortality.

Statewide management plan:

* Develop a statewide management plan for blue crabs

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Taxa Group: Crustacea/Meristomata
Species Group: Fiddler crab

Threats:
Oil Spills, substrate contamination, tidal wetlands loss, human activities, invasive floral and faunal species including Phragmites australis.

Trends:
None available. The species has not been extensively studied in this regard. See proposal described in the goals and objectives.

SEQR - No Action Alternative:
There is insufficient information about fiddler crab populations in New York to surmise the consequences of a no action alternative. Taking no action would leave the state ill prepared to deal with an emergency like a disease outbreak as seen in other marine fauna like American lobster and Eastern oyster. The role of fiddler crabs as habitat engineers in salt marshes makes their possible loss or decline a threat to other salt marsh dependant species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
fiddler crab (Uca pugnax)					U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
fiddler crab (Uca pugnax)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
fiddler crab (Uca pugnax)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

fiddler crab (Uca pugnax)

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
fiddler crab (Uca pugnax)				
	all	Estuarine	intertidal	emergent marsh
	all	Estuarine	intertidal	mudflats

Goal and Objectives for Fiddler crab

Goal: Increase our knowledge of the three species of fiddler crab, specifically their life history, inter- and intra- species relationships, habitat, ecology, response to anthropogenic and natural impacts, and determine their population status and trends.

Objective 1 : By 2015 a region specific fiddler crab baseline data base will be completed which includes, abundance, distribution, and other parameters in 10 reference and 20 impacted wetlands throughout the NY marine district.

Measure: *The number of reference and impacted wetlands that have completed information*

Objective 2 : By 2015 know how habitat loss relates to fiddler crab population tends

Measure: *Understand the relationship of habitat loss and population trends*

Objective 3 : Develop region specific life histories of the 3 species of fiddler crabs, by increasing knowledge of food requirements at various life stages,

Measure:

Objective 4 : Have a program for integrated species monitoring in the lower Hudson/Long Island Bays watershed that can be implemented by 2010

Measure: *Implementation of the program*

Objective 5 : Have a protocol for integrated marsh species monitoring that can be implemented by 2008

Measure: *Completion of monitoring protocol*

Recommended Actions

Recommended Actions

Habitat management:

* The fiddlers are directly connected to tidal wetlands, the proper management and prevention of a wetland will undoubtedly protect the fiddler as well. While the wetlands are protected from filling and building by the land Use Regulations (Art 25 part 661) we have yet to determine the causes of the marsh loss phenomenon. This may be more devastating to the marsh and the fiddler since causes are unknown and varied depending on the subject marsh.

Habitat monitoring:

* Habitat monitoring and research: There are three fiddler crab species, genus Uca, whose range includes the marsh complexes of New York's marine district: the sand fiddler, Uca pugilator, the mud fiddler U. pugnax and the brackish water fiddler U. minax. The crabs and there burrows are seen within specific zones in the marsh, but little research has been done on their effect on the marsh and the effect of marsh loss on them. Specifically the mud fiddler U. pugnax, since it has a direct relationship with the intertidal marsh where there is a preponderance of vegetative marsh loss. Bertness (1985) calls the fiddlers "the earth worms of the marsh". What happens to the crab when the marsh is lost; when the peat becomes a slurry? Is there greater intra- and interspecies competition as a result? What are the limiting factors, just real estate? During the research and monitoring phase other actions may become necessary to address

Habitat restoration:

* If marsh restoration becomes a viable alternative, fiddler crab re-population may become an indicator of success. Since the crab aerates the marsh and promotes oxygenation of the peat and increases peat surface area for chemical absorption, perhaps fiddler crab populations should be restored as well.

Life history research:

* Information available is generic and does not address all 3 species specifically within NY's marine district and does not address abundance and distribution within the region. However, this information can be used and combined with new information gathered in NY marine district. During the research phase other actions may become necessary to address.

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Taxa Group: Crustacea/Meristomata
Species Group: Freshwater crustacea

Threats:
The major threat to these crustacea is pollution but the loss of streams and wetlands will also affect survival of these species. The introduction of exotic species, which appear to outnumber native species, is another factor which could cause decline in native populations.

Trends:
The American Fisheries Association lists Cambarus diogenes as stable but the status of Stygobromus tenuis tenuis is unknown.

SEQR - No Action Alternative:
Because the range of Cambarus diogenes is limited to the Lake Erie and SW Lake Ontario watersheds, any loss or degradation of habitat in those regions will lead to a decline in its population. The distribution of Stygobromus tenuis tenuis is unknown and as such, immediate threats remain unknown. Lack of habitat management will endanger existing populations of both species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Devil crawfish (Cambarus diogenes)			S2	G5	U	Resident
Piedmont groundwater amphipod (Stygobromus te			SNR	34G5T2T3C	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Piedmont groundwater amphipod (Stygobromus tenuis te	Susquehanna	Unknown	Unknown
	Upper Hudson		
	Lower Hudson - Long Island Bays		
	SE Lake Ontario		
	Delaware		
Devil crawfish (Cambarus diogenes)	Lake Erie	Lake Erie	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Piedmont groundwater amphipod (Stygobromus tenuis te	High Allegheny Plateau Lower New England Piedmont Great Lakes	Unknown	Unknown
Devil crawfish (Cambarus diogenes)	Great Lakes	Great Lakes	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Piedmont groundwater amphipod (Stygobromus tenuis tenuis)				
	all	Subterranean	natural	aquatic caves
Devil crawfish (Cambarus diogenes)				
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Riverine	coldwater stream	SAV
	all	Subterranean	natural	aquatic caves
	Breeding	Riverine	unknown	unknown

Goal and Objectives for Freshwater crustacea

Goal: To maintain viable populations of Cambarus diogenes and Stygobromus tenuis tenuis in their historic ranges.

Objective 1 : Complete an inventory of Cambarus diogenes in waters that are part of its historic range.

Measure: *Completed inventory.*

Objective 2 : Complete an inventory of Stygobromus tenuis tenuis in waters that are part of its historic range.

Measure: *Completed inventory.*

Objective 3 : Maintain self-sustaining populations of Cambarus diogenes in the Lake Erie and SW Lake Ontario watersheds.

Measure: *Number of populations maintained.*

Objective 4 : Maintain self-sustaining populations of Stygobromus tenuis tenuis in its historic range.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat monitoring:

* Investigate the degree of alteration to natural flow regime of waters containing the species.
* The immediate threats to these populations need to be determined.

Habitat research:

* The critical habitat needs of both species need to be evaluated.

Life history research:

* Investigate the impacts of modified flow regime on species life cycle.

Population monitoring:

* Inventories of Stygobromus tenuis tenuis and Cambarus diogenes need to be conducted in their respective historical ranges.

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Taxa Group: Crustacea/Meristomata
Species Group: Horseshoe crab

Threats:
Direct threats to the horseshoe crab include fishing pressure and loss of spawning habitat due to beach development and modification and also from dredging.

Horseshoe crabs are used as bait for the killifish (Fundulus spp.), eel (Anguilla rostrata) and conch (Busycon spp.) fisheries. In 2003, there were 311 commercial horseshoe crab bait permit holders who were responsible for harvesting 133,064 crabs for bait and other purposes. Over the past 3 years, the average harvest for horseshoe crabs in New York state was approximately 150,000 crabs. In prior years the landings were even higher, however current reporting practices were not yet in place and the reliability of these earlier numbers is suspect.

The bait industry in the past has preferentially harvested female horseshoe crabs, especially the eel fishery. This is due to the belief by fishermen that females are better at attracting eels. In addition the females are generally of larger size (Loveland, 1997). According to reports received by commercial fishermen, in 2001, over 60% of the crabs harvested were female, in 2002 and 2003 the male/female ratio has become approximately 50/50. This could be an indication of less females available, less crabs available, fishermen no longer caring which sex is used for bait or an increased awareness of sexing the crabs (in previous years many fishermen listed all of their catch as female) or from a combination of reasons. Targeting large breeding females can impact a species' ability experience population growth and potentially leads to declines in abundance.

The blood of the horseshoe crab is the sole source for Limulus Amebocyte Lysate (LAL), an important biomedical product. The LAL test is the standard for screening medical equipment for endotoxin contamination. Crabs that are harvested for LAL production must then, as stated in regulations, be returned to their place of capture. These crabs are usually shipped to one of the four biomedical companies that are licensed by the FDA to produce LAL (Tanacredi, 2001). Mortality rates for the whole process is unclear; however the bleeding process alone has been associated with as much as a 15% mortality level (Berkson, J. 1999). Botton argues out that although Rudloe’s 1983 study found only a 10% mortality rate of bled crabs to those in the control, it may be advisable to test mortality rates over different environmental conditions, suggesting that the rates for mortality during the bleeding process may indeed be higher (1987).

An unknown number of horseshoe crabs are harvested in New York and sent to Massachusetts to a biomedical company for bleeding and then used as bait in MA. Massachusetts regulations state that all bled horseshoe crabs go into their bait industry. Although this process helps the coast-wide population in general because it uses the same crabs for the bait as the LAL, and thus reduces overall horseshoe crab mortality, this may impact New York’s ability to meet its own bait needs by increasing the demand for crabs that are used out-of-state.

With the introduction of bulkheads, jetties, and groins, the shape, location and accessibility to spawning beaches may change such that they are no longer suitable for the horseshoe crabs or their eggs. Horseshoe crabs need low energy sandy beaches upon which to spawn as well as appropriate adjacent nursery habitats (tidal flats) and adult habitats (Shuster 1979). Availability of sandy beaches may limit their reproductive success and bulk headed beaches are unsuitable for horseshoe crabs (Loveland, 1997). Dredging along Long Island’s coast can severely alter the existing suitable nursery habitat. Modification of habitat is considered a principle factor in the declining population of the ecologically similar Japanese horseshoe crab (Botton, 1987). Many beach stabilization practices; such as “clean fill” being added to the intertidal zone may affect spawning and juvenile recruitment (Botton, 1987).

Like many other species, horseshoe crabs (adults and juveniles) along with their eggs can be affected by pollutants. In bioassays, signs of sublethal stress (delayed molting and elevated oxygen consumption) have been found after exposure to oil or chlorinated hydrocarbons (Botton, 1987).

In Delaware Bay, horseshoe crabs have been linked with declines in migrating shorebird populations such as the red knot (Calidris canutus), ruddy turnstone (Arenaria interpres) and semipalmated sandpipers (Calidris pusilla). These birds feed almost exclusively on the eggs as they migrate northward (Smith, et al, 2002). Due to this unique interaction, the status of these endangered birds depends heavily on the health of the horseshoe crab population. Further research needs to be conducted with reference to the percent of the birds' diet comprised of horseshoe crab eggs as they pass through New York as well as whether or not their migration through this area coincides with peak horseshoe crab spawning season as it does in Delaware.

Trends:

The overall trend for the horseshoe crab in New York's Waters is not clear. Certain surveys, such as the NYS DEC Peconic Small Mesh Trawl Survey and DNC Millstone Trawl Survey, show a parabolic change in relative abundance, where others, such as the NYS DEC Western Long Island Sound Beach Seine Survey and the CT DEP Long Island Sound Trawl Survey, show them as increasing or steady. As no directed study currently exists for the horseshoe crabs, absolute abundance can not be estimated. More research and more detailed studies are needed to determine the status of the stock and interactions with other species in New York's Waters.

SEQR - No Action Alternative:

The no action alternative would leave existing management actions in place without consideration for the future well being of the resource, resource users as well as dependent wildlife species, many of which are federally protected.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Horseshoe crab (Limulus polyphemus)					P	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Horseshoe crab (Limulus polyphemus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Horseshoe crab (Limulus polyphemus)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Horseshoe crab (Limulus polyphemus)				
	all	Marine	deep subtidal	sand/gravel
	all	Marine	deep subtidal	sand/gravel
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Breeding	Terrestrial	coastal	beach/shoreline
	Breeding	Terrestrial	coastal	beach/shoreline
	Nursery/Juvenile	Estuarine	intertidal	mud
	Nursery/Juvenile	Estuarine	intertidal	mud
	Nursery/Juvenile	Estuarine	intertidal	sand/gravel
	Nursery/Juvenile	Estuarine	intertidal	sand/gravel

Goal and Objectives for Horseshoe crab

Goal: Maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of coastal ecosystems, while providing the for continued use over time.

Objective 1 : Complete documentation of horseshoe crab harvest by 2006

Measure: *Compliance rate of fishery submitting VTR or other harvest reporting*

Objective 2 : Develop a protocol for examining the interaction of shorebirds and spawning horseshoe crabs in the Lower Hudson/ Long Island Bays watershed by 2010.

Measure: *Completion of protocol examining shorebird horseshoe crab interactions.*

Objective 3 : Develop a program for examining the interactions between shorebirds and horseshoe crabs in Lower Hudson and Long Island Bays watershed by 2015.

Measure: *Implement program for examining interactions between shorebirds and horseshoe crabs in Lower Hudson and Long Island Bays watershed.*

Objective 4 : Develop a program for monitoring spawning horseshoe crabs in the Lower Hudson/ Long Island Bays watershed that can be implemented by 2010.

Measure: *Implement the spawning monitoring program.*

Objective 5 : Develop a program to determine habitat use of juvenile horseshoe crabs in Lower Hudson and Long Island Bays by 2010.

Measure: *Implement program to determine habitat use of juvenile horseshoe crabs in Lower Hudson and Long Island Bays.*

Objective 6 : Develop a protocol for monitoring spawning horseshoe crabs in the Lower Hudson/ Long Island Bays watershed that can be then implemented by 2008.

Measure: *Completion of spawning monitoring protocol.*

Objective 7 : Develop a protocol for program to determine habitat use of juvenile horseshoe crabs in Lower Hudson and Long Island Bays by 2010.

Measure: *Completion of protocol for program to determine habitat use of juvenile horseshoe crabs in Lower Hudson and Long Island Bays.*

Objective 8 : Utilizing fishery independent and fishery dependent data to determine appropriate harvest levels by 2020.

Measure: *Harvest targets and thresholds established.*

Recommended Actions

Habitat management:

* Tidal flats are important nursery areas for horseshoe crabs. Tidal flat habitat protection and restoration are crucial elements in any lobster conservation and management plan. Aspects of tidal flat habitat protection and restoration will be included in the final watershed recommendations.
* Beaches are important spawning areas for horseshoe crabs. Beach habitat protection and restoration are crucial elements in any lobster conservation and management plan. Aspects of beach habitat protection and restoration will be included in the final watershed
* Shellfish beds are important foraging areas for horseshoe crabs. Shellfish habitat protection and restoration are crucial elements in any horseshoe crab conservation and management plan. Aspects of shellfish habitat protection and restoration will be included in the final watershed recommendations.
* Salt marshes are utilized as nursery areas for horseshoe crabs in some systems. Salt marsh habitat protection and restoration are crucial elements in any horseshoe crab conservation and management plan. Aspects of salt march habitat protection and restoration will be included in the final watershed recommendations.

Habitat research:

* Determine key spawning beaches and nursery habitat.

Recommended Actions

Life history research:

* Determine if there truly is a terminal molt for adult horseshoe crabs of either sex.
* Determine reliable field methods for aging horseshoe crabs

Modify regulation:

* Require bait bag usage in order to reduce number of crabs necessary to support the eel and conch fishery needs.
* Modify existing regulations as necessary to protect the Horseshoe crab consistent with the ASMFC FMP for the species.

Other action:

* Investigate interactions (if any) with migratory bird species and horseshoe crab eggs along NY's Coastline.

Population monitoring:

* Determine stock uniqueness by coordinating tagging studies with other states.
* Explore effectiveness of different tagging methods and implement coordinated tagging program in NY's Waters
* Design and implement a directed fishery independent spawning and abundance surveys

Statewide management plan:

* Implement horseshoe crab management consistent with the Interstate Fishery Management Plan for the species and the needs of the resource in New York.

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Taxa Group: Crustacea/Meristomata
Species Group: Zooplankton

Threats:
Chemical contaminants may be transported to other organisms in the food chain via zooplankton, but there is no indication that changes in zooplankton distribution are related to chemical concentrations in the water column. It is likely that zooplankton have developed resistance to chemical contaminants and can live in polluted environments where all other necessary conditions for survival exist.

Other threats to zooplankton include predation and cannibalism. Eggs, nauplii, and adult crustacean plankters are subject to predation by fish, molluscan shellfish, and gelatinous plankters, such as ctenophores and jellyfish.

Another factor that affects the zooplankton population is egg removal. There are two mechanisms by which this happens: sinking and horizontal advective removal from an area.

Entrainment of planktonic organisms through cooling systems of electric generating stations can also affect zooplankton populations locally. Typically, mortality of organisms entrained is high, due to thermal and mechanical stresses.

Trends:
Most trends in zooplankton are seasonal in nature; that is, different plankters will dominate at different times of year. For example, Acartia clausi is more dominant during winter months, while A. tonsa is more widely found during summer. In Long Island Sound and the Hudson River estuary, copepods are the dominant zooplankter. In terms of biomass, zooplankton peaks are timed to phytoplankton peaks, with peak densities found during spring and summer.

Little is known about collective trends in local zooplankton and information/data on year-to-year zooplankton abundance is depauperate.

SEQR - No Action Alternative:
A no action alternative could have one or more effects on the zooplankton population:

1) If water quality is allowed to deteriorate, it may result in conditions that would affect zooplankton growth and reproduction, which could result in a decrease in the zooplankton population.

2) Deterioration of habitat and water quality could affect predators of zooplankton, which could increase the zooplankton population.

3) Failure to manage nutrients in waterways could result in increase phytoplankton blooms which could either kill off zooplankton, or increase their food supply, depending on the type of phytoplankton and the degree of the bloom.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Marine zooplankton (Various species of invertebrat			N/A	N/A		Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Marine zooplankton (Various species of invertebrates)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Marine zooplankton (Various species of invertebrates)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Marine zooplankton (Various species of invertebrates)				
	all	Estuarine	shallow subtidal	pelagic
	all	Marine	deep subtidal	pelagic

Goal and Objectives for Zooplankton

Goal: Maintain a healthy population of zooplankton in the estuarine and marine environment

Objective 1 : Assess zooplankton population

Measure: *Increase survey frequency to obtain more information on the zooplankton population. Currently, useful data for any management of zooplankton in NYS marine and estuarine waters are severely inadequate.*

Objective 2 : Maintain a healthy environment for zooplankton.

Measure: *Implement water pollution control measures and habitat restoration projects, as per Long Island Sound Study, Peconic Estuary Program, Hudson River Estuarine Reserve, and South Shore Estuarine Reserve management plans.*

Objective 3 : Manage environmental conditions to maintain conditions conducive to zooplankton.

Measure: *Water quality monitoring and pollution controls.*

Objective 4 : Prevent introduction of exotic species.

Measure: *Ballast water discharge prohibitions.*

Recommended Actions

Educational signs:

* Develop appropriate fact sheets about this insufficiently understood component of the marine environment.

Habitat management:

* Species management of zooplankton is virtually impossible, given the seasonal nature of the population. However, it is possible to manage environmental conditions to maintain an environment favorable to plankton.

Habitat monitoring:

* Field surveys for water quality and habitat suitability can help determine whether or not the water column is suitable for a healthy zooplankton population.

Habitat research:

* Conduct studies to determine what environmental conditions increase habitat suitability for zooplankton. Habitat suitability should include growth and reproduction, as well as survival.

Habitat restoration:

* Habitat restoration, particularly projects that help control storm water runoff or increase circulation in an embayment, can contribute to suitable habitat for zooplankton, particularly in near shore waters.

Invasive species control:

* Controls on ballast discharges from oceangoing vessels should be implemented and enforced to prevent exotic planktonic organisms from invading local waterways.

Life history research:

* Research should be conducted to determine egg reproduction rate and hatching success for planktonic organisms of concern.

Modify regulation:

* Other than the aforementioned prohibition on ballast dumping, current regulations should be adequate to protect the endemic zooplankton population.

Regional management plan:

* Implement as appropriate recommendations of management plans for Long Island Sound, Peconic Estuary, NY/NJ Harbor, the Hudson River Estuary, and the South Shore Estuaries should be implemented.

Recommended Actions

Statewide baseline survey:

* Baseline studies on zooplankton should be conducted to determine future trends in populations.

Web page:

* Develop appropriate web page information about this group of species.

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Comprehensive Wildlife Conservation Strategy

Appendix A3:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Freshwater fish

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Freshwater fish
Species Group: Banded sunfish

Threats:
Because the only remaining New York populations of the banded sunfish are located in eastern Long Island, it is considered to be vulnerable to environmental catastrophes. Fortunately, several of the ponds are isolated and without surface water connections to the Peconic system. The ground water pumping that continues to lower the water level, could also threaten these waters during drought conditions.

Trends:
Historically found in about 30 (still in 19) waters and their range is not declining (or gone or dangerously sparse) in 1 of the 2 watersheds. Both habitat and abundance appears to be stable on Long Island, except for years when the water table goes down and ponds dry up.

SEQR - No Action Alternative:
Because the only remaining population of the banded sunfish is located in eastern Long Island, thus making it vulnerable to environmental changes and drops in the water table, a lack of management including monitoring their status in the Peconic system could jeopardize the New York population.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Banded sunfish (Enneacanthus obesus)		X	S1S2	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Banded sunfish (Enneacanthus obesus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Banded sunfish (Enneacanthus obesus)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Banded sunfish (Enneacanthus obesus)				
	all	Lacustrine	warm water shallow	mud bottom
	all	Lacustrine	warm water shallow	sand/gravel

Goal and Objectives for Banded sunfish

Goal: The existence of the banded sunfish in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Lower Hudson-Long Island watersheds.

Objective 1 : Perpetuation of self sustaining populations in other waters in the Lower Hudson-Long Hudson Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in water bodies or subbasins in the Lower Hudson-Long Island Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat monitoring:

* Complete surveys on submerged aquatic vegetation and floating woody mats in areas still inhabited by this species and monitor water level depths on dry years.

Habitat research:

* Define preferred habitat in order to guide future restoration efforts and focus habitat protection efforts.

Population monitoring:

* Continued monitoring of the Long Island populations.

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Taxa Group: Freshwater fish
Species Group: Bigeye chub

Threats:
Trautman (1981) has noted that populations of the bigeye chub declined in prairie streams of west central Ohio as a result of increased siltation of stream bottoms. Undoubtedly this has occurred in New York waters as well, but no studies to assess this or other problems, threats, limiting factors or overall vulnerability of this species or its essential habitat have been conducted.

Trends:
Historically found in over 19 waters (still in 6) and declining in their range (or gone or dangerously sparse) in all 4 watersheds. Abundance has declined in the Ontario, Allegheny and Oswego watersheds. Daniels (1989 and 1998) called for watchfulness of their declines in the Allegheny Watershed. Their status in the lower Buffalo River System appears more favorable. Habitat trends are currently unknown. This trend causes imminent concern.

SEQR - No Action Alternative:
Because both the range and abundance of the Bigeye chub appear to be declining, lack of management actions including population monitoring could put existing New York populations at risk.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bigeye chub (Hybopsis amblops)			S2	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bigeye chub (Hybopsis amblops)	Lake Erie	Lake Erie	Stable
	SW Lake Ontario	Allegheny	Decreasing
	Allegheny		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bigeye chub (Hybopsis amblops)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Western Allegheny Plateau		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bigeye chub (Hybopsis amblops)	all	Riverine	warm water shallow	sand/gravel

Goal and Objectives for Bigeye chub

Goal: Maintain the existence of the bigeye chub in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Lake Erie, Southwestern Lake Ontario and Allegheny watersheds.

Objective 1 : Establish an inventory of waters within the Allegheny watershed that are recognized as the historic range for the bigeye chub.

Measure: *Number of waters inventoried.*

Objective 2 : Establish an inventory of waters within the Lake Erie watershed that are recognized as the historic range for the bigeye chub.

Measure: *Number of waters inventoried.*

Objective 3 : Establish an inventory of waters within the Southwestern Lake Ontario watershed that are recognized as the historic range for the bigeye chub.

Measure: *Number of waters inventoried.*

Objective 4 : Perpetuation of self sustaining populations in other waters the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in other waters the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in the Allegheny watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in the Lake Erie watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory and assess losses of habitat and this species in tributaries of western Lake Ontario. Follow up with remediation efforts.

Population monitoring:

* More sampling is needed in these basins, like Olean/Ischua Creeks and Buffalo River system.

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Taxa Group: Freshwater fish
Species Group: Black redhorse

Threats:
Pollution, siltation or turbidity may be limiting some population densities.

Trends:
Historically found in 12 waters (now in 10) and their range is declining (or gone or dangerously sparse) in only 1 of the 3 watersheds. This species is abundant in the Allegheny watershed, is still present in all previously known tributaries of Lake Erie, but is extirpated from the Genesee.

SEQR - No Action Alternative:
With environmental factors possibly limiting some population densities, a lack of management such as population monitoring could jeopardize the self-sustaining populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Black redhorse (Moxostoma duquesnei)			S2	G5	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Black redhorse (Moxostoma duquesnei)	SW Lake Ontario	Lake Erie	Stable
	Lake Erie	Allegheny	Stable
	Allegheny		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Black redhorse (Moxostoma duquesnei)	Western Allegheny Plateau	Western Allegheny Plateau	Stable
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Great Lakes	Great Lakes	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Black redhorse (Moxostoma duquesnei)				
	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Black redhorse

Goal: The existence of the black redhorse in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Allegheny, Lake Erie and Southeastern Lake Ontario watersheds.

Objective 1 : Perpetuation of self sustaining populations in the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in the Allegheny Watershed.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory and assess losses of habitat and this species in the Genesee basin. This would be followed by considering remediation efforts.

Population monitoring:

* Surveys should be done in the Buffalo River system and the Genesee River.

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Taxa Group: Freshwater fish
Species Group: Blackchin shiner

Threats:
Dramatic changes in abundance over different sampling periods have been noted and later associated with water levels (in Minnesota). It changed from abundant, to rare, to abundant again (Becker 1983).Little is known about the ecological requirements of blackchin shiner.

Trends:
Historically found in 98 (still in at least 20) waters and their range is possibly declining (or gone or dangerously sparse) in 4 of the 10 watersheds. Their range has declined in downstream areas of the St. Lawrence River, bays on the south shore of Lake Ontario and in other inland lakes in New York State. In the St. Lawrence downstream of the Thousand Island region, only one has been collected (in 1999), while they were more widespread there in the 1930's. They still occur farther downstream in Ontario and Quebec (Bergeron and Brousseau 1983). Only one bay on the south shore of Lake Ontario from Rochester to Port Ontario was sampled with this species, Sodus Bay. Seven other bays were sampled in 1997 (field notes of D. Carlson, 1997), among which four of these contained blackchin shiner in the 1930's.

Previously inhabited lakes in the remaining parts of New York have been sampled less thoroughly (Regional DEC sampling efforts and six lake samples by D. Carlson in 1997), and only 13 lakes have included them since the 1930's and only four lakes since the 1960's. The lakes without recent captures, like Otsego, Brant and Rich lakes apparently show species declines. Cayuga, Fourth (near Warrensburg) and Canadarago lakes had samples with this species as recently as 1961, 1972 and 1976 (respectively, Cornell Univ Museum; NYS Fisheries Data Base; McBride and Sanford 1997). The two other lakes, Tully (near Cortland) and Highlands Forge (near Willsboro) lakes, had blackchin shiner in samples in 1993. They were also caught in Lake Champlain (Rouses Point) and the Great Chazy River in 1998, and yet-to-be-confirmed records for the Susquehanna drainage in Owego Creek and Catatonk Creek are as recent as 1992 and 1996 (Carlson 1999 draft). Another recent record (2003) included Conesus Lake of the Genesee watershed. Previously inhabited areas of the Allegheny drainage and French Creek (not collected since the 1930's) apparently no longer have appropriate habitat (Daniels 1989). Captures from Chautauqua Lake and Niagara River have not been repeated and confirmed since the 1930's, and their continued presences there seem unlikely. Sampling is needed. The Poultney River (on the Vt. boundary) had blackchin shiner in 1989 (Facey and LaBar 1989). Other streams like Black Creek near Batavia had historic records and need to be sampled.

This species may be subject to a decline in some areas, as said to be a trend in lakes of the Northeast U.S. (Whittier et al. 1997; Chapleau and Findlay 1997). It was found in ten of New York's 13 watersheds in the 1930's (about 55 waters), and it is now possibly secure in only six watersheds (24 waters). This species is still abundant in some areas (Jefferson Co.), but it has declined in others. Once the species becomes scarce, it is difficult to sample under these conditions. It may be "secure" even though sampling efforts were thorough, while it was not able to be collected. From all available records, it has been known in 98 waters, and only 16 have records as recent as 1989 (Carlson 1999, draft). More of these waters should be surveyed.

The population has disappeared in western tributaries of Lake Ontario, the Niagara River and the Allegheny watershed but appears stable elsewhere.

SEQR - No Action Alternative:
Because of the need for information on the ecological requirements of the Blackchin shiner and fluctuations in abundance levels during sampling, lack of management actions such as population monitoring, could jeopardize current populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Blackchin shiner (Notropis heterodon)			S1	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Blackchin shiner (Notropis heterodon)	Allegheny	NE Lake Ontario - St. Lawrence	Stable
	Lake Champlain	SE Lake Ontario	Unknown
	Lake Erie	Susquehanna	Unknown
	NE Lake Ontario - St. Lawrence	Upper Hudson	Unknown
	SE Lake Ontario	Lake Champlain	Unknown
	Susquehanna		
	SW Lake Ontario		
	Upper Hudson		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blackchin shiner (Notropis heterodon)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Western Allegheny Plateau	Northern Appalachian/Boreal Forest	Unknown
	Great Lakes		
	Northern Appalachian/Boreal Forest		
	Lower New England Piedmont		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Blackchin shiner (Notropis heterodon)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Blackchin shiner (Notropis heterodon)				
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom

Goal and Objectives for Blackchin shiner

Goal: The existence of self sustaining populations of blackchin shiner in NY throughout its historic range in the Allegheny, Susquehanna, L. Erie, SE L. Ontario, SW L. Ontario, NE L. Ontario-St. Lawrence, L. Champlain, and Upper Hudson watersheds.

Objective 1 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Allegheny Watershed.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Lake Champlain Watershed.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Northeastern Lake Ontario-St. Lawrence Watershed.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Southeastern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Southwestern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Susquehanna Watershed.

Measure: *Number of populations maintained.*

Objective 8 : Perpetuation of self sustaining populations in 80 % of the historic waters of the Upper Hudson Watershed.

Measure: *Number of populations maintained.*

Objective 9 : Perpetuation of self sustaining populations in other waters in the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 10 : Perpetuation of self sustaining populations in other waters in the Lake Champlain Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 11 : Perpetuation of self sustaining populations in other waters in the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 12 : Perpetuation of self sustaining populations in other waters in the Northeastern Lake Ontario-St. Lawrence Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 13 : Perpetuation of self sustaining populations in other waters in the Southeastern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 14 : Perpetuation of self sustaining populations in other waters in the Southwestern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 15 : Perpetuation of self sustaining populations in other waters in the Susquehanna Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 16 : Perpetuation of self sustaining populations in other waters the Upper Hudson Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory and assess losses of habitat and this species in the Allegheny and Erie watersheds. This would be followed by considering remediation efforts.

Population monitoring:

* The status of this species in New York needs to be determined in more inland lakes, and the records in the Susquehanna drainage near Pennsylvania needs further study to understand if this represents a range expansion.

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Taxa Group: Freshwater fish
Species Group: Bluebreast darter

Threats:
The Kinzua Dam in Pennsylvania prohibits upstream migrations of the bluebreast darter from the lower section of the Allegheny River. As well, pollution remains as a threat to existing, disparate populations of the species in New York waters of the Allegheny. This is a single river reach with New York's only population (plus the records for Oswayo Creek), and it's abundance was sparse. The prospect of a fish kill, as have occurred earlier (Brezner and Pulaski 1972), could be a serious threat. This species does not tolerate even moderate degrees of siltation (Jenkins and Burkhead 1994).

Trends:
Even though the population is limited, its habitat, reproduction and general health appear stable. However, the bluebreast darter continues to be threatened throughout its range and only exists in locations in New York State. This trend causes imminent concern.

SEQR - No Action Alternative:
Due to pollution (notably siltation) continuing to pose a threat to the existing disparate populations of the Bluebreast darter in New York waters of the Allegheny, a lack of management actions including rigorous sampling, could jeopardize the population.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bluebreast darter (Etheostoma camurum)		X	S1	G4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bluebreast darter (Etheostoma camurum)	Unknown	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bluebreast darter (Etheostoma camurum)	Unknown	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bluebreast darter (Etheostoma camurum)	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Bluebreast darter

Goal: Maintain the existence of the bluebreast darter in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Allegheny Watershed.

Objective 1 : Establish an inventory of waters with naturally occurring bluebreast darter populations within the Allegheny watershed.

Measure: *Creation of inventory*

Objective 2 : Perpetuation of self sustaining populations in the Allegheny River and tributaries, and additional waters in the Allegheny Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirements of this species and its co inhabitants in the Allegheny and outside New York State, part of the same State Wildlife Grants project.

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 that is directed at the Allegheny watershed.

Population monitoring:

* Extensive sampling will be part of a State Wildlife Grants project in 2004 on the Allegheny River near Weston Mills and in lower Oswayo Creek.

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Taxa Group: Freshwater fish
Species Group: Brook trout, Heritage strains

Threats:
Primary threats to heritage strain brook trout are diminished water quality resulting from acid precipitation, competition, predation from introduced species, and inadvertent stocking of other Brook trout strains in heritage systems. Loss of groundwater quantity and quality, and the loss of spawning and nursery habitats (Gordon et. al., 2003) are other threats.

Trends:
The current number of wild, self-sustaining brook trout ponds in New York State is very low relative to historic conditions. Kretser et. al. (1989) found that less than 4% of the lakes and ponds in New York are thought to contain unstocked, wild populations of brook trout. Primarily as the result of management actions, the number of known wild populations has recently increased. Gordon et. al. (2003) reported 85 known, self-sustaining populations in the Adirondacks compared to the 39 populations reported by Pfeiffer in 1979. Management actions have included the liming of acidified brook trout waters, chemical removal of competitor and predator fishes, and restocking. As an example of the success of these methods, Gordon et. al. (2003) reported that 25 years of pond reclamation had resulted in self-sustaining brook trout populations in 10 of 50 reclaimed ponds.

Keller (1979) listed eleven "heritage" brook trout strains still extant in their natal waters. Those included Dix Pond, Honnedaga Lake, Horn Lake, Little Tupper Lake, Nate Pond, Stink Lake, Tamarack Pond and Windfall Ponds in Franklin and Herkimer Counties in the Adirondacks. Keller also listed two Catskill waters, Balsam Lake and Tunis Lake. Recent data (June, 2004) from fisheries managers and an academician indicate that all strains may still be present in their natal waters except the Tamarack Pond strain. Brook trout stocking data indicate that Horn Lake strain fish have been stocked in Tamarack Pond since 1996. There are no recent fisheries survey data available for Stink Lake.

Genetic work performed by Perkins et. al. (1993) confirmed the unique genetic character of most of these populations. Furthermore, Perkins et. al. (1993) found significant genetic differences among river basins, among drainages within basins, and even among samples within minor drainages, and suggested that individual heritage populations should be the primary ecological units on which management strategies should be based. At a minimum, Perkins et. al. suggested that two populations be selected for preservation within each major drainage. Candidate populations could be selected based on their capability to contribute large sample sizes to restoration efforts, and on their degree of genetic uniqueness.

Wild brook trout strains have been shown to live longer and have better survival than domesticated strains (Webster and Flick 1981). Heritage brook trout populations are important for the adaptive ability and long-term survival of the species, and represent an irreplaceable part of the brook trout resource in New York State. Thousands of generations of natural selection have resulted in genetically discrete, ecologically specialized populations specifically adapted to conditions in New York State.

SEQR - No Action Alternative:
If no action is taken it is anticipated that at least some heritage strains will be lost to acid precipitation, non-native species introductions, and/or other habitat impacts.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status

Brook trout, Heritage strains (Salvelinus fontinalis)	S5	G5	P	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Brook trout, Heritage strains (Salvelinus fontinalis)	Allegheny	Allegheny	Stable
	Delaware	Delaware	Stable
	Lake Champlain	Lake Champlain	Stable
	Lake Erie	Lake Erie	Stable
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Stable
	SE Lake Ontario	SE Lake Ontario	Stable
	Susquehanna	Susquehanna	Stable
	SW Lake Ontario	SW Lake Ontario	Stable
	Upper Hudson	Upper Hudson	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Brook trout, Heritage strains (Salvelinus fontinalis)	Great Lakes	Great Lakes	Stable
	High Allegheny Plateau	High Allegheny Plateau	Stable
	Lower New England Piedmont	Lower New England Piedmont	Stable
	North Atlantic Coast	North Atlantic Coast	Stable
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Stable
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable
	Western Allegheny Plateau	Western Allegheny Plateau	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Brook trout, Heritage strains (Salvelinus fontinalis)				
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
	all	Riverine	coastal plain stream	sand/gravel bottom
	all	Riverine	coldwater stream	sand/gravel bottom

Goal and Objectives for Brook trout, Heritage strains

Goal: Maintain viable populations of heritage strain brook trout that collectively represent the full range of genetic diversity found in New York State.

Objective 1 : Maintain viable populations of all known heritage strain brook trout known to occur in lakes and ponds.

Measure: *Number of lakes and ponds supporting heritage strain brook trout; Number of strains protected.*

Objective 2 : Maintain, primarily through habitat protection, known or likely populations of stream and coastal populations of brook trout.

Measure: *Miles of wild brook trout stream.*

Recommended Actions

Captive breeding:

* Selected strains of heritage strain brook trout have been propagated in fish hatcheries and used to create naturally sustained wild populations. This work needs to continue, and be refined pending an updating of the management plan.

Habitat management:

* Select 2 stream populations for each watershed (major drainage) to designate as heritage riverine stocks - to protect from stocking and habitat loss.
* Construct and maintain fish barriers to prevent undesirable fish from populating reclaimed ponds, or ponds that are naturally recovering from acid precipitation.

Habitat restoration:

* Liming of selected ponds, followed by restocking with heritage strain brook trout, should continue. Target ponds and strains should be identified in the updated management plan.

Recommended Actions

Invasive species control:

* Reclamation of selected ponds to remove non-native and native but widely introduced fish species, followed by restocking with heritage strain brook trout, should continue. Target ponds and strains should be identified in the updated management plan.

Population monitoring:

* Complete an inventory of known stream and coastal populations of "never stocked" brook trout.

Statewide management plan:

* Keller's 1979 plan "Management of wild and hybrid brook trout in New York lakes, ponds and coastal streams" needs to be updated to include current status of known heritage strains, and updated conservation plans and research needs. Potential new research includes the characterization of additional heritage strains, and the broad-scale identification of lakes that may be suitable for the restoration of self-sustaining heritage brook trout populations (e.g., lakes likely to have suitable groundwater springs or coldwater inlets).

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Taxa Group: Freshwater fish
Species Group: Comely shiner

Threats:
Argent et al. (1998) felt that it was among the Pennsylvania species with most reduced distribution. Its ability to withstand turbidity make it seem more tolerant than some minnows. There have been no studies to assess its problems, threats, limiting factors or overall vulnerability.

Trends:
Historically found in over 50 waters and their range is declining (or gone or dangerously sparse) in at least 4 of the 5 watersheds where native. In the 1930s, this species occurred in 20%(112) of the samples in the Susquehanna, 8% (21) in Chemung, 5%(25) in the Delaware and 2% (18) in the lower Hudson in the 1935-37. It still occurs in these watersheds plus the southernmost part of the Oswego watershed by Seneca Lake, but it appears to be less common than earlier (Smith 1985). Smith collected them in 5% (3/63) of his sites in the Susquehanna and Chemung watersheds, 8% (3/38) in the Delaware and 4% (5/126) in the lower Hudson.

There are only 23 records or sites still inhabited by this species since 1975, compared to 241 sites from earlier years. Most of the recent records, since 1990, are from the Lower Hudson (8) and the Susquehanna (2) and there are none from the Chemung, Delaware or Newark Bay. The population appears stable in the Lower Hudson, has disappeared from many streams of the Susquehanna, Chemung and Delaware watersheds and is extirpated from the Newark Bay watershed. This trend causes imminent concern.

SEQR - No Action Alternative:
With the comely shiner having disappeared from many streams in two watersheds in New York, lack of monitoring and surveying could be detrimental to the perpetuation of existing populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Comely shiner (Notropis amoenus)			S3	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Comely shiner (Notropis amoenus)	Susquehanna	Susquehanna	Unknown
	Delaware	Delaware	Unknown
	Upper Hudson	SE Lake Ontario	Stable
	Lower Hudson - Long Island Bays	Upper Hudson	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Comely shiner (Notropis amoenus)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Comely shiner (Notropis amoenus)	all	Riverine	warmwater stream	sand/gravel bottom

Goal and Objectives for Comely shiner

Goal: The existence of the comely shiner in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Susquehanna, Delaware, Upper Hudson watersheds.

Objective 1 : Establish an inventory of waters within the Delaware watershed that are recognized as historic habitat for comely shiner.

Measure: *Number of waters inventoried.*

Objective 2 : Establish an inventory of waters within the Susquehanna watershed that are recognized as historic habitat for comely shiner.

Measure: *Number of waters inventoried.*

Objective 3 : Establish an inventory of waters within the Upper Hudson watershed that are recognized as historic habitat for comely shiner.

Measure: *Number of waters inventoried.*

Objective 4 : Perpetuation of self sustaining populations in other waters in the Delaware Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in other waters in the Susquehanna Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in other waters in the Upper Hudson Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat in streams currently and formerly occupied by the species.

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 directed at the Susquehanna watershed.

Population monitoring:

* More sampling is needed in these watersheds.

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Taxa Group: Freshwater fish

Species Group: Deepwater sculpin

Threats:

Reasons for the decline are unknown, but interactions with alewife and rainbow smelt are implicated. As recent as 1950, they were still abundant in Lake Ontario (Christie 1973). The decline of another sculpin, slimy sculpin, in Lake Ontario has been linked to the introduced animals in the lake, like zebra mussels and round goby (Owens et al. 1999). It is possible that the recovery of deepwater sculpin will be affected by these lake changes, particularly because of reduction of their food, an amphipod (Diporeia). This is a likely result of zebra mussels.

Trends:

Historically found in 2 waters and their range is declining (or gone or dangerously sparse) in 1 of the 2 watersheds. Population levels are unknown because levels are so low. It was thought to have been extirpated prior to its reoccurrence in 1996-2000.

SEQR - No Action Alternative:

Due to very low population numbers and little being known about its habitat requirements, a lack of attention and monitoring could jeopardize the remaining few populations. The Deepwater sculpin was thought to be extirpated prior to its re-occurrence in 1996-2000.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Deepwater sculpin (Myoxocephalus thompsoni)		X	S1	G5	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Deepwater sculpin (Myoxocephalus thompsoni)	SE Lake Ontario	SE Lake Ontario	Decreasing
	SW Lake Ontario		
	Lake Erie		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Deepwater sculpin (Myoxocephalus thompsoni)	Great Lakes	Great Lakes	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Deepwater sculpin (Myoxocephalus thompsoni)	all	Lacustrine	cold water deep	unknown

Goal and Objectives for Deepwater sculpin

Goal: The existence of the deepwater sculpin in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Southeastern Lake Ontario, Southwestern Lake Ontario and Lake Erie watersheds.

Objective 1 : Perpetuation of self sustaining populations in other waters in the Southeastern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in other waters in the Southwestern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in the waters in the Southeastern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in the waters in the Southwestern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Population monitoring:

* Continue sampling in Lake Ontario.

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Taxa Group: Freshwater fish
Species Group: Eastern sand darter

Threats:
The major cause of declines in eastern sand darter populations is loss of clean sandy substrate due to siltation. On some streams the construction of dams led to fragmentation of sand darter populations. In addition, impoundments created with the construction of these dams also act as settling basins which aggravate siltation problems. Stream pollution and stream channelization have also caused loss of eastern sand darter habitat. Problems in New York's populations are not evident, even though habitat protection was needed to control stream bank alterations in important areas. "Sea lamprey control practices were raised as a concern for eastern sand darters in in the Poultney River. As a precaution for sand darters and certain other species, two lamprey treatments in the Poultney were conducted at lower than normal TFM concentrations. However, in-stream tests, and laboratory bioassays, indicate that treatments at normal concentrations would be appropriate."

Trends:
Historically found in 12 waters (still in 10) and their range is declining (or gone or dangerously sparse) in 2 of the Lake Erie subbasins, while it still occurs in all 4 watersheds. Abundance appears stable in northern New York and it is unknown in western New York. The early records show losses of this species from Cattaraugus and Cazenovia creeks, and this reduced the number of waters from 4 to 2 . However there was a gain of 5 new waters in the last 20 years, and this puts the present number at 7 separate waters. Abundance was estimated (as catch per unit effort) over 4 years in four northern streams, and the numbers showed modest fluctuations (Bouton 1991). The population in Lake Erie may be affected by the recent invasion of round goby. Statewide, the number of number of times this species has been reported in the last 25 years exceeds 400, compared to only 4 reports prior to 1975. This shows an increase across all of the watersheds.

Essential habitat trend: appears stable, but specifics are unknown. Habitat degradation studies have been underway in the Poultney River (Facey and O’Brien 2003). The NYS recovery plan (Bouton 1988) said that five disjunct populations were needed, and the count is now seven, when including the ones in the St. Regis-Deer River, Grasse River and Conewango Creek (Allegheny).

SEQR - No Action Alternative:
Because their range is declining and in some cases the construction of dams has led to fragmentation of sand darter populations, a lack of management actions could jeopardize the future of Eastern Sand Darter populations in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Eastern sand darter (Ammocrypta pellucidum)		X	S2	G3	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern sand darter (Ammocrypta pellucidum)	NE Lake Ontario - St. Lawrence	Lake Erie	Decreasing
	Lake Champlain	NE Lake Ontario - St. Lawrence	Increasing
		Lake Champlain	Increasing
		Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern sand darter (Ammocrypta pellucidum)	Great Lakes	Great Lakes	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
		Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern sand darter (Ammocrypta pellucidum)				
	all	Lacustrine	cold water deep	sand/gravel
	all	Riverine	cold water deep	sand/gravel

Goal and Objectives for Eastern sand darter

Goal: The existence of the Eastern sand darter in NY, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Lake Erie, Northeastern Lake Ontario-St. Lawrence and Lake Champlain watersheds.

Objective 1 : Perpetuation of self sustaining populations in other waters within the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in other waters within the Lake Champlain Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in other waters within the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in other waters within the Northeastern Lake Ontario-St. Lawrence Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in water bodies in the Allegheny Watershed.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in water bodies in the Lake Champlain Watershed.

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in water bodies in the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Objective 8 : Perpetuation of self sustaining populations in water bodies in the Northeastern Lake Ontario-St Lawrence watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat restoration:

* Habitat losses and recommendations for restoration in the Poultney River, as studied in Vermont, will be applied as appropriate.

Relocation/reintroduction:

* Examine possibilities for reintroducing to Cattaraugus Creek and for introducing to other St. Lawrence tributaries.

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Taxa Group: Freshwater fish
Species Group: Extirpated Fishes

Threats:
Several natural and human factors are believed to have caused the extirpation of these fish species including climatic variations, exotic species and watershed succession, as well as human perturbation which altered habitats. The continuance of these conditions and environment are thus a threat to re-establishment.

Trends:
The best current information available indicates that none of these species are still present in NY. For example, while Atlantic salmon are present in NY as a result of stocking of non-native strains, there is no known source of the native genetic Atlantic salmon resource. The same is true of paddlefish.

SEQR - No Action Alternative:
These species, believed to be extirpated from their historic waters in New York, will not return without active management, specifically habitat evaluation, monitoring and reintroduction by stocking.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Spoonhead sculpin (Cottus ricei)		X	SH	G5	E	Resident
Gilt darter (Percina evides)		X	SH	G4	E	Resident
Mud sunfish (Acantharchus pomotis)		X	SH	G5	T	Resident
Lake chubsucker (Erimyzon sucetta)		X	SH	G5	T	Resident
Silver chub (Macrhybopsis storeriana)		X	SH	G5	E	Resident
Shortjaw cisco (Coregonus zenithicus)			SX	G3	U	Resident
Shortnose cisco (Coregonus reighardi)			SX	G1	U	Resident
Kiyi (Coregonus kiyi)			SX	G3	U	Migratory
Paddlefish (Polyodon spathula)			SX	G4	EP	Migratory
Bloater (Coregonus hoyi)			SX	G4	U	Resident
Atlantic salmon (Salmo salar)					P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic salmon (Salmo salar)	SE Lake Ontario NE Lake Ontario - St. Lawrence Lake Champlain	Unknown	Unknown
Bloater (Coregonus hoyi)	SW Lake Ontario SE Lake Ontario	Unknown	Unknown
Paddlefish (Polyodon spathula)	Allegheny	Unknown	Unknown
Kiyi (Coregonus kiyi)	SE Lake Ontario	Unknown	Unknown
Shortnose cisco (Coregonus reighardi)	SE Lake Ontario	Unknown	Unknown
Shortjaw cisco (Coregonus zenithicus)	Lake Erie	Unknown	Unknown
Silver chub (Macrhybopsis storeriana)	Lake Erie SE Lake Ontario	Unknown	Unknown
Lake chubsucker (Erimyzon sucetta)	Lake Erie SW Lake Ontario	Unknown	Unknown
Mud sunfish (Acantharchus pomotis)	Lower Hudson - Long Island Bays	Unknown	Unknown
Gilt darter (Percina evides)	Allegheny	Unknown	Unknown
Spoonhead sculpin (Cottus ricei)	Lake Erie SE Lake Ontario	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Atlantic salmon (Salmo salar)	Great Lakes St. Lawrence-Lake Champlain Valley	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bloater (Coregonus hoyi)	Great Lakes	Unknown	Unknown
Paddlefish (Polyodon spathula)	High Allegheny Plateau Western Allegheny Plateau	Unknown	Unknown
Kiyi (Coregonus kiyi)	Great Lakes	Unknown	Unknown
Shortnose cisco (Coregonus reighardi)	Great Lakes	Unknown	Unknown
Shortjaw cisco (Coregonus zenithicus)	Great Lakes	Unknown	Unknown
Silver chub (Macrhybopsis storeriana)	Great Lakes	Unknown	Unknown
Lake chubsucker (Erimyzon sucetta)	Great Lakes	Unknown	Unknown
Mud sunfish (Acantharchus pomotis)	Lower New England Piedmont	Unknown	Unknown
Gilt darter (Percina evides)	Western Allegheny Plateau High Allegheny Plateau	Unknown	Unknown
Spoonhead sculpin (Cottus ricei)	Great Lakes	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Atlantic salmon (Salmo salar)				
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Nursery/Juvenile	Riverine	coldwater stream	sand/gravel bottom
Bloater (Coregonus hoyi)				
	all	Lacustrine	cold water deep	mud bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bloater (Coregonus hoyi)				
	all	Lacustrine	cold water deep	sand/gravel bottom
Paddlefish (Polyodon spathula)				
	all	Lacustrine	unknown	unknown
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Feeding	Riverine	deepwater river	structure
Kiyi (Coregonus kiyi)				
	all	Lacustrine	cold water deep	mud bottom
	all	Lacustrine	cold water deep	sand/gravel bottom
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	intertidal	sand/gravel
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel
Shortnose cisco (Coregonus reighardi)				
	all	Lacustrine	cold water deep	mud bottom
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
Shortjaw cisco (Coregonus zenithicus)				
	all	Lacustrine	cold water deep	mud bottom
	all	Lacustrine	cold water deep	sand/gravel bottom
Silver chub (Macrhybopsis storeriana)				
	Breeding	Lacustrine	unknown	unknown
	Breeding	Riverine	coldwater stream	mud bottom
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Feeding	Riverine	coldwater stream	mud bottom
	Feeding	Riverine	coldwater stream	sand/gravel bottom
Lake chubsucker (Erimyzon sucetta)				
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Feeding	Lacustrine	unknown	unknown
	Feeding	Riverine	coldwater stream	sand/gravel bottom
	Feeding	Riverine	coldwater stream	SAV
	Nursery/Juvenile	Riverine	coldwater stream	marsh
Mud sunfish (Acantharchus pomotis)				
	all	Palustrine	peatlands	bog/fen
	all	Riverine	coldwater stream	marsh

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Mud sunfish (Acantharchus pomotis)	all	Riverine	coldwater stream	mud bottom
Gilt darter (Percina evides)	all	Riverine	coldwater stream	sand/gravel bottom
Spoonhead sculpin (Cottus ricei)	all	Lacustrine	cold water deep	sand/gravel bottom

Goal and Objectives for Extirpated Fishes

Goal: The existence of rare fish species (now extirpated) in their native habitats, where present day conditions allow for their restoration.

Objective 1 : Complete an inventory of New York State waters that are recognized as the historic range for extirpated fish species.

Measure: *Completed inventory.*

Objective 2 : Re-establish, if feasible, populations of those endangered fish species now believed to be extirpated from New York.

Measure: *Number of lakes or rivers stocked.*

Recommended Actions

Habitat monitoring:

* Inventories will be completed in all areas where restoration might be practical.

Relocation/reintroduction:

* Paddlefish and Atlantic salmon populations will continue to be restored with hatchery stocking as described in management plans.

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Taxa Group: Freshwater fish

Species Group: Gravel chub

Threats:

The increase in siltation is the reason for the extensive decimation of this species in Illinois (Smith 1979).

Trends:

Historically found in 2 waters and their range appears to be declining (or gone or dangerously sparse) in the 1 watershed. There appears to be a decline in abundance in the last 30 years and habitat is largely unknown. This trend causes imminent concern.

SEQR - No Action Alternative:

Because the Gravel chub's range appears to be declining and with its abundance appearing to be declining over the last 30 years, lack of management actions including population monitoring could put existing New York populations at risk.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Gravel chub (Erimystax x-punctatus)		X	S1	G4	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Gravel chub (Erimystax x-punctatus)	Allegheny	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Gravel chub (Erimystax x-punctatus)	High Allegheny Plateau	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Gravel chub (Erimystax x-punctatus)	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Gravel chub

Goal: The existence of the gravel chub in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny watershed.

Objective 1 : Perpetuation of self sustaining populations in other waters in the Allegheny watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in the Allegheny River.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirements of this species and its coinhabitants in the Allegheny and outside New York State, part of the same State Wildlife Grants project.

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 that are directed at the Allegheny watershed.

Population monitoring:

* Additional survey in the Allegheny River and Tunungwant Creek is warranted as part of a State Wildlife Grants project in 2004.

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Taxa Group: Freshwater fish
Species Group: Iowa darter

Threats:
Little is known; including the ecological requirements of this species.

Trends:
Unknown because thorough lake sampling has rarely been completed. This species has apparently declined in watersheds where extirpated, but thorough sampling has is not available from these few lakes. Historically found in over 36 waters (now in 15) and declining (or gone dangerously sparse) in 2 of the 10 watersheds. Little is also known about their status in tributaries of western Lake Ontario There were about 100 different site records from all sources examined, and only 13 of these records are since 1975. Most recent and historic records were from the Ontario, Oswego and Niagara watersheds. Species has been extirpated from Champlain and Allegheny watersheds.

SEQR - No Action Alternative:
Because little is known about the ecological requirements of this species and thorough lake sampling for the Iowa darter has rarely been completed, lack of management actions including surveying and sampling could put existing populations at risk.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Iowa darter (Etheostoma exile)		X	S2	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Iowa darter (Etheostoma exile)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	Allegheny	Lake Erie	Unknown
	SW Lake Ontario	SE Lake Ontario	Unknown
	SE Lake Ontario	SW Lake Ontario	Unknown
	Lake Champlain		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Iowa darter (Etheostoma exile)	Great Lakes	Great Lakes	Unknown
	Western Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Unknown
	St. Lawrence-Lake Champlain Valley		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Iowa darter (Etheostoma exile)				
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Lacustrine	warm water shallow	SAV

Goal and Objectives for Iowa darter

Goal: The existence of the Iowa darter in NY, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Allegheny, SW L. Ontario, SE L. Ontario, L. Champlain & NE L Ontario- St. Lawrence watersheds.

Objective 1 : Establish an inventory of waters within the Allegheny Watershed, that are recognized as the current and historic range for the Iowa darter.

Measure: *Number of waters inventoried.*

Objective 2 : Establish an inventory of waters within the Lake Champlain Watershed, that are recognized as the current and historic range for the Iowa darter.

Measure: *Number of waters inventoried.*

Objective 3 : Establish an inventory of waters within the Northeastern Lake Ontario -St. Lawrence Watershed, that are recognized as the current and historic range for the Iowa darter.

Measure: *Number of waters inventoried.*

Objective 4 : Establish an inventory of waters within the Southeastern Lake Ontario Watershed, that are recognized as the current and historic range for the Iowa darter.

Measure: *Number of waters inventoried.*

Objective 5 : Establish an inventory of waters within the Southwestern Lake Ontario Watershed, that are recognized as the current and historic range for the Iowa darter.

Measure: *Number of waters inventoried.*

Objective 6 : Perpetuation of self sustaining populations in other waters in the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in other waters in the Lake Champlain Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 8 : Perpetuation of self sustaining populations in other waters in the Northeastern Lake Ontario-St. Lawrence Watershed where surveys show adequate population numbers

Measure: *Number of populations maintained.*

Objective 9 : Perpetuation of self sustaining populations in other waters in the Southeastern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 10 : Perpetuation of self sustaining populations in other waters in the Southwestern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 11 : Perpetuation of self sustaining populations in water bodies in the Allegheny Watershed.

Measure: *Number of populations maintained.*

Objective 12 : Perpetuation of self sustaining populations in water bodies in the Lake Champlain Watershed.

Measure: *Number of populations maintained.*

Objective 13 : Perpetuation of self sustaining populations in water bodies in the Northeastern Lake Ontario- St. Lawrence Watershed.

Measure: *Number of populations maintained.*

Objective 14 : Perpetuation of self sustaining populations in water bodies in the Southeastern Lake Ontario watershed.

Measure: *Number of populations maintained.*

Objective 15 : Perpetuation of self sustaining populations in water bodies in the Southwestern Lake Ontario watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Fact sheet:

* Develop fact sheet for DEC website

Habitat research:

* Determine ecological requirements of this species

Population monitoring:

* Monitor for presence and ecological requirements of this species

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Taxa Group: Freshwater fish
Species Group: Ironcolor shiner

Threats:
Only a single population of ironcolor shiner is found in New York (the Basher Kill Wetlands). Hence it is vulnerable to extirpation in this State, should a catastrophic event occur. Fish kills have occurred in midwinter and late summer from oxygen depletion, as early as 1961 (Hermes, undated).

The large marsh complex, is owned and managed by NYSDEC as a wildlife management area (Hermes undated). Water levels in the marsh are controlled by a large sand/gravel accumulation (and to a lesser degree a short concrete structure) at the lower end of the wetland, and major changes in this could be detrimental to the ironcolor shiner. The management plan recognizes this threat to the entire wetland system and discusses preventive measures.

Trends:
Historically found in 2 waters and their range is declining (or gone or dangerously sparse) in 1of 2 watersheds. Abundance appears to be stable, but the critical parts of its habitat and its trend over time in the Basher Kill has never been studied.

SEQR - No Action Alternative:
With only a single population of the Ironcolor shiner in New York and a vulnerability to extirpation, lack of management action (surveying and monitoring) could jeopardize the existing Ironcolor shiner population in New York State.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ironcolor shiner (Notropis chalybaeus)			S1	G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Ironcolor shiner (Notropis chalybaeus)	Lower Hudson - Long Island Bays Delaware	Delaware	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Ironcolor shiner (Notropis chalybaeus)	North Atlantic Coast High Allegheny Plateau	High Allegheny Plateau	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ironcolor shiner (Notropis chalybaeus)	all	Riverine	deepwater river	sand/gravel

Goal and Objectives for Ironcolor shiner

Goal: The existence of the ironcolor shiner in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Lower Hudson-Long Island watersheds.

Objective 1 : Perpetuation of self sustaining populations in other waters in the Lower Hudson- Long Island watershed where surveys show adequate population numbers (e.g.. Delaware River).

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in the Basher Kill.

Measure: *Number of populations maintained.*

Recommended Actions

Population monitoring:

* Surveys of the Delaware River and lower section of the Basher Kill should be completed.

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Taxa Group: Freshwater fish

Species Group: Lake Sturgeon

Threats:

Although it is difficult to determine the specific causes of lake sturgeon population declines, several factors have been blamed including over-exploitation of stocks due to high demand for their eggs (caviar) and smoked fish; construction of dams that cut off spawning and nursery areas; and possibly by-products of urban and rural development such as pollution and channelization that caused degradation of habitat. Recent die-offs in Lakes Erie and Ontario are due to Botulism from eating gobies and zebra mussels.

Trends:

Historically found in 8 waters and its range is declining (or gone or dangerously sparse) in 6 of the 9 watersheds. Abundance is low but perhaps stable in the St. Lawrence and Grasse rivers. There may be increases in abundance in the lower Niagara but they are still low. Recovery appears to be underway in these stocked waters although it is not known if stocked fish will successfully reproduce and re-establish robust populations. Habitat appears to be stable.

SEQR - No Action Alternative:

Because the range of the Lake sturgeon is declining, believed to be the result of several factors, lack of active management would jeopardize current populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Lake sturgeon (Acipenser fulvescens)		X	S1S2	G3G4	T	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Lake sturgeon (Acipenser fulvescens)	Lake Erie	Lake Erie	Unknown
	SE Lake Ontario	SE Lake Ontario	Increasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Increasing
	Lake Champlain	Lake Champlain	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Lake sturgeon (Acipenser fulvescens)	Great Lakes	Great Lakes	Increasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Lake sturgeon (Acipenser fulvescens)				
	all	Lacustrine	warm water deep	sand/gravel
	all	Riverine	warm water deep	sand/gravel
	Breeding	Riverine	warmwater stream	rocky bottom

Goal and Objectives for Lake Sturgeon

Goal: The existence of the lake sturgeon in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Lake Erie, SE Lake Ontario, NE Lake Ontario-St. Lawrence and Lake Champlain watersheds.

Objective 1 : Perpetuation of self-sustaining populations in a select group of waters in the Lake Champlain Watershed.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self-sustaining populations in a select group of waters in the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self-sustaining populations in a select group of waters in the Northeastern Lake Ontario - St. Lawrence Watershed.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self-sustaining populations in a select group of waters in the Southeastern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Objective 5 : Re-establish self-sustaining populations in Black Lake, Oswegatchie and St. Regis Rivers & other waters in the NE L. Ont./ St. Law. Watershed where surveys determine the species to be absent, or of sufficient abundance, & where restoration is feasible.

Measure: *Number of populations maintained.*

Objective 6 : Re-establish self-sustaining populations in Cayuga and Oneida Lakes, Genesee River and in other waters in the SE Lake Ontario Watershed where surveys determine the species to be absent, or of sufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Objective 7 : Re-establish self-sustaining populations in the Lake Champlain Watershed where surveys determine the species to be absent, or of sufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Objective 8 : Re-establish self-sustaining populations in the Lake Erie Watershed where surveys determine the species to be absent, or of sufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Recommended Actions

Captive breeding:

* Pyatskowit (1998) recommended that restoration programs with hatchery stocking include a genetic evaluation. Some preliminary comparisons of lake sturgeon genetics in the St. Lawrence R. are reported by McQuown et al.(1999 oral). Additional studies are needed to determine if there are differences between these and stocks in Lakes Erie and Champlain.

Habitat restoration:

* The relicensing of the Niagara Mohawk project at Niagara Falls provides an opportunity to improve the habitats and flow conditions for sturgeon that have been impaired in this area, so habitat should be restored.
* Stocking: evaluations of hatchery rearing and experimental plantings should be conducted in the Oswegatchie, St. Regis and Genesee Rivers and Black, Oneida and Cayuga Lakes.
* Spawning habitat should be restored in the St. Lawrence River.

Statewide management plan:

* Develop and implement a plan that continues efforts to return this species back to its full range and abundance. Target waters would be tributary bays of Lake Champlain, and tributaries of Lakes Ontario and Erie and the St. Lawrence River.

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Taxa Group: Freshwater fish
Species Group: Longear sunfish

Threats:
In New York, several populations appear to have disappeared. Biologists attribute the decline in this sunfish's numbers to several causes including: siltation, water quality deterioration and hybridization with the pumpkinseed. This opinion on hybridization is based on Smith (1985) and on 1988 sampling of Bouton. However, hybridization is not commonly reported elsewhere in the species range, with a exceptions described in northern Wisc. by Ehlinger (see Lyons et al. 2000) and in Oklahoma with green sunfish and bluegill and in Great Lakes drainage with pumpkinseed (Childers 1967). Perhaps an introduced or spreading species, the green sunfish, is responsible, as they were not caught here in 1975 but were abundant in 1998 collections. Hybrids have been caught recently in one of the remaining two areas for longear sunfish in NYS, at a catch frequency almost as high as the frequency of longear sunfish (that are not hybrids). Several specimens from other parts of the state were re-examined by Smith and were misidentified.

Trends:
Historically found in 6 waters (still in 2) and their range is declining (or gone or dangerously sparse) in 2 of the 3 watersheds. Population levels are largely unknown in two very small sections of two streams, and habitat trends are unknown. There are a total of 13 authenticated catches since 1974, with 12 in Tonawanda Creek, and one in Johnson Creek (since 2003). This trend causes imminent concern.

SEQR - No Action Alternative:
Because several of their populations appear to have disappeared and with concerns over their vulnerability to water quality deterioration and hybridization with other sunfish, a lack of management action especially surveying and monitoring, could endanger existing populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Longear sunfish (Lepomis megalotis)			S1	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Longear sunfish (Lepomis megalotis)	Lake Erie	Lake Erie	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	SE Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Longear sunfish (Lepomis megalotis)	Great Lakes	Great Lakes	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Longear sunfish (Lepomis megalotis)	all	Riverine	warmwater stream	sand/gravel bottom

Goal and Objectives for Longear sunfish

Goal: The existence of the longear sunfish in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Southeastern Lake Ontario, Southwestern Lake Ontario and Lake Erie watersheds.

Objective 1 : Establish an inventory of waters within the Lake Erie Watershed, that are recognized as the current and historic range for the longear sunfish.

Measure: *Number of waters inventoried.*

Objective 2 : Establish an inventory of waters within the Southeastern Lake Ontario Watershed, that are recognized as the historic range for the longear sunfish.

Measure: *Number of waters inventoried.*

Objective 3 : Establish an inventory of waters within the Southwestern Lake Ontario Watershed, that are recognized as the historic range for the longear sunfish.

Measure: *Number of waters inventoried.*

Objective 4 : Perpetuation of self sustaining populations in the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in the waters in the Southeastern Lake Ontario watershed.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in Tonawanda Creek and at least one tributary of Southwestern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Population monitoring:

* Continue surveys to understand its current distribution of the species.

Statewide management plan:

* A State Wildlife Grants funded project from 2004, by SUNY Brockport is designed to provide habitat and population assessment as well as to develop a recovery plan.

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Taxa Group: Freshwater fish
Species Group: Longhead darter

Threats:
Declines in the populations in other areas have been caused by pollution, siltation and collection by hobbyists (Jenkins and Burkhead 1994).

Trends:
Historically found in 5 waters and their range is not declining (or gone or dangerously sparse) in the 1 watershed. The population appears to be stable in the eastern subbasin of the Allegheny but unknown in French Creek. In New York it has been in 10 collections before 1940, in 13 collections between 1972 and 1992, and in 20 samples from 1998-2000. This can not be characterized as a decrease even though the French Creek population is uncertain.

SEQR - No Action Alternative:
With uncertainty of the status of the French Creek population and due to its potential vulnerability (declines in other areas have been documented) lack of management actions including population monitoring could put existing New York state populations at risk.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Longhead darter (Percina macrocephala)		X	S1	G3	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Longhead darter (Percina macrocephala)	Allegheny	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Longhead darter (Percina macrocephala)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Longhead darter (Percina macrocephala)				
	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Longhead darter

Goal: The existence of the longhead darter in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny Watershed.

Objective 1 : Establish an inventory of waters within the Allegheny Watershed, that are recognized as the current and historic range for the longhead darter.

Measure: *Number of waters inventoried.*

Objective 2 : Perpetuation of self sustaining populations in other waters in the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in water bodies in the Allegheny Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Population monitoring:

* This species has not been caught in recent years in French Creek, and occasional sampling should continue for updating records in both this and the central part of the Allegheny basin.

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Taxa Group: Freshwater fish
Species Group: Mooneye

Threats:
While the exact causes of population declines are not known, it is due in part to increased siltation occurring in clear water areas where mooneye normally occur.

Trends:
Historically found in 8 waters and their range is not declining (or gone dangerously sparse) in 3 of the 6 watersheds. Abundance seems to be increasing in Black Lake, the section of the Oswegatchie River near Heuvelton and eastern Lake Erie; abundance may be stable in Lake Champlain; and there will be no recovery in the Allegheny River without reintroduction from a distant source. Habitat in the smaller historic waters is probably still suitable.

SEQR - No Action Alternative:
With populations showing declines, due in part to increased siltation, lack of active management such as population monitoring and habitat restoration would negatively impact maintaining self-sustaining populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Mooneye (Hiodon tergisus)		X	S1	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Mooneye (Hiodon tergisus)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	Allegheny	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lake Champlain		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Mooneye (Hiodon tergisus)	High Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Unknown
	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
	Northern Appalachian/Boreal Forest		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Mooneye (Hiodon tergisus)				
	all	Lacustrine	warm water shallow	sand/gravel
	all	Palustrine	warmwater stream	sand/gravel

Goal and Objectives for Mooneye

Goal: The existence of the mooneye, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Northeastern Lake Ontario-St. Lawrence, Lake Erie, Allegheny and Lake Champlain.

Objective 1 : Perpetuation of self sustaining populations in a select group of waters in the Lake Champlain Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in a select group of waters in the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in a select group of waters in the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in a select group of waters in the Northeastern Lake Ontario-St. Lawrence Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 5 : Re-establish self sustaining populations in other waters where surveys determine the species to be absent, or of insufficient abundance, and where restoration is feasible (possible candidate being the mouth of the Oswegatchie River).

Measure: *Number of populations maintained.*

Objective 6 : Re-establish self sustaining populations in other waters where surveys determine the species to be absent, or of insufficient abundance, and where restoration is feasible (possible candidate being Tonawanda Creek).

Measure: *Number of populations maintained.*

Objective 7 : Re-establish self sustaining populations in the Allegheny River.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat restoration:

* Restoration of spawning areas may be accomplished with cobble and rubble placed in streams like that done for walleye spawning. Examples near Black Lake include the Oswegatchie River at Ogdensburg and Fish Creek at Pope Mills.

Population monitoring:

* The status of the Black Lake and the Lake Erie populations need to be evaluated, and critical habitats need to be identified.

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Taxa Group: Freshwater fish
Species Group: Mountain brook lamprey

Threats:
According to The Nature Conservancy (1994), a number of potential threats to French Creek's water quality and aquatic fauna have been identified:

Siltation from: overgrazing, row cropping, road construction, and land clearing.
Elevated nutrients from: dairy animals wastes, sewage plant failure and fertilizer spills.
Pesticide threats from: catastrophic events and agricultural applications.

Mountain brook lamprey has a general history of depletion, localization and extirpation in other areas (Trautman 1981). Vladykov (1973) summarized reasons for protecting non-parasitic lampreys.

Trends:
Historically found in 2 (or possibly 5) waters and their range is not declining in the one watershed. Little is known about abundance in New York and there is no knowledge of decline.

SEQR - No Action Alternative:
With New York populations being limited to just a few waters and because the Mountain brook lamprey is very sensitive to pollution threats and its present population levels are unknown, lack of management action (sampling, monitoring and evaluation) could jeopardize existing populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Mountain brook lamprey (Ichthyomyzon greeleyi)		X	S1	G3G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Mountain brook lamprey (Ichthyomyzon greeleyi)	Allegheny	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Mountain brook lamprey (Ichthyomyzon greeleyi)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Mountain brook lamprey (Ichthyomyzon greeleyi)				
	all	Riverine	coldwater stream	sand/gravel

Goal and Objectives for Mountain brook lamprey

Goal: The existence of the Mountain brook lamprey in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny Watershed.

Objective 1 : Establish an inventory of waters within the Allegheny Watershed, that are recognized as the historic range for the Mountain Brook Lamprey.

Measure: *Number of waters inventoried.*

Objective 2 : Perpetuation of self sustaining populations in French Creek and in other waters of the Allegheny watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirements of this species and protect critical areas, as is part of the State Wildlife Grants project in 2003 focusing on the Allegheny watershed. These efforts will be coordinated with similar programs in place by The Nature Conservancy.

Life history research:

* Also specific information of its life history in the French and Olean Creek systems is needed. Studies in Pennsylvania on the native lamprey species (J. Stauffer, Penn. State Univ.) were to be completed in 1998, and this will provide valuable insight. Sampling in the Allegheny tributaries in 2000 by the author has extended the known range of the genus Ichthyomyzon, but there is yet a limited basis to confirm which species (I. greeleyi or I. bdellium). More sampling is needed to obtain adults which can be identified to species.

Population monitoring:

* More information is needed for this lamprey regarding the significance of its occurrence in French Creek.

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Taxa Group: Freshwater fish
Species Group: Ninespine stickleback - inland

Threats:
Unknown

Trends:
Historically found in two of the Finger Lakes plus Lake Ontario. It is uncertain whether its range is declining or extirpated. There are two other dubious reports of occurrence in streams. There have been no inland collections of ninespine stickleback since 1975. All recent collections have been in the Marine District.

SEQR - No Action Alternative:

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
N. American ninespine stickleback (Pungitius pungi					U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
N. American ninespine stickleback (Pungitius pungitius	SW Lake Ontario	SW Lake Ontario	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
N. American ninespine stickleback (Pungitius pungitius o	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

N. American ninespine stickleback (Pungitius pungitius occidentalis)

all	Lacustrine	warm water deep	pelagic

Goal and Objectives for Ninespine stickleback - inland

Goal: Maintain the existence of ninespine stickleback in New York at self-sustaining population levels throughout its historic range in SW L. Ontario, SE L. Ontario, and NE L. Ontario-St. Lawrence watersheds.

Objective 1 : Establish an inventory of ninespine stickleback in the inland waters of New York.

Measure: *Creation of inventory*

Objective 2 : Maintain self-sustaining population of ninespine stickleback in at least one historic inland water.

Measure: *Number of self-sustaining populations*

Recommended Actions

Population monitoring:

* Sampling in the two lakes where ninespine stickleback has been reported and in Lake Ontario.

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Taxa Group: Freshwater fish
Species Group: Ohio lamprey

Threats:
Populations of Ohio lamprey in New York are confirmed known only in French, Conewango, Olean and Oswayo Creeks and the Allegheny River. The Kinzua Dam in Pennsylvania impounds the Allegheny River into New York, and it likely prohibits effective interaction between the isolated New York (and downstream in Pennsylvania) groups of the Ohio lamprey from its larger below-dam core population. This could limit the potential genetic diversity in the future.

An additional threat to both lamprey populations and to their essential habitat is pollution, primarily agricultural in French Creek and industrial and domestic in the Allegheny River.

Trends:
Historically found in 5 waters and its range is not declining (or gone or dangerously sparse) in the one watershed. Abundance trends are unknown except there is no knowledge of decline, and habitat trends are unknown.

SEQR - No Action Alternative:
With abundance trends largely unknown and the number of identified populations limited to a few waters, lack of management actions (sampling, monitoring and protection) could endanger the perpetuation of the Ohio lamprey in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ohio lamprey (Ichthyomyzon bdellium)		X	S1	G3G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Ohio lamprey (Ichthyomyzon bdellium)	Allegheny	Allegheny	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Ohio lamprey (Ichthyomyzon bdellium)	Western Allegheny Plateau	Western Allegheny Plateau	Stable
	High Allegheny Plateau	High Allegheny Plateau	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ohio lamprey (Ichthyomyzon bdellium)				
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Feeding	Riverine	coldwater stream	sand/gravel bottom
	Nursery/Juvenile	Riverine	coldwater stream	other

Goal and Objectives for Ohio lamprey

Goal: The existence of the Ohio lamprey in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny Watershed.

Objective 1 : Perpetuation of self sustaining populations in Allegheny River, Olean Creek, Oswayo Creek, Conewango Creek and French Creek, and in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained over 10 years.*

Recommended Actions

Life history research:

* Also specific information of its life history in the French Creek system is needed. Studies in Pennsylvania on the native lamprey species (J. Stauffer, Penn State University) were to be completed in 1998, and this will provide valuable insight. Sampling in the Allegheny tributaries in 2000 by the author has extended the known range of the genus Ichthyomyzon, but there is yet no basis to confirm which species (I. greeleyi or I. Bdellium).

Population monitoring:

* More sampling in other tributaries of the Allegheny system (with lamprey sampling gear) may show them more widely distributed than presently thought.

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Taxa Group: Freshwater fish
Species Group: Pugnose shiner

Threats:
This species is extremely sensitive to turbidity, and this explains why its range has been reduced. In one Wisconsin lake, it disappeared after eutrophication and invasion of Eurasian milfoil (Lyons 1989).

Trends:
Historically found in 6 waters (still in 4) and otherwise their range is not declining (or gone or dangerously sparse) in the 2 watersheds. Their abundance appears to be stable in the St. Lawrence, but the species is apparently gone from the areas near Cayuga Lake and Irondequoit Bay. IN Sodus Bay, both the habitat and population are vulnerable to change and are poorly understood. Sampling in the 1990s documented pugnose shiner in a 20 mile reach of the Thousand Islands area (Picton Island, Deer Island and Oak Island). It was also caught in the nearby Eel Bay of Wellesley Island in 1976. Bays along the south and east shores of Lake Ontario may also contain them, but sampling directed at this species in 25 bays in 1996-97 caught them only in Sodus Bay. Similar efforts to catch them in Cayuga Lake (mouth of Fall Creek) were unsuccessful in 1997, and current habitat conditions do not look favorable there or in Montezuma Marsh.

SEQR - No Action Alternative:
Because of the Pugnose shiner's sensitivity to habitat impairment and with very little known about where they live, lack of management action, notably conducting life history studies and improving sampling techniques could put existing populations in jeopardy.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Pugnose shiner (Notropis anogenus)			S1	G3	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Pugnose shiner (Notropis anogenus)	SE Lake Ontario	SE Lake Ontario	Stable
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Pugnose shiner (Notropis anogenus)	Great Lakes	Great Lakes	Stable
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Pugnose shiner (Notropis anogenus)				
	all	Lacustrine	warm water shallow	sand/gravel
	all	Riverine	warm water shallow	sand/gravel

Goal and Objectives for Pugnose shiner

Goal: The existence of the pugnose shiner in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Southeastern Lake Ontario and Northeastern Lake Ontario-St. Lawrence watersheds.

Objective 1 : Perpetuation of self sustaining populations in bay (s) in Lake Ontario.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in other waters in the Northeastern Lake Ontario-St. Lawrence watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in other waters in the Southeastern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in the St. Lawrence River.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirement requirements of this species and note the influence of the invasive milfoil.

Life history research:

* Life history studies need to be done, and sampling techniques must be improved in order to carry out surveys. We know very little about where they live in large water bodies.

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Taxa Group: Freshwater fish
Species Group: Redfin shiner

Threats:
The species is not highly sensitive to environmental change in other parts of its range, but it is included on the “watch list” in Wisconsin (Becker 1983). In Iowa it has been used as a bait minnow (Scott and Crossman 1973), and in central Missouri, it is the most common minnow (Pflieger 1997).

Trends:
Historically found in 11 waters (now in 3) and declining (or gone or dangerously sparse) in all 3 of the watersheds. The population appears stable in very small areas of three streams, and the status in other areas like the Niagara River and Twelvemile Creek is unknown. Smith says it is locally common at only a few sites. This trend causes imminent concern.

SEQR - No Action Alternative:
Due to a lack of knowledge of the status of the redfin shiner in New York, a lack of management, including population monitoring, could jeopardize the future of self-sustaining populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Redfin shiner (Lythrurus umbratilis)			S2	G5	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Redfin shiner (Lythrurus umbratilis)	SW Lake Ontario	SW Lake Ontario	Decreasing
	Lake Erie	Lake Erie	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Redfin shiner (Lythrurus umbratilis)	Great Lakes	Great Lakes	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Redfin shiner (Lythrurus umbratilis)	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Redfin shiner

Goal: The existence of the redfin shiner in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Lake Erie and Southwestern Lake Ontario watersheds.

Objective 1 : Establish an inventory of waters within the Lake Erie watershed that are recognized as the historic range for the redfin shiner.

Measure: *Number of waters inventoried.*

Objective 2 : Perpetuation of self sustaining populations (in the Lake Erie Watershed) in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations (in the Southwestern Lake Ontario Watershed) in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in Eighteen Mile Creek .

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in Johnson Creek

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in Twelvemile creek

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in the Barge Canal near Lockport.

Measure: *Number of populations maintained.*

Objective 8 : Perpetuation of self sustaining populations in the Carlton Lake.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory and assess losses of habitat and of this species in tributaries of Western Lake Ontario. This would be followed by considering remediation efforts.

Population monitoring:

* Its status in New York needs to be determined. The circumstance of one of the recent records for both the redfin shiner and the longear sunfish being from the same locations, Tonawanda Creek near Millersport and Johnson Creek near Kuckville, deserves further study. Sampling at several sites in Tonawanda Creek and the Niagara River in 1998-2000 did not confirm of its presence there.

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Taxa Group: Freshwater fish
Species Group: River redhorse

Threats:
Jenkins and Burkhead (1994) feel this species is one of the largest and least numerous species. Also it is and trophically and behaviorally the most divergent of the redhorse species. It has fared poorly over the last 100 years, because of impoundments, siltation and pollution. Parker (1988) felt it has the most restrictive habitat requirements of the redhorse species. Identification requires very thorough examinations.

Trends:
Historically found in 4 waters and their range is not declining (or gone or dangerously sparse) in the 1 watershed. The population has been recognized here for 20 years and is poorly understood.

SEQR - No Action Alternative:
With the river redhorse's restrictive habitats and difficulty to be clearly identified lack of management actions, particularly monitoring, could jeopardize current populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
River redhorse (Moxostoma carinatum)		X	S2?	G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
River redhorse (Moxostoma carinatum)	Unknown	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
River redhorse (Moxostoma carinatum)	Unknown	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
River redhorse (Moxostoma carinatum)	all	Riverine	warmwater stream	sand/gravel

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
River redhorse (Moxostoma carinatum)				

Goal and Objectives for River redhorse

Goal: The existence of the river redhorse in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny Watershed.

Objective 1 : Establish an inventory of waters within the Allegheny watershed that are recognized as the historic range for the river redhorse.

Measure: *Number of waters inventoried.*

Objective 2 : Perpetuation of self sustaining populations in the Allegheny Watershed where surveys show adequate population numbers

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirements of this species and compare it to what's available in the literature, as part of the State Wildlife Grants project of 2004.

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 that are directed at the Allegheny watershed.

Population monitoring:

* Surveys of the Allegheny River and Allegheny Reservoir during the time of spawning should be completed, and representative samples of all redhorse should be closely examined or preserved.

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Taxa Group: Freshwater fish
Species Group: Round whitefish

Threats:
This species has diminished from, and may be vulnerable to several factors including, competition and predation from introduced fish species (yellow perch, smallmouth bass and lake whitefish). An additional factor could be acid rain. Intensive netting has collapsed and eliminated round whitefish from some lakes (D. Josephson, Cornell Univ. Ithaca). Angler catches are probably not a threat to their survival, even though some angling was reported by (Pfeiffer 1979).

Trends:
Historically found in 68 waters (now in 8) and their range has declined (or gone or dangerously sparse) in one (St. Lawrence) of the 9 watersheds. There appears to be no continuing loss of waters they inhabit in the last 20 years, and hatchery efforts have added waters where reproduction may occur. Because the habitat trends are unknown, concern remains to be high. This trend causes imminent concern.

SEQR - No Action Alternative:
Due to the Round whitefish's vulnerability to other introduced fish species, and perhaps acid rain, lack of active management will likely prevent the establishment of self-sustaining populations in historic waters.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Round whitefish (Prosopium cylindraceum)		X	S1S2	G5	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Round whitefish (Prosopium cylindraceum)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Round whitefish (Prosopium cylindraceum)			
	Great Lakes	Great Lakes	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Round whitefish (Prosopium cylindraceum)				
	all	Lacustrine	cold water deep	sand/gravel bottom

Goal and Objectives for Round whitefish

Goal: Maintain the existence of the round whitefish in New York at levels that enable self sustaining populations throughout it's historic range in the NE Lake Ontario -St. Lawrence, Lake Champlain and Upper Hudson watersheds.

Objective 1 : Perpetuation of self sustaining populations in targeted waters in the Lake Champlain Watershed.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in targeted waters in the NE Lake Ontario - St. Lawrence Watershed.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in targeted waters in the Upper Hudson Watershed.

Measure: *Number of populations maintained.*

Objective 4 : Restore self sustaining populations in the Lake Champlain Watershed, in waters where surveys determine the species to be absent, or of insufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Objective 5 : Restore self sustaining populations in the NE Lake Ontario - St. Lawrence Watershed, in waters where surveys determine the species to be absent, or of insufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Objective 6 : Restore self sustaining populations in the Upper Hudson Watershed, in waters where surveys determine the species to be absent, or of insufficient abundance, and where restoration is feasible.

Measure: *Number of populations maintained.*

Recommended Actions

Population monitoring:

* Studies are being conducted to determine the causes of population declines and losses within the Adirondack region, especially the impact of acid rain and invasive species.

Relocation/reintroduction:

* Establish populations.

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Taxa Group: Freshwater fish
Species Group: Sauger

Threats:
Decrease in lake turbidity, hybridization with walleye. Also the development of a salmonid fishery may have increased the predator abundance sufficient to reduce walleye, sauger and smelt.

Trends:
This species has declined in the Lake Erie, SE Lake Ontario, SW Lake Ontario and NE Lake Ontario-St. Lawrence drainage basins. This species has apparently declined in watersheds where extirpated (Erie, Ontario, Oswego and St. Lawrence watersheds), and there was a surprising catch of one by an angler in the lower Niagara River in 1990. The population in South Bay of Lake Champlain was studied in 1984, 1983 and in the 1960s. There is suspicion of declines in Lake Champlain, based on generalized fish monitoring by Vermont and New York in the last 10 years. This state-wide trend causes imminent concern.

SEQR - No Action Alternative:
Sauger will likely remain extirpated in Lake Erie and NE Lake Ontario-St. Lawrence drainage basins.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Sauger (Stizostedion canadense)			S1	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sauger (Stizostedion canadense)	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	SW Lake Ontario	Decreasing
	NE Lake Ontario - St. Lawrence		
	SW Lake Ontario		
	SE Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sauger (Stizostedion canadense)	St. Lawrence-Lake Champlain Valley	Great Lakes	Decreasing
	Great Lakes	St. Lawrence-Lake Champlain Valley	Decreasing
	High Allegheny Plateau		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sauger (Stizostedion canadense)				
	all	Lacustrine	cold water shallow	sand/gravel bottom
	all	Lacustrine	warm water deep	sand/gravel bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	deepwater river	rocky bottom
	all	Riverine	warmwater stream	sand/gravel bottom
	Breeding	Lacustrine	warm water shallow	sand/gravel bottom
	Breeding	Riverine	coldwater stream	sand/gravel bottom

Goal and Objectives for Sauger

Goal: The existence of the sauger, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Northeastern Lake Ontario-St. Lawrence, Lake Champlain, Lake Erie and Southeastern Lake Ontario watersheds.

Objective 1 : Determine status of species in Lake Champlain watershed.

Measure: *Presence/absence of sauger populations in Lake Champlain watershed.*

Objective 2 : Perpetuation of self sustaining populations in other waters in the Lake Champlain Watershed where surveys show adequate population numbers

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in other waters in the Lake Erie Watershed where surveys show adequate population numbers

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in other waters in the Northeastern Lake Ontario - St. Lawrence Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 5 : Perpetuation of self sustaining populations in other waters in the Southeastern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 6 : Perpetuation of self sustaining populations in other waters in the Southwestern Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 7 : Perpetuation of self sustaining populations in waters in the Lake Erie Watershed.

Measure: *Number of populations maintained.*

Objective 8 : Perpetuation of self sustaining populations in waters in the Northeastern Lake Ontario-St. Lawrence Watershed.

Measure: *Number of populations maintained.*

Objective 9 : Perpetuation of self sustaining populations in waters in the SE Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Objective 10 : Perpetuation of self sustaining populations in waters in the Southwestern Lake Ontario Watershed.

Measure: *Number of populations maintained.*

Recommended Actions

Fact sheet:

* Develop fact sheet on Sauger

Habitat monitoring:

* Monitor habitat for changes in turbidity

Recommended Actions

Habitat research:

* Research habitat requirements for sauger in New York.

Life history research:

* Research biology of sauger as it relates to hybridization with walleye.

Population monitoring:

* Monitor for presence in Lake Champlain watershed to determine whether or not species is declining in this watershed.
* Monitor existing sauger populations in Lake Champlain and the Poultney River.

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Taxa Group: Freshwater fish
Species Group: Spotted darter

Threats:
According to The Nature Conservancy (1994), a number of potential threats to French Creek's water quality and aquatic fauna have been identified:

Siltation from: overgrazing, row cropping, road construction, and land clearing.
Elevated nutrients from: dairy animals wastes, sewage plant failure and fertilizer spills.
Pesticide threats from: catastrophic events and agricultural applications.

Trends:
Historically found in 1water and their range is not declining (or gone or dangerously sparse) in the 1 watershed. Populations are low and habitats are poorly understood. This trend causes imminent concern.

SEQR - No Action Alternative:
Because the Spotted darter’s population is low and limited to French Creek, a lack of management action, including population monitoring and life history research could jeopardize its existence in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Spotted darter (Etheostoma maculatum)		X	S1	G2	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spotted darter (Etheostoma maculatum)	Allegheny	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spotted darter (Etheostoma maculatum)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spotted darter (Etheostoma maculatum)				
	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Spotted darter

Goal: The existence of the spotted darter in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Allegheny Watershed.

Objective 1 : Perpetuation of self sustaining populations in French Creek and in other waters of the Allegheny Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Inventory the habitat requirements of this species and protect critical areas, as in part of the State Wildlife Grants project in 2003 focusing on the Allegheny watershed. These efforts will be coordinated with similar programs in place by The Nature Conservancy.

Life history research:

* Data is needed on fish species interactions. Some of these interactions are described by Hansen (1983). Initial progress toward efforts at laboratory rearing was reported by Stauffer (1995).

Population monitoring:

* Data are needed on long term population trends.

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Taxa Group: Freshwater fish
Species Group: Streamline chub

Threats:
The Allegheny River has been impounded by the Kinzua Dam (which was completed in 1967, upstream of Warren, Pennsylvania), and the dam eliminated habitat and effectively isolated the population of the streamline chub in New York. This could have a negative affect on the population since immigration of specimens from farther downstream is prevented.

Water quality in the New York section of the upper Allegheny is degraded because of industrial and domestic pollution and agricultural runoff.

Trends:
Historically found in 5 waters and their range is not declining (or gone or dangerously sparse) in the 1 watershed. They were abundant in the central sub-basin of the Allegheny Watershed in 1998-99, and there were no apparent declines. The habitats seem secure, but are poorly understood.

SEQR - No Action Alternative:
With past impoundments of the Allegheny River potentially having a negative effect on the River's population and with concerns over water quality in waters currently inhabited by streamline chub, lack of management action especially monitoring and surveying, could jeopardize current populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Streamline chub (Erimystax dissimilis)			S1	G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Streamline chub (Erimystax dissimilis)	Allegheny	Allegheny	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Streamline chub (Erimystax dissimilis)	High Allegheny Plateau	High Allegheny Plateau	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Streamline chub (Erimystax dissimilis)	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Streamline chub

Goal: Continue the existence of the streamline chub in New York, at levels that enable the species to maintain self sustaining populations throughout its historic range in the Allegheny watershed.

Objective 1 : Perpetuation of self sustaining populations in the Allegheny River and [insert names of the tributaries that apply] and in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 that is directed at the Allegheny watershed.

Population monitoring:

* Surveys of the Allegheny River and tributaries should occur at 10-20 year intervals to evaluate species trends.

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Taxa Group: Freshwater fish
Species Group: Swallowtail shiner

Threats:
Argent et al. 1998 felt that it was among the PA species with most reduced distribution. Its ability to withstand turbidity make it seem more tolerant than some minnows. There have been no studies to assess its problems, threats, limiting factors or overall vulnerability.

Trends:
Historically found in over 50 (still in at least 20) waters and their range is possibly declining (or gone or dangerously sparse) in 1 of the 3 watersheds. Their abundance has declined in many streams of the Chemung watershed, their population may be stable in the Susquehanna and the trend is unknown in the Delaware. It was caught at 7% of the samples in the Susquehanna, 6% in Chemung and 1% in the Delaware in the 1935-37. The number of records statewide in the 1930's was 79, 1940-74 had 77 records and 1975-present had 21 records. The effort was not consistent between these periods and records were primarily from DEC.

Swallowtail shiner still occurs in the Delaware, Susquehanna and Chemung watersheds, but they appear to be less common in the Chemung. The most recent records in the Susquehanna/Chemung basin were the four by Smith (6% of his samples here, 1977-81), two by Cornell Univ., two stored at the NYS Muss. and eight others since 2001. The records since 2001include Mud Creek of Canisteo R., Chemung River, Susquehanna R. (3 sites), Geneganslet (1), Cheningo (1) and Unadilla R. (1 site by S. Coglin, ESF). The most recent record in the Delaware basin were at Fishs Eddy in E. Br. Delaware R. (by DEC in 1995, 2001 and 2003) and from a tributary of the Delaware R. (NYS Mus in 2001).

SEQR - No Action Alternative:
Due to declining occurrences in some areas and because of the need for additional information, a lack of management action, including population monitoring, could jeopardize the future of current self-sustaining populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Swallowtail shiner (Notropis procne)			S2	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Swallowtail shiner (Notropis procne)	Susquehanna	Susquehanna	Unknown
	Delaware	Delaware	Unknown
	SE Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Swallowtail shiner (Notropis procne)	High Allegheny Plateau Great Lakes	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Swallowtail shiner (Notropis procne)	all	Riverine	warmwater stream	sand/gravel

Goal and Objectives for Swallowtail shiner

Goal: The existence of the swallowtail shiner in New York, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Susquehanna, Delaware and Southeastern Lake Ontario watershed.

Objective 1 : Establish an inventory of waters within the Delaware Watershed that are recognized as the historic range for the swallowtail shiner.

Measure: *Number of waters inventoried.*

Objective 2 : Establish an inventory of waters within the Susquehanna Watershed that are recognized as the historic range for the swallowtail shiner.

Measure: *Number of waters inventoried.*

Objective 3 : Perpetuation of self sustaining populations in the Delaware Watershed in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 4 : Perpetuation of self sustaining populations in the Susquehanna Watershed in other waters where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat restoration:

* Habitat losses and restoration are part of a State Wildlife Grants project from 2003 that are directed at the Susquehanna watershed.

Population monitoring:

* More sampling is needed in the Susquehanna and Delaware Basins.

References

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Taxa Group: Freshwater fish

Species Group: Swamp darter

Threats:

The populations are little studied, the range is restricted to only a few ponds in the Peconic River system in New York and they may be vulnerable. They are not particularly environmentally sensitive, and their protection is mostly a function of protecting the lakes, streams and wetlands from being dewatered in eastern Long Island.

Trends:

Historically found in 16 (still in 8) waters and is not declining (or gone or dangerously sparse) in the 1watershed. The population appears to be stable.

SEQR - No Action Alternative:

With their range in New York restricted to only a few ponds and because the population are little studied, lack of management action including monitoring could jeopardize the New York population.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Swamp darter (Etheostoma fusiforme)			S1S2	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Swamp darter (Etheostoma fusiforme)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Swamp darter (Etheostoma fusiforme)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Swamp darter (Etheostoma fusiforme)				
	all	Lacustrine	cold water shallow	SAV

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Swamp darter (Etheostoma fusiforme)				
	all	Lacustrine	warm water shallow	SAV
	all	Riverine	coldwater stream	SAV
	all	Riverine	warmwater stream	SAV

Goal and Objectives for Swamp darter

Goal: Continue the existence of the swamp darter in New York at levels that enable the species to maintain self sustaining populations throughout it's historic range in the Lower Hudson- Long Island Bays Watershed.

Objective 1 : Perpetuation of self sustaining populations in the Peconic River, Lake Ronkonkoma, Little River, Merritts Pond and Lower Lake Yaphank, and in other waters of Lower Hudson-Long Island Bays Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat monitoring:

* Complete surveys on submerged aquatic vegetation and floating woody mats in areas still inhabited by this species and monitor water levels or depths on dry years.

Habitat research:

* Define preferred habitat in order to guide future restoration efforts and focus habitat protection efforts.

Population monitoring:

* Continued monitoring of the Long Island populations.

Relocation/reintroduction:

* Establish populations after dewatering of streams and lakes due to groundwater withdrawals. Zeeks Pond suffered this in 2002 and restorative measures are needed.

References

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Taxa Group: Freshwater fish
Species Group: Western pirate perch

Threats:
Concerns for this species relate only to the western form, A. sayanus gibbosus. The habitat of Buttonwood Creek is described briefly in Haynes (1987, 1994). An environmental impact statement was prepared in 1994 to assure their protection during bridge rebuilding.

Trends:
Historically found in 10 (still in 3) waters and their range is declining (or gone or dangerously sparse) in both of the 2 watersheds. Population trends show decline, but this species is stable in one tributary of Lake Ontario, infrequently collected in other tributaries and absent from tributaries of Lake Erie/Niagara. It is very difficult to assess at low abundance levels and much remains mysterious about its appearances. Habitat trends appear to be stable. This trend causes imminent concern.

SEQR - No Action Alternative:
With the range and population both in decline and with low abundance levels, a lack of management action (s) including population monitoring could jeopardize the ability to retain self-sustaining populations in the watersheds where the Western pirate perch are currently found.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Western pirate perch (Aphredoderus sayanus gibb			N/A	N/A		Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Western pirate perch (Aphredoderus sayanus gibbosus)	SE Lake Ontario	SE Lake Ontario	Decreasing
	SW Lake Ontario	SW Lake Ontario	Decreasing
	Lake Erie	NE Lake Ontario - St. Lawrence	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Western pirate perch (Aphredoderus sayanus gibbosus)	Great Lakes	Great Lakes	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Western pirate perch (Aphredoderus sayanus gibbosus)				
	all	Estuarine	shallow subtidal	SAV
	all	Lacustrine	warm water deep	SAV
	all	Lacustrine	warm water shallow	SAV
	all	Riverine	warmwater stream	SAV
	Breeding	Lacustrine	warm water shallow	SAV

Goal and Objectives for Western pirate perch

Goal: The existence of the pirate perch in NY, at levels that enable the species to maintain self sustaining populations throughout it's historic range in the L. Erie, Southeastern L. Ontario, and Southwestern Lake Ontario watersheds.

Objective 1 : Perpetuation of self sustaining populations in waters in the Lake Erie Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 2 : Perpetuation of self sustaining populations in waters in the SE Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Objective 3 : Perpetuation of self sustaining populations in waters in the SW Lake Ontario Watershed where surveys show adequate population numbers.

Measure: *Number of populations maintained.*

Recommended Actions

Habitat research:

* Research habitat requirements for this subspecies in tributaries of Lake Ontario.

Population monitoring:

* There should be more surveys on bays of Lake Ontario and the nearby streams for this species.

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Comprehensive Wildlife Conservation Strategy

Appendix A4:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Herpetofauna

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Herpetofauna
Species Group: Box Turtle

Threats:
-Habitat loss/alteration
-Habitat fragmentation
-Road mortality
-Illegal collection of specimens
-Translocation of captured specimens
-Subsidized predators
-Pathogenic organisms

Trends:
All evidence indicates a negative trend for this species. However, most available information is fragmentary and anecdotal, as this species is not subject to comprehensive survey in New York or elsewhere in the range. Managers lack baseline information which might enable documentation of trends through time.

In New York the species occurs in areas (Long Island and the Hudson River Valley) which are subject to intense development. The resulting habitat loss is driving a negative trend for the species. Furthermore, even in areas where suitable habitat remains, the loss of adult breeder animals to road kill and to specimen collection is particularly worrisome, as the reproductive strategy of these turtles is predicated upon the assumption that adults will remain productive for decades. Field biologists note that juvenile turtles are seldom encountered during surveys, suggesting that population recruitment may be feeble or absent in many local populations.

SEQR - No Action Alternative:
Available evidence indicates a negative trend for this species in New York and range wide. In the absence of management intervention, we must expect further deterioration and eventual extirpation of demes and populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Eastern box turtle (Terrapene carolina)		X	S3	G5	G SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern box turtle (Terrapene carolina)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern box turtle (Terrapene carolina)	Lower New England Piedmont	North Atlantic Coast	Decreasing
	North Atlantic Coast	Lower New England Piedmont	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern box turtle (Terrapene carolina)	all	Terrestrial	barrens/woodlands	northern deciduous

Goal and Objectives for Box Turtle

Goal: Maintain self-sustaining populations of box turtles and sufficient good quality habitat to support the species throughout its historic range in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies and environmental consultants.

Measure: *Number of protection and management sections coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of box turtles in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop a management plan for box turtles in New York.

Measure: *Completion of a management plan for box turtles in New York.*

Objective 5 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Restore depleted or extirpated populations.

Measure: *Number of sites at which restoration or population enhancement has been carried out.*

Recommended Actions

Easement acquisition:

* Secure habitats critical to species survival by acquisition of easements, or by other land protection mechanisms.

Habitat management:

* Manage vegetative succession and invasive plant species by means of prescribed burns, herbicide applications and/or by mechanical removal, and evaluate the effectiveness of such measures in enhancing habitat suitability for the species. Develop and implement mitigation strategies to manage adverse effects of habitat fragmentation.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites to document the character, quality and extent of occupied habitat.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements. .

Other action:

* Enhance law enforcement and public education to limit collection/translocation of specimens, and to prevent (illegal) sale of specimens in the pet trade.

State land unit management plan:

* Incorporate box turtle conservation into state land management planning.

References

Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

Adler, K. 1970. The influence of prehistoric man on the distribution of the box turtle. Ann. Carnegie Mus. 41:263-280.

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Carr, A. 1978 Handbook of Turtles Cornell University Press Ithaca, NY.

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Taxa Group: Herpetofauna
Species Group: Diamond-backed Terrapin

Threats:
-Shoreline development
-Subsidized predators
-Waterborne pollutants
-Road mortality
-Drowning in crab traps
-Incidental capture in fisheries/angling gear
-Marsh habitat losses
-Dredging

Trends:
Trends are difficult to determine. Historically the species was considered common in suitable habitats in New York. Late 19th century and early 20th century over harvesting of terrapins for the food trade led to severe reductions of populations. New York terrapin populations have been in slow recovery ever since, although more recent threats (pollutants, egg predation, habitat degradation) have certainly limited that recovery trend.

SEQR - No Action Alternative:
Because trends are not clearly discernable at this point, it is difficult to predict eventual status of these populations in the absence of any management action. Nevertheless, there is concern that population recruitment for this species may be inadequate to maintain stability of New York's resident terrapin populations without efforts to manage threats that are recognized at this time.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Northern diamondback terrapin (Malaclemys terra		X			P G	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern diamondback terrapin (Malaclemys terrapin ter	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Northern diamondback terrapin (Malaclemys terrapin terr	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern diamondback terrapin (Malaclemys terrapin terrapin)				
	all	Estuarine	shallow subtidal	sand/gravel
	Breeding	Terrestrial	coastal	beach/shoreline

Goal and Objectives for Diamond-backed Terrapin

Goal: Make diamondback terrapin populations stable statewide by 2020

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Determine distribution, population status and habitat suitability for populations of diamondback terrapins in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 3 : Develop a management plan for diamondback terrapins in New York.

Measure: *Completion of a management plan for diamondback terrapins in New York.*

Objective 4 : Restore depleted or extirpated populations.

Measure: *Number of sites at which restoration or population enhancement has been carried out.*

Objective 5 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed.*

Recommended Actions

Easement acquisition:

* Secure upland habitats critical to species reproduction by acquisition of easements, or by other land protection mechanisms.

Habitat management:

* Maintain water quality in brackish-water bays where terrapins reside. Manage beach areas where terrapins nest to maintain habitat security and optimal substrate conditions and to reduce impact of egg predators.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate this species as a protected small game species.

Other action:

* Limit incidental bycatch of terrapins in crab traps, trawls and other fisheries gear.

Population enhancement:

* Employ restoration techniques at selected sites as needed, including head starting, nest protection, and repatriation/relocation strategies.

Population monitoring:

* Discern population trends through periodic resurvey.

Statewide baseline survey:

* Acquire 'baseline' understanding of distribution and status of terrapin sub-populations, in order to recognize trends.

References

Ditmars, R.L. 1905. The reptiles of the vicinity of New York City. J. Am. Mus. Nat. Hist. 5:93-140.

Harding, J.H. 1997. Amphibians and Reptiles of the Great Lakes region. The University of Michigan Press. Ann Arbor. Michigan.

Ernst, C.H., Lovich, Jeffrey E. & Barbour, R.W. 1994. Turtles of the United States and Canada. Smithsonian Institution Press. Washington D.C.

Carr, A. 1978 Handbook of Turtles Cornell University Press Ithaca, NY.

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Taxa Group: Herpetofauna
Species Group: Eastern Spadefoot Toad

Threats:
-Vernal pond losses
-Upland habitat loss/fragmentation
-Road mortality
-Contaminants (pesticides, heavy metals, hydrocarbon compounds, salts, acid rain)
-Parasites/pathogens

Trends:
Absence of reliable 'baseline' information precludes clear estimate of trends for this species. Habitat loss to development (especially loss of vernal pool habitats) is probably driving a negative trend for the species

SEQR - No Action Alternative:
Unless management action is employed to limit loss of vernal pool habitat, it is likely that this species will continue to decline toward a threatened status.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Eastern spadefoot (Scaphiopus holbrookii)		X	S3	G5	G	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern spadefoot (Scaphiopus holbrookii)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern spadefoot (Scaphiopus holbrookii)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern spadefoot (Scaphiopus holbrookii)	all	Palustrine	mineral soil wetland	vernal pool

Goal and Objectives for Eastern Spadefoot Toad

Goal: Make spadefoot toad populations stable statewide by 2020.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Determine distribution, population status and habitat suitability for populations of eastern spadefoot toad in New York

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 3 : Develop a management plan for eastern spadefoot toad in New York.

Measure: *Completion of a management plan for eastern spadefoot toad in New York.*

Objective 4 : Restore depleted or extirpated populations.

Measure: *Number of sites at which population restoration or population enhancement has been carried out.*

Objective 5 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed for the benefit of the species.*

Recommended Actions

Habitat management:

* Provide for stability/security of vernal pool habitats which support the species.

Invasive species control:

* Manage exotic competitors, predators and pathogens which might undermine the integrity of spadefoot toad populations.

Recommended Actions

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate spadefoot toad as a protected small game species.

Population monitoring:

* Conduct periodic monitoring of populations in order to detect population trends.

Statewide baseline survey:

* Develop population survey protocols, and implement protocols at known and potentially suitable sites to determine present distribution and status of this species in New York.

Statewide management plan:

* Incorporate eastern spadefoot toad conservation objectives into state land management planning.

References

Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

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Hulse, A. C., C. J. McCoy, and E. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Comstock Publishing Associates, Ithaca. 419 pp.

Behler, J.L. and F. W. King. 1997. National Audubon Society Field Guide to North American Amphibians and Reptiles. Alfred A. Knopf, New York, New York.

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Taxa Group: Herpetofauna
Species Group: Freshwater wetland amphibians

Threats:
-Wetland losses
Loss of wetland-adjacent uplands
-Water quality reductions (siltation, turbidity, low oxygen)
-Release of live bait into wetlands
-Introduced competitors
-Parasites/pathogens
-Contaminants (pesticides, heavy metals, hydrocarbon compounds, salts, acid rain)
-Invasive aquatic plant species
-Natural succession
-Road mortality

Trends:
Trends for this group are not clearly understood. Northern cricket frogs, the only species in this group which has been monitored with any frequency in recent years in New York, has shown loss of a number of known populations.

SEQR - No Action Alternative:
In the absence of management effort, we may anticipate that the many threats to this group will continue to undermine populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Southern leopard frog (Rana sphenocephala)			S2S3	G5	G SC	Resident
Western chorus frog (Pseudacris triseriata)			S4	G5	G	Resident
Fowler's toad (Bufo fowleri)			S4	G5	G	Resident
Northern cricket frog (Acris crepitans)			S1	G5	E	Resident
Four-toed salamander (Hemidactylium scutatum)			S5	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Four-toed salamander (Hemidactylium scutatum)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	Upper Hudson	Unknown
	SE Lake Ontario	SW Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SE Lake Ontario	Unknown
	Upper Hudson	NE Lake Ontario - St. Lawrence	Unknown
Northern cricket frog (Acris crepitans)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Fowler's toad (Bufo fowleri)	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Decreasing
Western chorus frog (Pseudacris triseriata)	Allegheny	Allegheny	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
Southern leopard frog (Rana sphenocephala)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Four-toed salamander (Hemidactylium scutatum)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Northern cricket frog (Acris crepitans)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast		
Fowler’s toad (Bufo fowleri)	Great Lakes	Great Lakes	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Unknown
Western chorus frog (Pseudacris triseriata)	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Southern leopard frog (Rana sphenocephala)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Four-toed salamander (Hemidactylium scutatum)				
	all	Palustrine	peatlands	bog/fen
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
Northern cricket frog (Acris crepitans)				
	all	Palustrine	mineral soil wetland	emergent marsh

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern cricket frog (Acris crepitans)				
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
Fowler's toad (Bufo fowleri)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	forested	southern coniferous
	all	Terrestrial	open upland	dunes
	all	Terrestrial	open upland	grasslands
	Nursery/Juvenile	Palustrine	mineral soil wetland	vernal pool
Western chorus frog (Pseudacris triseriata)				
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Terrestrial	forested	pond/lake shore
	all	Terrestrial	open upland	meadow
Southern leopard frog (Rana sphenocephala)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Terrestrial	forested	pond/lake shore
	all	Terrestrial	open upland	meadow

Goal and Objectives for Freshwater wetland amphibians

Goal: Maintain self-sustaining populations of freshwater wetland amphibians and sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of freshwater wetland amphibian populations in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plan for the cricket frog and management plans for the other freshwater wetland amphibian species in New York.

Measure: *Completion of recovery/plans for individual freshwater wetland amphibian species in New York.*

Objective 5 : Increase public awareness in support of conservation objectives for these species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect these species.

Measure: *Success in adopting needed changes in existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of sites at which population restoration or population enhancement has been carried out.*

Objective 8 : Restore extirpated populations of cricket frogs to selected sites in DEC regions 1, 2 and 3.

Measure: *Number of sites at which restoration or population enhancement has been carried out.*

Objective 9 : Undertake management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed.*

Recommended Actions

Easement acquisition:

* Secure habitats critical to species survival by acquisition of conservation easements, or by other land protection mechanisms.

Habitat management:

* Manage the variety of factors which might be limiting wetland habitat suitability for resident amphibian species, including management of exotic plant and animal species, management of adverse hydrological alterations, and management of anthropogenic inputs of sediments and toxicants.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Modify Freshwater Wetlands Act, in order to protect wetlands smaller than 12.4 acres where they support species of conservation concern, and in order to expand the protected upland buffer beyond the 100-foot limit where necessary.
* Adopt provisions into New York's Environmental Conservation Law designating four-toed salamander and Fowler's toad as a protected small game species.

Other action:

* Periodically evaluate status of the subject species to determine whether appropriate E/T/SC status listings are in effect.

Population enhancement:

* Employ restoration techniques for the cricket frog at selected sites as needed, including captive breeding and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic surveys of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement protocols at all known and potentially suitable sites to document the extent of occupied habitat.

References

Conant, R. and J. T. Collins. 1998. A Field Guide to the Amphibians and Reptiles: Eastern and Central North America. Houghton Mifflin Company, Nev York, New York.

Behler, J.L. and F. W. King. 1997. National Audubon Society Field Guide to North American Amphibians and Reptiles. Alfred A. Knopf, New York, Nev York.

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Taxa Group: Herpetofauna
Species Group: Hellbender

Threats:
-River/Stream channelization
-River/Stream silt loading
-Water pollutants
-Dams impeding dispersal
-Bridge construction/repairs
-Persecution (caught specimens killed by anglers)

Trends:
Historical records indicate that during the early part of the 20th century hellbenders were very much more commonly encountered in the New York portions of the Allegheny and Susquehanna rivers than is presently the case. Surveys commissioned by NYSDEC in the early 1990s still found hellbenders at a number of locations where subsequent resurvey has been unable to locate any specimens. All indications are that this species is in continuing long-term decline in New York. Hellbender eggs and juvenile specimens are very seldom encountered in New York, suggesting that population recruitment may not be occurring in many places. The USFWS (2003) completed a range wide status assessment of the hellbender which indicates that it is declining throughout a majority of its range and that it should be considered for federal listing.

SEQR - No Action Alternative:
In the absence of management intervention, we should expect further decline for this species in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Hellbender (Cryptobranchus alleganiensis)		X	S2	G3G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Hellbender (Cryptobranchus alleganiensis)	Allegheny	Allegheny	Decreasing
	Susquehanna	Susquehanna	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Hellbender (Cryptobranchus alleganiensis)	High Allegheny Plateau	High Allegheny Plateau	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Hellbender (Cryptobranchus alleganiensis)	all	Riverine	coldwater stream	rocky bottom

Goal and Objectives for Hellbender

Goal: Maintain self-sustaining populations of eastern hellbender and sufficient good quality habitat to support the species throughout its historic range in New York.

Objective 1 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, environmental consultants and the USFWS.

Measure: *Number of protection and management actions coordinated.*

Objective 2 : Determine distribution, population status and habitat suitability for populations of eastern hellbender in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 3 : Develop a recovery plan for eastern hellbender in New York.

Measure: *Completion of a recovery plan for eastern hellbender in New York.*

Objective 4 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 5 : Provide NYSDEC with necessary additional authority to protect the species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 6 : Restore depleted or extirpated populations.

Measure: *Number of sites at which population restoration or population enhancement has been carried out.*

Objective 7 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of miles of streambed and stream bank managed to maintain or improve habitat quality.*

Recommended Actions

Educational signs:

* Educational outreach to fishermen in the Allegheny and Susquehanna drainages could encourage release of incidentally caught hellbenders, as well as enlisting fishermen to report captures to wildlife managers.

Habitat management:

* Undertake management actions to control water pollutant inputs and sediment loading of streams in the Susquehanna and Allegany River watersheds. Manage land use practices in the upland vicinity of streams where such practices may be adversely impacting stream qualities which are critical to hellbender survival. Investigate whether removal of some dams blocking movement of the hellbender is feasible.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and stream habitat requirements. Undertake research to document life history and habitat use by juvenile hellbenders in New York.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate hellbender as a protected small game species.

Other action:

* Periodically evaluate status of the species to determine whether the appropriate E/T/SC status listing is in effect.

Population enhancement:

* Employ restoration techniques at selected sites as needed, including captive breeding, head starting, nest protection, and repatriation/relocation strategies.

Recommended Actions

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop population survey protocols and implement protocols at known and potentially suitable sites to determine the extent of occupied habitat in New York.

References

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Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 576 pp.

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Taxa Group: Herpetofauna
Species Group: Lake/river reptiles

Threats:
-Unregulated or illegal collecting
-Lake level drawdown
-Aquatic weed harvesting
-Subsidized predators
-Shoreline development
-Road mortality
-Dams
-Introduced competitors
-Dredging
-Upland habitat fragmentation/losses
-Stream channelization
-Recreational boating
-Invasive aquatic plants
-Waterborne contaminants
-Pathogenic organisms

Trends:
Expanding human development of landscapes and proliferating road networks in southern New York, have certainly impacted wood turtle populations in those areas. Shoreline development along bays in Lake Ontario has certainly impacted spiny soft-shell and map turtle populations in those areas. Yet, we do not yet have a clear understanding of the statewide trends for these species, or for any of the other lake/river reptiles in this group.

SEQR - No Action Alternative:
Because trends for the lake/river reptiles in this group are not currently defined, we cannot predict the consequences of a no action alternative.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Queen snake (Regina septemvittata)		X	S1	G5	E	Resident
Eastern ribbonsnake (Thamnophis sauritus sauritu		X	S5	G5	U	Resident
Northern map turtle (Graptemys geographica)			S4	G5	U	Resident
Spiny softshell (Trionyx spiniferus)			S2S3	G5	U SC	Resident
Wood turtle (Clemmys insculpta)		X	S3	G4	G SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Wood turtle (Clemmys insculpta)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown
Spiny softshell (Trionyx spiniferus)	Allegheny	NE Lake Ontario - St. Lawrence	Unknown
	NE Lake Ontario - St. Lawrence	Lake Champlain	Unknown
	Lake Champlain	SE Lake Ontario	Unknown
	SE Lake Ontario	SW Lake Ontario	Decreasing
	SW Lake Ontario	Upper Hudson	Unknown
	Upper Hudson		
Northern map turtle (Graptemys geographica)	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern ribbonsnake (Thamnophis sauritus sauritus)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	Upper Hudson	Unknown
	Susquehanna	SW Lake Ontario	Unknown
	SW Lake Ontario	Susquehanna	Unknown
	Upper Hudson	SE Lake Ontario	Unknown
Queen snake (Regina septemvittata)	Lake Erie	Lake Erie	Decreasing
	Allegheny	SW Lake Ontario	Decreasing
	SW Lake Ontario		
	Lower Hudson - Long Island Bays		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Wood turtle (Clemmys insculpta)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spiny softshell (Trionyx spiniferus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Northern map turtle (Graptemys geographica)	Great Lakes	Great Lakes	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
Eastern ribbonsnake (Thamnophis sauritus sauritus)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Queen snake (Regina septemvittata)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Wood turtle (Clemmys insculpta)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	open upland	grasslands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Wood turtle (Clemmys insculpta)				
Spiny softshell (Trionyx spiniferus)				
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	deepwater river	sand/gravel bottom
	Breeding	Terrestrial	open upland	sand/gravel bar
Northern map turtle (Graptemys geographica)				
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Riverine	coldwater stream	sand/gravel bottom
	Breeding	Terrestrial	open upland	sand/gravel bar
Eastern ribbonsnake (Thamnophis sauritus sauritus)				
	all	Riverine	warmwater stream	other
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	open upland	grasslands
Queen snake (Regina septemvittata)				
	all	Palustrine	mineral soil wetland	coniferous forested
	all	Riverine	coldwater stream	rocky bottom
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	open upland	grasslands

Goal and Objectives for Lake/river reptiles

Goal: Maintain self-sustaining populations of lake/river reptile species and sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of lakes/rivers where waters, shorelines and adjacent uplands are adequately protected by conservation easements or other habitat protection mechanisms.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of lake/river reptile species in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plan for the queen snake and management plans for the other lake/river reptile species in New York.

Measure: *Completion of recovery plans for lake/river reptile species in New York.*

Objective 5 : Increase public awareness in support of conservation objectives for lake/river reptile species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of lake/river sites at which population restoration or population enhancement has been carried out.*

Objective 8 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of lake/river sites receiving habitat management activity.*

Recommended Actions

Habitat management:

* Manage the variety of adverse influences which might reduce lake/river habitat suitability for the subject reptile species, including invasive aquatic plant species, water pollutants, lake level manipulations, aquatic weed control measures, excessive disturbance by watercraft, and fishing practices which incidentally take lake/river reptiles in significant numbers.
* For lake/river turtles in this group, manage uplands adjacent to aquatic habitat in order to provide adequate and secure nesting habitat sites and to provide dispersal routes for migrating animals.

Habitat research:

* Develop standardized habitat survey protocols for the subject species, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate queen snake, eastern ribbonsnake, northern map turtle and spiny softshell as a protected small game species.

Other action:

* Enhance law enforcement and public education to limit collection/translocation of wood turtles.

Population enhancement:

* Employ restoration techniques for the spiny softshell and the queen snake at selected sites as needed, including captive breeding, head starting, nest protection, and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop population survey protocols and implement protocols at known and potentially suitable sites to determine the extent of occupied habitat in New York

References

Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

Behler, J.L. and F. W. King. 1997. National Audubon Society Field Guide to North American Amphibians and Reptiles. Alfred A. Knopf, New York, New York.

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Ernst, C.H., Lovich, Jeffrey E. & Barbour, R.W. 1994. Turtles of the United States and Canada. Smithsonian Institution Press. Washington D.C.

Carr, A. 1978 Handbook of Turtles Cornell University Press Ithaca, NY.

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Taxa Group: Herpetofauna
Species Group: Lizards

Threats:
-Unregulated collecting of specimens
-Subsidized predators
-Habitat loss/fragmentation
-Vegetative succession
-Environmental contaminants

Trends:
Anecdotal reports suggest that some historic sites of occurrence for New York native lizards have been depleted by factors unknown. Whether and to what extent these reports might indicate a trend is unknown.

SEQR - No Action Alternative:
To date there have been no conservation actions in New York specifically targeted toward this species group. Because we lack information on the present status and trends for the group, it is not possible to determine the effect of a (continued) no-action alternative.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Common five-lined skink (Eumeces fasciatus)			S3	G5	U	Resident
Coal skink (Eumeces anthracinus)		X	S2S3	G5	U	Resident
Fence lizard (Sceloporus undulatus)			S1	G5	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Fence lizard (Sceloporus undulatus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Coal skink (Eumeces anthracinus)	Allegheny	Allegheny	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
Common five-lined skink (Eumeces fasciatus)	Lake Champlain	Lake Champlain	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Fence lizard (Sceloporus undulatus)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
Coal skink (Eumeces anthracinus)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Common five-lined skink (Eumeces fasciatus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Fence lizard (Sceloporus undulatus)				
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	cliffs & open talus
Coal skink (Eumeces anthracinus)				
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
Common five-lined skink (Eumeces fasciatus)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	open upland	cliffs & open talus

Goal and Objectives for Lizards

Goal: Maintain self-supporting populations of New York resident lizard species and sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, environmental consultants and the USFWS.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of New York native lizard species in New York

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plan for the fence lizard and management plans for New York's native skink species.

Measure: *Completion of management/recovery plans for New York's native lizard species.*

Objective 5 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect New York's native lizard species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed.*

Recommended Actions

Easement acquisition:

* Secure habitats critical to species survival by acquisition of conservation easements, or by other land protection mechanisms.

Habitat management:

* Manage vegetative succession or other factors which are determined to be detrimental to habitat suitability in areas occupied by New York's resident lizard species.

Recommended Actions

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate fence lizard, coal skink and common five-lined skink as protected small game species.

Other action:

* Enhance law enforcement to limit specimen collection.

* Enhance regulation and law enforcement to limit specimen collection.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop population survey protocols and implement protocols at known and potentially suitable sites to determine the extent of occupied habitat in New York.

References

Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

Hulse, A. C., C. J. McCoy, and E. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Comstock Publishing Associates, Ithaca. 419 pp.

Behler, J.L. and F. W. King. 1997. National Audubon Society Field Guide to North American Amphibians and Reptiles. Alfred A. Knopf, New York, New York.

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Taxa Group: Herpetofauna
Species Group: Massasauga

Threats:
-Vegetative succession
-Illegal collection of specimens
-Mosquito control pesticides
-Agricultural practices

Trends:
The species appears to have undergone gradual decline in recent decades.

SEQR - No Action Alternative:
In the absence of management intervention, we can anticipate further decline of Massasauga rattlesnakes in New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Eastern massasauga (Sistrurus c. catenatus)	C	X	S1	G3G4T3T4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern massasauga (Sistrurus c. catenatus)	SW Lake Ontario	SW Lake Ontario	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern massasauga (Sistrurus c. catenatus)	Great Lakes	Great Lakes	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern massasauga (Sistrurus c. catenatus)				
	all	Palustrine	mineral soil wetland	shrub swamp

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern massasauga (Sistrurus c. catenatus)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	open upland	grasslands

Goal and Objectives for Massasauga

Goal: Maintain self-sustaining populations of Massasauga rattlesnake and sufficient good quality habitat to support the species throughout its historic range in New York.

Objective 1 : Determine distribution, population status and habitat suitability for populations of massasauga rattlesnake in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 2 : Develop a recovery plan for massasauga rattlesnake in New York.

Measure: *Completion of recovery plan for massasauga rattlesnake in New York.*

Objective 3 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 4 : Provide NYSDEC with necessary additional authority and enhanced law enforcement effort to protect the species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL), and provision of needed law enforcement activity.*

Objective 5 : Restore depleted or extirpated populations.

Measure: *Number of sites at which population restoration or population enhancement has been carried out.*

Objective 6 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed.*

Recommended Actions

Recommended Actions

Habitat management:

* Manage vegetative succession and invasive plant species by means of prescribed burns, herbicide applications and/or by mechanical removal, and evaluate the effectiveness of such measures in enhancing habitat suitability for the species.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designates Massasauga rattlesnake as a protected small game species.

Other action:

* Enhance law enforcement to prevent collection of snake specimens.

Population enhancement:

* Employ restoration techniques at selected sites as needed, including captive breeding, headstarting, and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

References

Ernst, Carl H. and E.M. Ernst, 2003. Snakes of the United States and Canada. Smithsonian Books. Washington, DC.

Hulse, A.C., C. J. McCoy, and E. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Comstock Publishing Associates, Ithaca. 419 pp.

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Conant, R. and J. T. Collins. 1998. A Field Guide to the Amphibians and Reptiles: Eastern and Central North America. Houghton Mifflin Company, New York, New York.

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Taxa Group: Herpetofauna
Species Group: Mudpuppy

Threats:
-Pathogenic organisms (type E botulism)
-Lampricide applications
-Water quality reductions (siltation, turbidity, low oxygen)
-Stream channelization
-Incidental bycatch by anglers
-Dredging
-Dams

Trends:
Trends appear to be negative in areas where botulism or lampricide applications are challenging resident mudpuppy populations.

SEQR - No Action Alternative:
Statewide status of the species is presently unclear. It is not currently known whether management actions would significantly improve stability of populations. Therefore, the effect of a no action alternative cannot be assessed at this time.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Common mudpuppy (Necturus maculosus)			S4	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Common mudpuppy (Necturus maculosus)	Allegheny	Allegheny	Unknown
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Common mudpuppy (Necturus maculosus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Common mudpuppy (Necturus maculosus)				
	all	Lacustrine	cold water deep	rocky bottom
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	warmwater stream	rocky bottom

Goal and Objectives for Mudpuppy

Goal: Maintain self-sustaining populations of mudpuppy and sufficient good quality habitat to support the species throughout its historic range in New York.

Objective 1 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 2 : Determine distribution, population status and habitat suitability for populations of mudpuppy in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 3 : Develop a management plan for mudpuppy in New York.

Measure: *Completion of a management plan for mudpuppy in New York.*

Objective 4 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 5 : Provide NYSDEC with necessary additional authority to protect the species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 6 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of sites subjected to habitat management.*

Recommended Actions

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate mudpuppy as a protected small game species.

Other action:

* Investigate the effects of lampricide applications upon mudpuppy populations which are resident in Lake Champlain and its tributary streams.
* Investigate the significance of botulism-induced mortality in mudpuppy populations resident in Lake Erie.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat.

References

Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 576 pp.

Bishop, S. C. 1941. The Salamanders of New York. The New York State Museum Bulletin No. 324.

Conant, R. and J. T. Collins. 1998. A Field Guide to the Amphibians and Reptiles: Eastern and Central North America. Houghton Mifflin Company, New York, New York.

Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

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Taxa Group: Herpetofauna
Species Group: Sea turtles

Threats:
Threats to the sea turtles are both human induced and natural such as, pollution, boat strikes, and entanglement, cold stunning and disease. Radio and satellite tags can be combined with aerial and shipboard survey work to study abundance, distribution, and movements of habitat usage coupled with seasonal changes. This information would be useful as means of protecting the species and the habitat in which they live as well as maintain their population at or above current levels.

Trends:
There is insufficient data to establish a trend for these species. The lack of data regarding habitat usage may lead to management decisions that may not be in the best interest of the animal. The little data that does exist is conflicting. According to Spotila, in the National Marine Fisheries Service Stock Assessment, the population is declining in the Pacific yet increasing or stable in the Atlantic (NMFS, 2001). In addition, the number of Ridley sea turtle nests are increasing (Turtle Expert Working Group,2000). Aerial and shipboard surveys in New York waters can assist in assessing these population status.

SEQR - No Action Alternative:
If no action is taken we will not be able to maintain the population at or above current levels. Without more surveys to better understand habitat usage we can not thoroughly assess movement and population levels. As a result, actions such as minimizing mortality from commercial fisheries, reducing marine pollution, and determining distribution and seasonal movements for all life stages (NMFS, 1991, 1992, 1993) will not be supported.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Leatherback (Dermochelys coriacea)	E		SNA	G2	E	Migratory
Kemp's or Atlantic ridley (Lepidochelys kempii)	E		S1N	G1	E	Migratory
Hawksbill (Eretmochelys imbricata)	E		SNA	G3	E	Migratory
Green turtle (Chelonia mydas)	T		S1N	G3	T	Migratory
Loggerhead (Caretta caretta)	T		S1N	G3	T	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Loggerhead (Caretta caretta)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Green turtle (Chelonia mydas)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Hawksbill (Eretmochelys imbricata)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Kemp's or Atlantic ridley (Lepidochelys kempii)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Leatherback (Dermochelys coriacea)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Loggerhead (Caretta caretta)	North Atlantic Coast	North Atlantic Coast	Decreasing
Green turtle (Chelonia mydas)	North Atlantic Coast	North Atlantic Coast	Decreasing
Hawksbill (Eretmochelys imbricata)	North Atlantic Coast	North Atlantic Coast	Unknown
Kemp's or Atlantic ridley (Lepidochelys kempii)	North Atlantic Coast	North Atlantic Coast	Decreasing
Leatherback (Dermochelys coriacea)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Loggerhead (Caretta caretta)				
	Feeding	Marine	deep subtidal	pelagic
	Nursery/Juvenile	Marine	deep subtidal	pelagic

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Green turtle (Chelonia mydas)				
	Feeding	Marine	deep subtidal	pelagic
	Nursery/Juvenile	Marine	deep subtidal	pelagic
Hawksbill (Eretmochelys imbricata)				
	all	Marine	deep subtidal	pelagic
Kemp's or Atlantic ridley (Lepidochelys kempii)				
	Feeding	Marine	deep subtidal	pelagic
	Nursery/Juvenile	Marine	deep subtidal	pelagic
Leatherback (Dermochelys coriacea)				
	Feeding	Marine	deep subtidal	pelagic

Goal and Objectives for Sea turtles

Goal: Better understand abundance and habitat usage

Objective 1 : Habitat utilization and selection

Measure: *Radio and satellite tracking, diet analysis*

Objective 2 : To study abundance, distribution and habitat usage in all waters.

Measure: *Radio and satellite tracking, diet analysis*

Recommended Actions

Curriculum development:

* To provide public outreach programs about local species and their environment within the Long Island Sound and the New York Bight. Partnering with agencies such as the New York State Marine Mammal and Sea Turtle Rescue Program, N.Y. DEC, NOAA, U.S. Coast Guard and local law enforcement, will allow the Riverhead Foundation to adhere to the actions listed in the sea turtle recovery plans more efficiently and effectively.

Fact sheet:

* To provide literature for local communities, as well as law enforcement agencies, regarding sea turtles and their environment within the Long Island Sound and the New York Bight. The information distributed by the Riverhead Foundation to these people will provide a more effective response to strandings and sightings of animals.

Recommended Actions

Population monitoring:

* Mark recapture studies will provide data on the diet composition of these animals between bodies of water. These results can be compared to historical studies to identify any shifts in prey species.
* Determine sex composition of NY sea turtle populations. As the New York region is a critical developmental habitat for sea turtles it is important to understand if there is a sexual bias for this area. Historical studies were unable to obtain the sex of many live animals.
* Radio and satellite tags can be combined with aerial and shipboard survey work to study abundance, distribution, and movements associated with seasonal changes.

  Genetic studies should be conducted to identify stock structure and possibly understand broad scale movements.

  Mark recapture studies will provide data on size class, and population structure. With these data comparisons can be made within years, between years and between bodies of water (e.g. Long Island Sound, Peconic Bay, Great South Bay, offshore waters) and also compared to stranded animals to understand how and if stranded animals can be used as a representative of the current population or a proxy for ecosystem health.

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Taxa Group: Herpetofauna
Species Group: Snapping Turtle

Threats:
-Persecution
-Road mortality
-Parasites/pathogens
-Subsidized predators (of turtle eggs)
-Waterborne contaminants (pesticides, heavy metals, chlorinated hydrocarbons, salts, acid rain)
-Water quality reductions (e.g.. low oxygen) affecting prey availability
-Unregulated collecting

Trends:
The current statewide trend for this species is not well understood. Although snapping turtle adults appear to be plentiful in most areas of the state, we do not have a clear enough understanding of trends to make a useful estimate of long term viability of these populations.

SEQR - No Action Alternative:
Too little is known about snapping turtle status and trends statewide to allow estimation of effect of a no action alternative.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Snapping turtle (Chelydra serpentina)					U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Snapping turtle (Chelydra serpentina)	Allegheny	Upper Hudson	Unknown
	Delaware	SW Lake Ontario	Unknown
	Lake Champlain	Susquehanna	Unknown
	Lake Erie	SE Lake Ontario	Unknown
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Unknown
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Lake Erie	Unknown
	SW Lake Ontario	Lake Champlain	Unknown
	Susquehanna	Delaware	Unknown
	SE Lake Ontario	Allegheny	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Snapping turtle (Chelydra serpentina)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Great Lakes	Great Lakes	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Snapping turtle (Chelydra serpentina)				
	all	Lacustrine	warm water shallow	mud bottom
	Breeding	Terrestrial	open upland	beach/shoreline

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Snapping turtle (Chelydra serpentina)				
	Breeding	Terrestrial	open upland	grasslands

Goal and Objectives for Snapping Turtle

Goal: Maintain self-sustaining populations of snapping turtle and sufficient good quality habitat to support the species throughout its historic range in New York.

Objective 1 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 2 : Determine distribution, population status and habitat suitability for populations of snapping turtle in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 3 : Develop a management plan for snapping turtle in New York.

Measure: *Completion of a management plan for snapping turtle in New York.*

Objective 4 : Increase public awareness in support of conservation objectives for the species.

Measure: *Number of public outreach efforts undertaken.*

Objective 5 : Provide NYSDEC with necessary additional regulatory authority to protect the species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Recommended Actions

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate snapping turtle as a protected small game species.

New regulation:

* Regulate commercial take of specimens to the degree necessary for the maintenance of population stability.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends, and monitor harvest of this species.
* Conduct statewide assessment of contaminant levels in snapping turtles.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at known and potentially suitable sites, to document the extent of occupied habitat.

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Taxa Group: Herpetofauna
Species Group: Stream salamanders

Threats:
-Stream channelization
-Siltation of streams
-Waterborne contaminants
-Pathogenic organisms
-Unregulated collecting

Trends:
Trends for these species are not well understood. Wherever stream water quality has been significantly reduced, we can expect populations of these species to decline.

SEQR - No Action Alternative:
Regulatory programs which enhance and protect stream water quality are critical to maintenance of these salamander populations. In the absence of such regulatory protection we would expect reductions in stream-dependent species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Longtail salamander (Eurycea longicauda)		X	S2S3	G5	U SC	Resident
Northern red salamander (Pseudotriton ruber)			S4	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern red salamander (Pseudotriton ruber)	Allegheny	Delaware	Unknown
	Delaware	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	Susquehanna	Unknown
	Susquehanna	Upper Hudson	Unknown
	Upper Hudson		

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Longtail salamander (Eurycea longicauda)	Allegheny	Allegheny	Decreasing
	Susquehanna	Susquehanna	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	Delaware	Delaware	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Northern red salamander (Pseudotriton ruber)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Longtail salamander (Eurycea longicauda)	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern red salamander (Pseudotriton ruber)				
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Riverine	coldwater stream	rocky bottom
	all	Terrestrial	forested	mixed deciduous/coniferous
Longtail salamander (Eurycea longicauda)				
	all	Riverine	coldwater stream	rocky bottom
	Feeding	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Terrestrial	forested	northern deciduous

Goal and Objectives for Stream salamanders

Goal: Maintain self-sustaining populations of stream salamander species and sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Miles of stream length, stream edge and adjacent uplands adequately protected by regulatory mechanisms.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of stream salamanders in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop management plans for selected stream salamander species in New York.

Measure: *Completion of management plans for selected stream salamander species in New York.*

Objective 5 : Increase public awareness in support of conservation objectives for these species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect these species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of stream sites at which population restoration or population enhancement has been carried out.*

Recommended Actions

Habitat management:

* Undertake remedial actions as needed to restore habitat quality in degraded streams.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate all species in this group of stream salamanders as a protected small game species.

Other action:

* Periodically evaluate status of the species to determine whether the appropriate E/T/SC status listing is in effect.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat.

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Taxa Group: Herpetofauna
Species Group: Uncommon turtles of wetlands

Threats:
-Wetland loss
-Wetland-adjacent upland loss
-Illegal and unregulated collection of specimens
-Road mortality
-Subsidized predators
-Invasive plant and animal species
-Hydrological changes (raising or lowering water levels)
-Water quality reductions
-Persecution
-Obstructions to dispersal
-Habitat fragmentation
-Natural succession
-Mosquito ditching

Trends:
New York populations of spotted, bog and Blanding's turtles have been in decline for many decades. All three species occur in areas of the state which are subject to intense development pressure, leading to habitat fragmentation, more frequent roadkill events and (frequently) compromised wetland quality.

Stinkpot populations are widely distributed in New York. The trend for this species is not clear.

Mud turtles currently occur in New York at only a few locations on eastern Long Island. All but one of these remaining populations are considered to be only marginally viable.

SEQR - No Action Alternative:
Except for the stinkpot, all of these turtles are presently managed to some significant degree (by regulation, habitat management and monitoring). In the absence of such management we would expect these populations to decline dramatically.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Stinkpot (Sternotherus odoratus)						Resident
Eastern mud turtle (Kinosternon subrubrum)			S1	G5	E	Resident
Blanding's turtle (Emydoidea blandingii)		X	S2S3	G4	T	Resident
Bog turtle (Clemmys muhlenbergii)	T		S2	G3	E	Resident
Spotted turtle (Clemmys guttata)		X	S3	G5	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spotted turtle (Clemmys guttata)	Allegheny	Lake Champlain	Decreasing
	Lake Champlain	Lake Erie	Unknown
	Lake Erie	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Unknown
	NE Lake Ontario - St. Lawrence	SE Lake Ontario	Unknown
	SE Lake Ontario	Susquehanna	Unknown
	Susquehanna	SW Lake Ontario	Unknown
	SW Lake Ontario	Upper Hudson	Unknown
	Upper Hudson		
Bog turtle (Clemmys muhlenbergii)	Lake Champlain	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	SE Lake Ontario	Decreasing
	SE Lake Ontario	Upper Hudson	Decreasing
	Susquehanna		
	SW Lake Ontario		
	Upper Hudson		
Blanding's turtle (Emydoidea blandingii)	Lake Erie	Lake Erie	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Decreasing
Eastern mud turtle (Kinosternon subrubrum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Stinkpot (Sternotherus odoratus)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spotted turtle (Clemmys guttata)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	
Bog turtle (Clemmys muhlenbergii)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	Lower New England Piedmont	Decreasing
	Lower New England Piedmont		
Blanding's turtle (Emydoidea blandingii)	Great Lakes	Great Lakes	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern mud turtle (Kinosternon subrubrum)	Lower New England Piedmont	North Atlantic Coast	Decreasing
	North Atlantic Coast		
Stinkpot (Sternotherus odoratus)	Great Lakes	Great Lakes	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spotted turtle (Clemmys guttata)				
	all	Palustrine	mineral soil wetland	vernal pool
	all	Palustrine	peatlands	bog/fen
	Breeding	Palustrine	mineral soil wetland	meadow
	Breeding	Terrestrial	open upland	grasslands
	Hibernating/Overwintering	Terrestrial	forested	mixed deciduous/coniferous
Bog turtle (Clemmys muhlenbergii)				
	all	Palustrine	mineral soil wetland	meadow
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Palustrine	peatlands	bog/fen
Blanding's turtle (Emydoidea blandingii)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	mineral soil wetland	shrub swamp
	Breeding	Terrestrial	forested	northern deciduous
	Breeding	Terrestrial	open upland	grasslands
Eastern mud turtle (Kinosternon subrubrum)				
	all	Estuarine	intertidal	emergent marsh
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	mineral soil wetland	pond/lake shore
	all	Terrestrial	open upland	beach/shoreline

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern mud turtle (Kinosternon subrubrum)				
	all	Terrestrial	open upland	grasslands
Stinkpot (Sternotherus odoratus)				
	all	Lacustrine	warm water shallow	mud bottom
	all	Terrestrial	open upland	grasslands

Goal and Objectives for Uncommon turtles of wetlands

Goal: Maintain self-sustaining populations of New York's 'uncommon turtles of wetlands' and maintain sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, environmental consultants and the USFWS.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of New York's 'uncommon turtles of wetlands'.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plans for bog, mud and Blanding's turtles, and management plans for stinkpots and spotted turtles in New York.

Measure: *Completion of recovery plans or management plans for species in this group.*

Objective 5 : Increase public awareness in support of conservation objectives for these species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect these species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of wetland sites at which population restoration or population enhancement has been carried out.*

Objective 8 : Undertake management actions to improve habitat quality at selected sites.

Measure: *Number of wetlands and adjacent upland habitat managed.*

Recommended Actions

Easement acquisition:

* Secure habitats critical to species survival by acquisition of conservation easements for wetlands and adjacent uplands.

Habitat management:

* Develop and implement mitigation strategies to manage adverse effects of habitat fragmentation.
* Conduct a variety of habitat management activities where needed, including management of vegetation succession, management of invasive species, maintenance of hydrological regimes, curtailment of contaminant inputs, and management of human access, in order to preserve wetland suitability for these uncommon turtles of wetlands.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Modify regulation:

* Modify Freshwater Wetlands Act, in order to protect wetlands smaller than 12.4 acres where they support species of conservation concern, and in order to expand the protected upland buffer beyond the 100-foot limit where necessary.
* Adopt into New York's Environmental Conservation Law provisions which designate stinkpot, eastern mud turtle, Blanding's turtle, and spotted turtle as protected small game species.

Other action:

* Develop and implement mitigation measures to manage turtle population losses to egg predators and to vehicular roadkill.
* Enhance law enforcement and public education in order to curtail collection/translocation of turtle specimens.
* Determine significance of specific threats to populations of species in this group, and formulate management options to control significant threats.

Recommended Actions

Population enhancement:

* Employ restoration techniques for bog turtle, Blanding's turtle and mud turtle at selected sites as needed, including captive breeding, headstarting, nest protection, and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat.

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Taxa Group: Herpetofauna
Species Group: Vernal pool salamanders

Threats:
-Vernal pond losses
-Loss of pond-adjacent upland habitat
-Release of live bait into vernal ponds
-Subsidized predators
-Invasive aquatic plants
-Road mortality
-Water quality reductions
-Hydrological changes to vernal ponds
-Waterborne contaminants
-Off road vehicles
-Upland habitat fragmentation
-Obstructions to dispersal (curbs, window wells)
-Pathogenic organisms
-Unregulated or illegal collecting

Trends:
Trends for Jefferson and blue-spotted salamanders are not clear at this time. Trends for New York's resident marbled salamanders and tiger salamanders appear to be decidedly negative over the past several decades.

SEQR - No Action Alternative:
In the absence of management intervention, further declines may be anticipated for tiger salamanders and for marbled salamanders.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Tiger salamander (Ambystoma tigrinum)		X	S2S3	G5	E	Resident
Marbled salamander (Ambystoma opacum)			S3	G5	U SC	Resident
Blue-spotted salamander (Ambystoma laterale)		X	S3	G5	U SC	Resident
Jefferson salamander (Ambystoma jeffersonianum)		X	S3	G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Jefferson salamander (Ambystoma jeffersonianum)	Allegheny	Allegheny	Unknown
	Upper Hudson	Delaware	Unknown
	SW Lake Ontario	Lake Champlain	Unknown
	Susquehanna	Lake Erie	Unknown
	SE Lake Ontario	Lower Hudson - Long Island Bays	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	Lower Hudson - Long Island Bays	SE Lake Ontario	Unknown
	Lake Erie	Susquehanna	Unknown
	Lake Champlain	SW Lake Ontario	Unknown
	Delaware	Upper Hudson	Unknown
Blue-spotted salamander (Ambystoma laterale)	Allegheny	Allegheny	Unknown
	Upper Hudson	Delaware	Unknown
	SW Lake Ontario	Upper Hudson	Unknown
	Susquehanna	SW Lake Ontario	Unknown
	SE Lake Ontario	Susquehanna	Unknown
	NE Lake Ontario - St. Lawrence	SE Lake Ontario	Unknown
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Unknown
	Lake Erie	Lower Hudson - Long Island Bays	Unknown
	Lake Champlain	Lake Erie	Unknown
	Delaware	Lake Champlain	Unknown
Marbled salamander (Ambystoma opacum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	Delaware	Delaware	Unknown
Tiger salamander (Ambystoma tigrinum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Jefferson salamander (Ambystoma jeffersonianum)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Blue-spotted salamander (Ambystoma laterale)	Western Allegheny Plateau	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	High Allegheny Plateau	Unknown
	North Atlantic Coast	Lower New England Piedmont	Unknown
	Lower New England Piedmont	Northern Appalachian/Boreal Forest	Unknown
	High Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Unknown
	Great Lakes	Western Allegheny Plateau	Unknown
Marbled salamander (Ambystoma opacum)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Tiger salamander (Ambystoma tigrinum)	Lower New England Piedmont	North Atlantic Coast	Decreasing
	North Atlantic Coast		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Jefferson salamander (Ambystoma jeffersonianum)				
	all	Terrestrial	barrens/woodlands	southern deciduous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Jefferson salamander (Ambystoma jeffersonianum)				
	all	Terrestrial	forested	northern deciduous
	Nursery/Juvenile	Palustrine	mineral soil wetland	vernal pool
Blue-spotted salamander (Ambystoma laterale)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
	Nursery/Juvenile	Palustrine	mineral soil wetland	vernal pool
Marbled salamander (Ambystoma opacum)				
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	southern deciduous
	Nursery/Juvenile	Palustrine	mineral soil wetland	vernal pool
Tiger salamander (Ambystoma tigrinum)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	barrens/woodlands	southern deciduous
	Nursery/Juvenile	Palustrine	mineral soil wetland	vernal pool

Goal and Objectives for Vernal pool salamanders

Goal: Maintain self-supporting populations of vernal pool salamanders and sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of vernal pool habitats adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of vernal pool salamander in New York.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plans for tiger salamander, and management plans for the other New York vernal pool salamander species.

Measure: *Completion of recovery plans/management plans for New York's vernal pool salamander species.*

Objective 5 : Increase public awareness in support of conservation objectives for these species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect these species.

Measure: *Success in adopting needed changes to existing provisions of New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of vernal pool sites at which population restoration or population enhancement has been carried out.*

Objective 8 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of vernal pool habitats managed.*

Recommended Actions

Easement acquisition:

* Secure wetland and adjacent upland habitats critical to species survival by acquisition of conservation easements, or by other land protection mechanisms.

Habitat management:

* Develop and implement measures to manage reductions of wetland habitat quality caused by invasive plants, by off-road vehicles, and by introductions of fish and other predatory species.

Habitat research:

* Enable research to further document extent of upland habitat required by vernal pond breeding salamanders.
* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

Modify regulation:

* Modify Freshwater Wetlands Act, in order to protect wetlands smaller than 12.4 acres where they support species of conservation concern, and in order to expand the protected upland buffer beyond the 100-foot limit where necessary.
* Adopt into New York's Environmental Conservation Law provisions which designate tiger salamander, marbled salamander, Jefferson salamander and blue-spotted salamander as protected small game species.

Other action:

* Determine significance of specific threats to populations of species in this group, and formulate management options to control significant threats.

Population enhancement:

* Employ restoration techniques for tiger salamanders at selected sites as needed, including head starting, and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat.
* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the statewide distribution of species in this group.

References

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Tyning, T.F. & Tyning, L.Q. (eds.), 1990 A Guide to Reptiles and Amphibians Little, Brown and Company, Boston, MA.

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Taxa Group: Herpetofauna
Species Group: Woodland/grassland snakes

Threats:
-Habitat loss
-Habitat fragmentation
-Road mortality
-Unregulated or illegal collecting
-Persecution
-Mining (hard rock, sand and gravel)
-Subsidized predators
-Pathogenic organisms

Trends:
Timber rattlesnake, the only species in this group which has been comprehensively monitored in recent years in New York, has been subjected to substantial reduction due to specimen collection and persecution during the past century. Remaining rattlesnake populations have been somewhat stabilized by management efforts which have been focused on habitat protection and public education. Nevertheless, the unremitting loss of habitat continues to undermine the prospects for the species. Population trends for the other snake species in this group are poorly understood.

SEQR - No Action Alternative:
Unless major threat factors, such as habitat loss, can be managed, we expect that populations of these woodland/grassland snakes will suffer reduction in the viability of their populations.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Timber rattlesnake (Crotalus horridus)		X	S3	G4	T	Resident
Smooth greensnake (Opheodrys vernalis)			S5	G5	U	Resident
Black ratsnake (Elaphe obsoleta)			S5	G5	U	Resident
Northern black racer (Coluber constrictor)			S5	G5	U	Resident
Northern copperhead (Agkistrodon contortrix mok			S3	G5	U	Resident
Eastern hognose snake (Heterodon platirhinos)		X	S3S4	G5	U SC	Resident
Short-headed gartersnake (Thamnophis brachysto			S3	G4	U	Resident
Worm snake (Carphophis amoenus)			S3S4	G5	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Worm snake (Carphophis amoenus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
Short-headed gartersnake (Thamnophis brachystoma)	Allegheny	Allegheny	Decreasing
	Susquehanna	Susquehanna	Decreasing
Eastern hognose snake (Heterodon platirhinos)	Delaware	Delaware	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Susquehanna	Susquehanna	Unknown
	Upper Hudson	Upper Hudson	Decreasing
Northern copperhead (Agkistrodon contortrix mokasen)	Lower Hudson - Long Island Bays	Delaware	Unknown
	Upper Hudson	Lower Hudson - Long Island Bays	Unknown
	Delaware	Upper Hudson	Unknown
Northern black racer (Coluber constrictor)	Lake Champlain	Lake Champlain	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Susquehanna	SE Lake Ontario	Unknown
	SE Lake Ontario	Susquehanna	Unknown
	Upper Hudson	Upper Hudson	Decreasing
Black ratsnake (Elaphe obsoleta)	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lake Erie	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	SW Lake Ontario	Susquehanna	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Smooth greensnake (Opheodrys vernalis)	Allegheny	Allegheny	Unknown
	Delaware	Delaware	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson	Upper Hudson	Decreasing
Timber rattlesnake (Crotalus horridus)	Allegheny	Allegheny	Decreasing
	Delaware	Delaware	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
	Lake Erie	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	SE Lake Ontario	Decreasing
	SE Lake Ontario	Susquehanna	Decreasing
	Susquehanna	SW Lake Ontario	Decreasing
	SW Lake Ontario	Upper Hudson	Decreasing
	Upper Hudson		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Worm snake (Carphophis amoenus)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Short-headed gartersnake (Thamnophis brachystoma)	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Western Allegheny Plateau	Western Allegheny Plateau	Decreasing
Eastern hognose snake (Heterodon platirhinos)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
Northern copperhead (Agkistrodon contortrix mokasen)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Northern black racer (Coluber constrictor)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Unknown
Black ratsnake (Elaphe obsoleta)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Smooth greensnake (Opheodrys vernalis)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Timber rattlesnake (Crotalus horridus)	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	Northern Appalachian/Boreal Forest	Decreasing
	Northern Appalachian/Boreal Forest	St. Lawrence-Lake Champlain Valley	Decreasing
	St. Lawrence-Lake Champlain Valley		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Worm snake (Carphophis amoenus)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	southern coniferous
Short-headed gartersnake (Thamnophis brachystoma)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	open upland	grasslands
Eastern hognose snake (Heterodon platirhinos)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	open upland	dunes
Northern copperhead (Agkistrodon contortrix mokasen)				
	all	Terrestrial	forested	mixed deciduous/coniferous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern copperhead (Agkistrodon contortrix mokasen)				
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
Northern black racer (Coluber constrictor)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	grasslands
Black ratsnake (Elaphe obsoleta)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	grasslands
Smooth greensnake (Opheodrys vernalis)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	open upland	grasslands
Timber rattlesnake (Crotalus horridus)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	cliffs & open talus

Goal and Objectives for Woodland/grassland snakes

Goal: Maintain self-sustaining populations of New York's woodland/grassland snake species, and maintain sufficient good quality habitat to support those species throughout their historic ranges in New York.

Objective 1 : Assure long-term protection of habitat necessary for species survival.

Measure: *Number of sites adequately protected by acquisition, transfer of development rights, or conservation easement.*

Objective 2 : Coordinate statewide management and protection actions with involved landowners, non-governmental organizations, public regulatory agencies, and environmental consultants.

Measure: *Number of protection and management actions coordinated.*

Objective 3 : Determine distribution, population status and habitat suitability for populations of New York's woodland/grassland snake species.

Measure: *Number of sites of occurrence evaluated to determine population status and habitat suitability.*

Objective 4 : Develop recovery plan for timber rattlesnake, and management plans for other woodland/grassland snake species in New York.

Measure: *Completion of recovery plans/management plans for New York's woodland/grassland snake species.*

Objective 5 : Increase public awareness in support of conservation objectives for these species.

Measure: *Number of public outreach efforts undertaken.*

Objective 6 : Provide NYSDEC with necessary additional authority to protect these species.

Measure: *Success in adopting needed changes to existing provisions to New York's Environmental Conservation Law (ECL).*

Objective 7 : Restore depleted or extirpated populations.

Measure: *Number of sites at which population restoration or population enhancement has been carried out.*

Objective 8 : Undertake habitat management actions to improve habitat quality at selected sites.

Measure: *Number of acres of habitat managed.*

Recommended Actions

Easement acquisition:

* Secure habitats critical to species survival by acquisition of conservation easements, or by other land protection mechanisms.

Habitat management:

* Develop and implement mitigation measures to manage the adverse effects of habitat fragmentation.

Habitat research:

* Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

Recommended Actions

Life history research:

* Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and habitat requirements.

Modify regulation:

* Adopt into New York's Environmental Conservation Law provisions which designate timber rattlesnake, smooth greensnake, black ratsnake, northern black racer, northern copperhead, eastern hognose snake, short-headed garter snake and worm snake as protected small game species.

Other action:

* Determine significance of specific threats to populations of species in this group, and formulate management options to control significant threats.
* Enhance law enforcement and public education to limit specimen collection, killing and translocation of woodland/grassland snake species.
* Educate the New York public to abandon misconceptions about the menace/value of woodland/grassland snakes.

Population enhancement:

* Employ restoration techniques for timber rattlesnakes at selected sites as needed including head starting and repatriation/relocation strategies.

Population monitoring:

* Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

* Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat for each of the woodland/grassland snake species in New York.

References

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Tennant, A. and R.D. Bartlett, 1999. Snakes of North America: Eastern and Central Regions. Gulf Publishing Co., Houston, TX.

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new york state

Comprehensive Wildlife Conservation Strategy

Appendix A5:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Insects

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Insect
Species Group: American burying beetle

Threats:
The causes of the decline for this federally Endangered beetle are unclear. Habitat fragmentation was the prevailing theory at the time of federal listing in 1989 and is still thought to be a primary factor in the species decline (Raithel 1991). Outright loss and alteration of habitat and a reduction in larval food resources (carcasses) are related and also thought to be involved. Disease or pesticides have also been mentioned as possible causes in the decline although a dramatic disappearance of this insect took place over wide areas before the widespread use of DDT. Today, the American burying beetle seems to be largely restricted to areas that are not heavily disturbed by human influence so further development and habitat alteration are considered current threats.

Trends:
The American burying beetle has been recorded historically from at least 150 counties in 35 states and three Canadian provinces extending from southern Maine west across the Great Lakes states to South Dakota, and south to Texas and Florida. At the time of federal listing it was known from just two locations; a small, but apparently stable population on Block Island off the coast of Rhode Island and a lower density, but more widespread population in eastern Oklahoma. East of the Appalachians records indicate that the species declined in a generally north to south direction, and the decline was well underway, if not complete by the early 1920s. West of the Appalachians, the decline occurred later. In the Midwest, the decline appears to have proceeded from the center of the range outward (Univ. Nebraska 2004). While it is now known to occur in Nebraska, South Dakota, Kansas, and Arkansas, as well as Oklahoma, these locations are rediscoveries or discoveries within the known historical range, and do not indicate an increasing trend. Reintroduction efforts have taken place in Massachusetts and Ohio.

SEQR - No Action Alternative:
With no action it is difficult to envision a scenario under which the American burying beetle would re-occupy New York State given the distance to the nearest known, extant site (Block Island to eastern point of Long Island is approximately15 miles over the ocean). It is remotely possible that a population of burying beetles remains on Gardiner's Island or at some other site in New York State, but even were this to be true any such site could be lost to natural or other causes without our knowledge, should surveys not be undertaken to search for the species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
American burying beetle (Nicrophorus americanus)	E		SH	G2G3	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American burying beetle (Nicrophorus americanus)	Lower Hudson - Long Island Bays	Unknown	Unknown
	Lake Erie		
	SW Lake Ontario		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American burying beetle (Nicrophorus americanus)	North Atlantic Coast	Unknown	Unknown
	Great Lakes		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American burying beetle (Nicrophorus americanus)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	grasslands

Goal and Objectives for American burying beetle

Goal: Assess the need for surveys for American burying beetle at specific localities in New York, conduct needed surveys to determine presence/absence, and assess the potential for a reintroduction effort for New York.

Objective 1 : Determine the presence/absence of American burying beetle at selected sites in New York.

Measure: *Survey results for selected sites.*

Objective 2 : Evaluate the Massachusetts and Ohio reintroduction efforts with respect to the potential to for a reintroduction effort for New York. This should be undertaken in conjunction with USFWS Recovery team should suitable reintroduction sites be identified.

Measure: *Reports on MA and Ohio reintroductions obtained, reviewed, and discussed with USFWS Recovery team.*

Objective 3 : Identify specific sites in New York that may warrant surveys for American burying beetle based on the likely presence of substantial populations of suitable sized carcasses, relative lack of human disturbance, and grassland or woodland habitat.

Measure: *Map of potential survey sites.*

Recommended Actions

Habitat research:

* Identify sites that may warrant surveys for American burying beetle based on likely availability of appropriate size carcasses, and relatively undisturbed habitat of grasslands or woodlands (probably mainly oak or oak/pine).

Other management plan:

* Incorporate findings into USFWS Recovery Plan and planning efforts.

Statewide baseline survey:

* In addition to Gardiner's Island, sites to be surveyed (if any) could be expected to occur within the vicinity of known, recorded New York locations for the species, but need not be restricted to those areas as the species overall range suggest it could possibly have occurred throughout the state. Surveys are called for in the USFWS Recovery Plan.

References

U. S. Fish and Wildlife Service - New England. No date. The American Burying Beetle. Endangered Species Fact Sheet.

Raithel, C. 1991. Letter to Peter Nye of March 14 1991 regarding American burying beetle records and survey needs for New York , including an attached survey protocol by Andrea Kozol.

New York State Department of Environmental Conservation. American Burying Beetle Fact Sheet. Endangered Species Unit, Albany, NY.

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Taxa Group: Insect

Species Group: Barrens buck moth

Threats:

Loss of habitat via direct destruction from construction and other human activity, invasive species, and natural succession due to fire suppression. Also spraying for mosquitoes and gypsy moth of both chemical and Bt control agents. Possibly impact from introduced parasites meant to control other Lepidopteran pest species. Light pollution from human development is an increasing concern for moths, but it is not clear what effect it might have on diurnal species like the buckmoth.

Trends:

Monitoring is sporadic for this species. Some populations where management is taking place (e.g. Albany Pine Bush Preserve) may be stable or increasing, while it is likely most populations are either stable or declining. More surveys are needed to determine actual population status.

SEQR - No Action Alternative:

Without any action it is likely that a few populations may continue to survive in refuge areas but will disappear from the majority of their range. Populations will become isolated and precarious without management.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Barrens buck moth (Hemileuca maia maia)						Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Barrens buck moth (Hemileuca maia maia)	Upper Hudson	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Barrens buck moth (Hemileuca maia maia)	Northern Appalachian/Boreal Forest	North Atlantic Coast	Unknown
	North Atlantic Coast	Northern Appalachian/Boreal Forest	Stable
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Barrens buck moth (Hemileuca maia maia)				
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	southern deciduous

Goal and Objectives for Barrens buck moth

Goal: Maintain viable populations of barrens buck moth throughout its historic range in New York State.

Objective 1 : Identify entities that will be responsible for long-term management and protection of buckmoth habitat.

Measure: *Entities are identified and funded to accomplish all actions necessary to maintain viable populations of the buckmoth throughout its range for the foreseeable future.*

Objective 2 : Preserve and manage locations for barrens buckmoths to maintain viable populations across its range in New York.

Measure: *Actions to protect and manage populations sites long-term are in place in sufficient locations across the species range to ensure its viability in New York.*

Objective 3 : Understand differences if any between inland barrens and coastal barrens populations

Measure: *Genetic/life history research determines whether there are more than one species or subspecies and whether the two population groups have different status and/or needs.*

Objective 4 : Understand habitat parameters necessary for viable populations of buckmoths.

Measure: *Life history and habitat research determine what aspects of habitat are necessary for good populations of buckmoths and what fluctuations in populations numbers are normal for the species.*

Objective 5 : Understand the status and distribution of all barrens buckmoth populations in New York

Measure: *Surveys and population monitoring programs determine where populations are located and whether they are stable, increasing or decreasing.*

Recommended Actions

Curriculum development:

* Develop and disseminate curricula to educate the public about management of "fire communities" and the protection and conservation needs of barrens buckmoth and other pine-barrens species.

Easement acquisition:

* Where appropriate, state or local municipalities or NGOs acquire easements to protect and manage buckmoth habitat.

Fact sheet:

* Update the barrens buckmoth fact sheet on paper and on webpage

Habitat management:

* Manage habitat via burning, cutting, mowing or other methods to stimulate scrub oak production in appropriate areas.

Habitat monitoring:

* Develop standardized protocols for measuring and evaluating the quality of barrens buckmoth habitat.
* Monitor habitat to determine suitability for buckmoth.

Habitat research:

* Conduct research to determine optimal habitat parameters for buckmoth.

Other action:

* Evaluate threats to barrens buckmoth and rank according to severity at all sites in New York.
* Work with researchers to determine if the Long Island populations are different from inland populations. If so, develop appropriate management and protection strategies to ensure long-term viability of both groups
* Work with researchers and experts on barrens buckmoth to define parameters of "viable" barrens buckmoth populations.
* Develop an outreach program to encourage local municipalities to include conservation of buckmoth habitat during local planning and project review

Population monitoring:

* Develop standardized survey protocol for barrens buckmoth.

Recommended Actions

* Survey populations to understand population status, trends and distribution

Private fee acquisition:

* Encourage private NGOs to acquire land to protect and manage buckmoth habitat.

State fee acquisition:

* State acquire land to protect and manage buckmoth habitat.

State land unit management plan:

* Incorporate buck moth management into appropriate state land area management plans

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Legge, John. 1992 Genetic differentiation between populations of the Hemileuca main-Complex. Report on file in Endangered Species Unit, NYS DEC, 625 Broadway, Albany, NY 12233. January 1992.

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Taxa Group: Insect
Species Group: Beach tiger beetles

Threats:
The extirpation of Cicindela dorsalis dorsalis from much of its former range has been attributed primarily to the destruction and disturbance of natural beach habitats from shoreline development, beach stabilization efforts, and high recreational use, all of which affect the larval stage. Oil slicks, use of pesticides for mosquito control, increased vehicular beach traffic, and natural phenomena such as winter beach erosion, flood tides, and hurricanes may also have contributed to the species decline (USFWS 1993a). Threats identified at a recent Recovery Team meeting for Cicindela dorsalis dorsalis include groins, bulkheads, shoreline hardening, human use, sand backfill/deposition, pesticides, spills, storms, sea level rise, invasive species, erosion, and disruption of sand sources (USFWS 2004). Some of these same factors threaten the Chesapeake Bay populations of Cicindela puritana, while Connecticut River populations of this species have probably been lost due to the construction of dams, urbanization and bank stabilization, pollution, excessive recreational use (including off-road vehicle use), and invasion of woody plants (USFWS 1993b).

Trends:
These federally listed species have declined throughout major portions of their range. Cicindela dorsalis dorsalis is thought to be extirpated from New York State. The historical presence of Cicindela puritana in New York is based on three location records in a Cornell University Master's thesis (Gordon 1939), and a New York State list published in 1926 (Leonard). One of the records appears to be a case of mistaken identification, one of the records appears to be a case of mistaken location (taken in CT rather than NY), while the third record is indefinite in location, listed only as "NY" (Novak 1997). It is possible this species never actually occurred in NY.

SEQR - No Action Alternative:
Cicindela dorsalis dorsalis is likely extirpated from NY, while Cicindela puritana is almost certainly extirpated if it did ever occur in the state. With no action we will remain uncertain as to whether either species is still extant in the state and there will be no efforts to restore Cicindela dorsalis dorsalis to a significant portion (Long Island, NY) of its former range. If either is still present in the state (one privately owned offshore island with very restricted access could possibly support Cicindela dorsalis dorsalis) they could persist at this or other existing sites as long as the habitat is protected and the population size is large enough to weather natural population fluctuation. There are no nearby populations of either species so neither species is likely to re-colonize NY sites without assistance.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Puritan tiger beetle (Cicindela puritana)	T		SNA	G1G2	U	Resident
Northeastern beach tiger beetle (Cicindela dorsalis	T		SX	G4T2	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northeastern beach tiger beetle (Cicindela dorsalis dorsa	Lower Hudson - Long Island Bays	Unknown	Unknown
Puritan tiger beetle (Cicindela puritana)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Northeastern beach tiger beetle (Cicindela dorsalis dorsali	North Atlantic Coast	Unknown	Unknown
Puritan tiger beetle (Cicindela puritana)	Unknown	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northeastern beach tiger beetle (Cicindela dorsalis dorsalis)	all	Terrestrial	coastal	beach/shoreline
Puritan tiger beetle (Cicindela puritana)	all	Terrestrial	coastal	beach/shoreline

Goal and Objectives for Beach tiger beetles

Goal: Complete a final status assessment for Cicindela dorsalis dorsalis and Cicindela puritana for NY and assess the potential for restoration of Cicindela dorsalis dorsalis in NY.

Objective 1 : Evaluate the potential for the restoration of the federally listed Cicindela dorsalis dorsalis on Long island.

Measure: *Data regarding the extent of beach not accessible to vehicle and heavy foot traffic, beach width/ length measurements, qualitative population data for Cicindela hirticollis at a selected number of beaches on Long Island. Coordinate with Recovery Team.*

Objective 2 : Research the third published record for Cicindela puritana for New York in order to determine if the species can be confirmed as having occurred historically in the state.

Measure: *Survey of museums for NY specimens. Review of old literature that may shed light on the published record in Leonard (1926).*

Objective 3 : Through targeted surveys at a selected number of beaches on Long Island, more definitively answer whether this species is extirpated from New York.

Measure: *Number of beaches surveyed with presence/absence for Cicindela dorsalis dorsalis.*

Recommended Actions

Habitat research:

* Beaches on Long Island where Cicindela dorsalis dorsalis formerly occurred or could occur should be examined to determine if any support large populations of an associated species (Cicindela hirticollis) or have other factors (such as a long stretch of beach where vehicle and heavy foot traffic is restricted) suggesting that they may be capable of supporting a population of Cicindela dorsalis. Coordinate with Cicindela dorsalis dorsalis Recovery Team.

Other management plan:

* Information from surveys should be provided to the USFWS recovery teams for Cicindela dorsalis dorsalis and Cicindela puritana.

Relocation/reintroduction:

* An assessment as to the feasibility of a New York reintroduction site for Cicindela dorsalis dorsalis should be given consideration in conjunction with USFWS Cicindela dorsalis dorsalis Recovery Team planning. Introductions took place in New Jersey in 1994, 1995, and 1997 and the beetles were still present as of 2003 (USFWS 2004).

Statewide baseline survey:

* Status surveys should be conducted to definitively determine if Cicindela dorsalis dorsalis is extirpated from the state. Surveys should also seek to determine if C. puritana may be present in the state. In at least one case, access to private lands will be essential.
* Compile a complete list of all beaches searched for Cicindela dorsalis dorsalis in recent years as part of NY Natural Heritage Program surveys of NYS Parks, or other surveys.

References

Leonard, M. D. 1926. A list of the insects of New York. Cornell University Agr. Exp. Sta. Memoir No. 101.

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Novak, P. 1997. Memorandum to Kathy O'Brien regarding Cicindela puritana specimens at the Staten Island Museum. 2 pp.

U. S. Fish and Wildlife Service. 1993. Puritan Tiger Beetle (Cicindela puritana G. Horn) Recovery Plan. Agency Draft. Hadley, MA. 43 pp.

U. S. Fish and Wildlife Service. 1993a. Northeastern Beach Tiger Beetle (Cicindela dorsalis dorsalis Say) Recovery Plan. Hadley, MA. 50 pp.

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Taxa Group: Insect
Species Group: Bog buck moth

Threats:
Changes in water levels in fens where populations are located. Natural succession of fens to woody swamp. Encroachment of invasive species such as purple loosestrife and phragmites and glossy buckthorn. Development in the watersheds of the drainages supplying water to the fens which change water patterns and send pollution into the wetlands. Any spraying for mosquitoes, gypsy moths or other pests may be a threat if done near the populations. There may be other threats which are not yet understood which more research on the species and its habitat may explain. For instance, we do not know the reason for declines in some of the populations in Deer Creek Marsh WMA or Rainbow Shores, and we do not understand the effect of parasitism on population levels.

Trends:
Some trend data are available but for the most part long-term population data have not been accumulated to well understand the population dynamics of the species. More research into this is necessary. Current annual censuses have shown short-term declines in some of the populations sites but short term increases have occurred in others. We have no information about the Selkirk fen population due to no access for 15 years or so. Now that the state owns the site, it will be possible to begin a dataset on this population.

SEQR - No Action Alternative:
With no action, the populations of this species will likely be affected negatively by changes in the wetland systems they depend on and by other factors we will not have an understanding of. It is likely they will die out in the foreseeable future.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bog buckmoth (Hemileuca sp.)						Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bog buckmoth (Hemileuca sp.)	SE Lake Ontario	SE Lake Ontario	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bog buckmoth (Hemileuca sp.)	Great Lakes	Great Lakes	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bog buckmoth (Hemileuca sp.)	all	Palustrine	peatlands	bog/fen

Goal and Objectives for Bog buck moth

Goal: Maintain viable populations of bog buck moths in New York into the foreseeable future.

Objective 1 : Evaluate potential to introduce the species to other fens in New York. If evaluation is positive, conduct introduction and monitoring of success.

Measure: *Parameters of bog buckmoth success are researched and applied to other potential population sites. Introduced populations are monitored and determined to be viable long term.*

Objective 2 : Maintain current populations at viable levels to ensure that self-sustaining populations persist long-term.

Measure: *Monitoring and management programs are in place to detect and reverse downward trends not related to natural fluctuations. Management actions address and reverse downward trends*

Objective 3 : Understand population status and dynamics of bog buckmoths at all current locations in New York.

Measure: *Monitoring and research programs are in place to provide data sufficient to understand how populations behave at individual sites and what roles climate, hydrology, food availability, and parasites play on population levels.*

Recommended Actions

Fact sheet:

* Develop a fact sheet for the bog buckmoth for paper distribution and for the website.

Habitat management:

* Take appropriate action to remove invasive species or control, deter, or repair damage from human activities

Habitat monitoring:

* Identify development and other human impacts on the population sites and whether they are negatively affecting the populations
* Identify invasive species contamination of all population sites and whether it is negatively impacting populations.

Recommended Actions

Habitat restoration:

* With understanding of habitat requirements and threats, identify methods to maintain and improve habitat and if possible expand the species to other wetlands.

Life history research:

* Conduct research on effects of egg/larvae parasitism on population dynamics at all sites.
* Determine viability parameters for bog buckmoth populations
* Conduct research to better understand pupation habitat, immigration and emigration from population sites, and long term population dynamics.

Other action:

* Contact experts in Ontario Canada regarding the status of the sites previously known from that province.
* Pursue final naming of the species (subspecies) by experts supposedly working on this.

Other management plan:

* Develop a management/recovery plan for the bog buckmoth that includes all current knowledge of the species and its habitat and recommendations for actions to recover the species to the extent that it can be down-listed or de-listed.

Population monitoring:

* Continue monitoring of all populations. Increase effectiveness of monitoring techniques.

State land unit management plan:

* Incorporate bog buckmoth management into management and work plans for NYS DEC lands where it occurs.

References

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Stanton, Edward J. 2001. Status of the monitoring program for the bog buckmoth populations in Oswego county, New York. Submitted to The Nature Conservancy Central and Western New York Chapter, Eastern Lake Ontario Project Office, 31 South Jefferson Street, Pulaski, NY 13142. 8pp.

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Taxa Group: Insect
Species Group: Karner blue butterfly

Threats:
Loss of habitat and habitat fragmentation from development, forest succession, ATV use, invasive species, dumping and inappropriate mowing and other physical disturbance of the habitat. Physical destruction of butterflies themselves from mowing, crushing, etc. or spraying of pesticides. Decline of lupine from unknown factors (speculation about acidification from rain).

Trends:
Seriously declining at almost all sites. Only one seems to be stable, but all sites are vulnerable to human impacts and poor weather.

SEQR - No Action Alternative:
Without protection and active management to improve and increase habitat this species will become extirpated from New York.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Karner blue (Lycaeides melissa samuelis)	E		S1	G5T2	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Karner blue (Lycaeides melissa samuelis)	Upper Hudson	Upper Hudson	Decreasing
	Delaware		
	SE Lake Ontario		
	SW Lake Ontario		
	Lower Hudson - Long Island Bays		
	NE Lake Ontario - St. Lawrence		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Karner blue (Lycaeides melissa samuelis)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	Great Lakes		
	High Allegheny Plateau		
	North Atlantic Coast		
	St. Lawrence-Lake Champlain Valley		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Karner blue (Lycaeides melissa samuelis)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	open upland	grasslands

Goal and Objectives for Karner blue butterfly

Goal: Restore and maintain at least 5 viable Karner blue metapopulations in New York.

Objective 1 : Assure Adequate funding for long-term protection and management of each metapopulation.

Measure: *Protection/management/monitoring needs for each metapopulation are included in state work plans, unit management plans, organization budgets, etc. that are used to secure funding.*

Objective 2 : Continue legal protection of all occupied sites.

Measure: *All claims of damage and/or disturbance to the species and its habitat are pursued by law enforcement with the result that the damage is corrected and fines or other mitigation are required of the perpetrators.*

Objective 3 : Continue protection of all Karner blue sites by review and comment on development projects that might impact populations and habitat.

Measure: *All development projects with potential to impact Karner blue are reviewed and, where necessary, protection or mitigation is achieved via cooperation from municipalities and developers or via permit conditions.*

Objective 4 : Develop and implement a monitoring protocol to estimate Karner blue populations and detect downward trends in the most effective and economical method.

Measure: *Karner blue monitoring at all metapopulations is sufficient to detect downward trends and estimate population levels.*

Objective 5 : Ensure long-term viability of metapopulations with protection/management entities dedicated to long-term maintenance of the metapopulations even after delisting.

Measure: *Each metapopulation has a long-term protection/management entity designated for it.*

Objective 6 : Establish viable metapopulations besides those targeted in the recovery and potential recovery units where opportunities arise in order to keep the numbers of metapopulations and the extent of the range of the species in New York above minimum levels.

Measure: *New metapopulations are established where possible, increasing connectivity among metapopulations and increasing the total number of Karner blues in the state.*

Objective 7 : Explore the feasibility of developing a statewide Habitat Conservation Plan for the Karner blue in New York State

Measure: *New York works with USFWS in evaluating the scope of a Habitat Conservation Plan, costs, funding, staff time expenditure, and benefits to the species, the State and to landowners.*

Objective 8 : Identify entities to be responsible for long-term management and protection of each Karner blue metapopulation.

Measure: *Each metapopulation has a management/protection entity identified and imbued with the responsibility to keep the metapopulation viable. Entity has access to funding necessary to conduct necessary actions and authority/permission to conduct the actions.*

Objective 9 : Improve connectivity among Karner blue sites within all recovery and potential recovery units.

Measure: *All Karner blue metapopulations have at least "good" connectivity according to habitat viability rating system in Karner blue butterfly state recovery plan.*

Objective 10 : Incorporate needs of the Karner blue into the New York State Landowner Incentive Program

Measure: *Landowner Incentive Program projects are developed and funded to benefit the Karner blue butterfly.*

Objective 11 : Increase and improve habitat at all Karner blue sites where management access exists.

Measure: *All managed Karner blue sites are at least "good" according to habitat viability rating system described in draft Karner blue butterfly state recovery plan.*

Objective 12 : Increase the number of Karner blue sites receiving appropriate management and protection.

Measure: *Outreach to owners of Karner blue habitat results in all or most sites receiving appropriate management and protection.*

Objective 13 : Keep habitat and monitoring activities current as knowledge of the Karner blue.

Measure: *Recovery plans, monitoring and habitat management plans are kept flexible and updated to adapt new management techniques to New York metapopulations.*

Objective 14 : Maintain an adequate land base for at least 5 viable Karner blue metapopulations in New York.

Measure: *All 4 recovery units in Glacial Lake Albany and at least 1 in either the Rome Sandplains or Western NY recovery units have metapopulations occupying areas rated "good" according to the habitat viability rating system in the Kb state recovery plan*

Objective 15 : Maintain Karner blue numbers in metapopulations at viable levels.

Measure: *All Karner blue metapopulations have at least "good" butterfly numbers according to habitat viability rating system in Karner blue butterfly state recovery plan.*

Objective 16 : Obtain funding from federal, state and private programs to benefit the Karner blue.

Measure: *Existing and new funding programs help provide funding for Karner blue management, monitoring and outreach for DEC and for recovery partners.*

Recommended Actions

Captive breeding:

* Continue to send Karner blue eggs or larvae to New Hampshire captive breeding facility and receive eggs or larvae in return to be returned to the donor sites or new areas of habitat.

Easement acquisition:

* Acquire easements where appropriate to create habitat and buffer from human development in all Karner blue recovery units according to the draft state Karner blue recovery plan.

Educational signs:

* Construct educational signs for Karner blue population sites on state land and private land to educate the public on protection of the site and values of habitat.

Fact sheet:

* Update the Karner blue fact sheet.

Recommended Actions

Habitat management:

* Manage population sites to increase and improve habitat for existing populations
* Manage new areas to create new habitat and create dispersal corridors between population sites and to buffer areas against human encroachment.

Habitat monitoring:

* Implement habitat viability monitoring protocol (to be developed under SWG grant).

Invasive species control:

* As part of habitat management, control invasive species such as spotted knapweed, aspen, black locust, garlic mustard, and other species detrimental to Karner blue habitat.

Life history research:

* Research aspects of Karner blue life history that are poorly understood including dispersal dynamics, especially the best configuration of corridors, ability to successfully nectar from lupine, etc.

Other action:

* Develop an outreach effort to municipalities to increase the effectiveness of project review in terms of protection and enhancement of Karner blue sites and to further the overall recovery strategies for the species.
* Use state funding programs to benefit Karner blue management, monitoring and outreach by partners in Karner blue recovery.
* Develop and implement incidental take policy for endangered species take permit so that opportunities to gain more from mitigation that would be lost can be taken advantage of from developers and enrollees of the Safe Harbor Program.
* Work with USFWS and TNC in developing a Safe Harbor program in New York State for the Karner blue butterfly.
* If evaluation of cost/benefits is positive, work with USFWS in developing a Habitat Conservation Plan for the Karner blue butterfly in New York State.
* Identify long-term protection/management entities that will sustain Karner blue metapopulations before and after delisting.
* Apply for funding from all available federal, state, and private funding programs appropriate to the Karner blue for acquisition, outreach, management and monitoring.
* Develop a network of volunteers to "adopt" sites for management and/or assist in monitoring activities
* Develop and implement an outreach program to Karner blue site landowners to increase protection and management of those sites.
* Protect existing Karner blue sites and potential habitat areas through review of development projects.
* Contact all landowners with Karner blue sites on their property and alert them to the presence and legal protection of the site.

Recommended Actions

* Enroll partners in Karner blue management via the Landowner incentive program

Other management plan:

* As a member of the recovery team, participate with US Fish and Wildlife Service in revisions to the federal recovery plan for the Karner blue.

Population monitoring:

* Continue to monitor all known Karner blue sites where access is allowed. Pursue access where it is presently denied.

Relocation/reintroduction:

* Where natural colonization will not suffice, reintroduce Karner blue to new habitat areas made in recovery units.

State fee acquisition:

* Acquire land to create habitat and buffer from human development in all Karner blue recovery units according to the draft state Karner blue recovery plan.

State land unit management plan:

* Develop management plans for state land where Karner blue habitat exists and where we want to create and expand it.

Statewide management plan:

* Complete the state recovery plan for the Karner blue.
* Incorporate Karner blue needs into UMPs and other land management plans in the recovery and potential recovery units.

References

Department of Environmental Conservation. 1998. Draft Karner Blue Butterfly New York State Recovery Plan. Draft 4/98 Working Draft.

US Fish and Wildlife Service. 2003. Final Recovery Plan for the Karner Blue Butterfly (Lycaeides melissa samuelis). US Fish and Wildlife Service, Fort Snelling, Minnesota. 273 pp.

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Taxa Group: Insect
Species Group: Odonates of bogs/fens/ponds

Threats:

Little published information is available citing specific cases of negative impacts to bog/fen odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. Examples include peat mining, ditching, filling, eutrophication and changes in dissolved oxygen content, direct effects of pesticides (e.g. for mosquito control or from agricultural runoff), and increases in the sediment load of the wetland (such as might result should logging occur down to the wetland edge). Natural succession could also threaten some sites as shallow pools fill in with vegetation over time.

Trends:

Many of these species have only been collected or observed a few times in New York State so there is virtually no information on population trends. One species, Williamsonia lintneri, is likely extirpated from the one area where it was discovered and from the state as a whole as well. Williamsonia fletcheri appears to have been extirpated from the lone site for it in the High Allegany Plateau.

SEQR - No Action Alternative:

Without the indicated actions, the status of these species will remain uncertain and at least some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. There are a large number of protected bog/fen habitats in the Adirondack Park and elsewhere in New York State, but some of these species may or do occur outside of the Adirondacks where these habitats are more likely to come under threat. In addition, some of the species are known from, and may occur in, a small number of sites putting the species at risk of extirpation from various factors.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Southern sprite (Nehalennia integricollis)			S1	G5	U SC	Resident
Subarctic bluet (Coenagrion interrogatum)			S1S3	G5	U	Resident
Black meadowhawk (Sympetrum danae)			S2S3	G5	U	Resident
Yellow-sided skimmer (Libellula flavida)			S1	G5	U	Resident
Ringed boghaunter (Williamsonia lintneri)			SH	G3	U	Resident
Ebony boghaunter (Williamsonia fletcheri)			S1	G3G4	U	Resident
Incurvate emerald (Somatochlora incurvata)			S1	G4	U	Resident
Forcipate emerald (Somatochlora forcipata)			S1	G5	U	Resident
Taper-tailed darner (Gomphaeschna antilope)			S1	G4	U	Resident
Subarctic darner (Aeshna subarctica)			S1?	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Subarctic darner (Aeshna subarctica)	Susquehanna Upper Hudson	Susquehanna	Unknown
Taper-tailed darner (Gomphaeschna antilope)	Unknown	Upper Hudson	Unknown
Forcipate emerald (Somatochlora forcipata)	Unknown	NE Lake Ontario - St. Lawrence Upper Hudson	Unknown
Incurvate emerald (Somatochlora incurvata)	Unknown	NE Lake Ontario - St. Lawrence Upper Hudson	Unknown
Ebony boghaunter (Williamsonia fletcheri)	Susquehanna	NE Lake Ontario - St. Lawrence Upper Hudson	Unknown
Ringed boghaunter (Williamsonia lintneri)	Upper Hudson	Unknown	Unknown
Yellow-sided skimmer (Libellula flavida)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Black meadowhawk (Sympetrum danae)	SW Lake Ontario Upper Hudson	Upper Hudson	Unknown
Subarctic bluet (Coenagrion interrogatum)	Unknown	NE Lake Ontario - St. Lawrence	Unknown
Southern sprite (Nehalennia integricollis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Subarctic darner (Aeshna subarctica)	High Allegheny Plateau Northern Appalachian/Boreal Forest	High Allegheny Plateau	Unknown
Taper-tailed darner (Gomphaeschna antilope)	Unknown	High Allegheny Plateau	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Forcipate emerald (Somatochlora forcipata)	Unknown	Northern Appalachian/Boreal Forest	Unknown
Incurvate emerald (Somatochlora incurvata)	Unknown	Northern Appalachian/Boreal Forest	Unknown
Ebony boghaunter (Williamsonia fletcheri)	High Allegheny Plateau	Northern Appalachian/Boreal Forest St. Lawrence-Lake Champlain Valley	Unknown
Ringed boghaunter (Williamsonia lintneri)	Lower New England Piedmont	Unknown	Unknown
Yellow-sided skimmer (Libellula flavida)	North Atlantic Coast Lower New England Piedmont	North Atlantic Coast	Unknown
Black meadowhawk (Sympetrum danae)	Great Lakes Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
Subarctic bluet (Coenagrion interrogatum)	Unknown	Northern Appalachian/Boreal Forest	Unknown
Southern sprite (Nehalennia integricollis)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Subarctic darner (Aeshna subarctica)				
	all	Palustrine	peatlands	bog/fen
Taper-tailed darner (Gomphaeschna antilope)				
	all	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	all	Palustrine	peatlands	bog/fen
Forcipate emerald (Somatochlora forcipata)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Forcipate emerald (Somatochlora forcipata)				
	all	Palustrine	peatlands	bog/fen
Incurvate emerald (Somatochlora incurvata)				
	all	Palustrine	peatlands	bog/fen
Ebony boghaunter (Williamsonia fletcheri)				
	all	Palustrine	peatlands	bog/fen
Ringed boghaunter (Williamsonia lintneri)				
	all	Palustrine	peatlands	bog/fen
Yellow-sided skimmer (Libellula flavida)				
	all	Palustrine	peatlands	bog/fen
Black meadowhawk (Sympetrum danae)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	peatlands	bog/fen
Subarctic bluet (Coenagrion interrogatum)				
	all	Palustrine	peatlands	bog/fen
Southern sprite (Nehalennia integricollis)				
	all	Palustrine	peatlands	bog/fen

Goal and Objectives for Odonates of bogs/fens/ponds

Goal: Maintain a sufficient number of self-sustaining populations of these dragonflies and damselflies, at sites with protected habitat, to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species.

Measure: *Number of studies.*

Objective 2 : Maintain existing populations, and if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of these species at known, extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations that can be identified and accessed, and by conducting surveys to at least 25 bogs/fens in each basin and each ecoregion north of Long Island.

Measure: *Number of bogs/fens surveyed.*

Objective 5 : Obtain baseline distribution data by conducting surveys of all known historic locations that can be identified and accessed, and by conducting surveys to at least 5 bogs/fens in the North Atlantic Coast ecoregion.

Measure: *Number of bogs/fens surveyed.*

Objective 6 : Protect, manage, restore, monitor habitats occupied by these species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species at the site.*

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that at least a few species will be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Recommended Actions

Statewide baseline survey:

* Most of these species are known from fewer than 10 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state.

References

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey, 14(2): 1-364.

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Donnelly, T. W. 1992. The Odonata of New York. Bulletin of American Odonatology 1(1):1-27.

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Taxa Group: Insect
Species Group: Odonates of brackish marshes/lakes/ponds

Threats:
Little published information is available citing specific cases of negative impacts to brackish marsh odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. Examples include ditching, filling, eutrophication and changes in dissolved oxygen content, direct effects of pesticides (e.g. for mosquito control or from agricultural runoff), and other chemical contamination from runoff or discharge of agricultural, industrial or urban effluent.

Trends:
Both of these species have been collected or observed at fewer than 10 sites in New York State and there is virtually no information on population trends.

SEQR - No Action Alternative:
Without the indicated actions, the status of these species will remain uncertain and at least some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. There are many brackish marshes, lakes and ponds from the lower Hudson valley out to the eastern end of Long Island and many of these are on protected lands such as state or National Parks. Clarification of whether the species are widespread and abundant in these sites is needed before one could offer a better evaluation of what no action could lead t to.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Rambur's forktail (Ischnura ramburii)			S2	G5	U	Resident
Needham's skimmer (Libellula needhami)			S2S3	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Needham's skimmer (Libellula needhami)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Rambur's forktail (Ischnura ramburii)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Needham's skimmer (Libellula needhami)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Rambur's forktail (Ischnura ramburii)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Needham's skimmer (Libellula needhami)				
	all	Estuarine	intertidal	emergent marsh
	all	Palustrine	mineral soil wetland	emergent marsh
Rambur's forktail (Ischnura ramburii)				
	all	Estuarine	intertidal	emergent marsh
	all	Palustrine	mineral soil wetland	emergent marsh

Goal and Objectives for Odonates of brackish marshes/lakes/ponds

Goal: Maintain a sufficient number of self-sustaining populations of these dragonflies and damselflies, at sites with protected habitat, to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species.

Measure:

Objective 2 : Maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of these species at known, extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations that can be identified and accessed, and by conducting surveys to at least 10 brackish marshes, ponds, and lakes in the Lower New England/Northern Piedmont ecoregion.

Measure: *Number of brackish marshes, ponds, and lakes surveyed.*

Objective 5 : Obtain baseline distribution data by conducting surveys of all known historic locations that can be identified and accessed, and by conducting surveys to at least 20 brackish marshes, ponds, and lakes in the North Atlantic Coast ecoregion.

Measure: *Number of brackish marshes, ponds, and lakes surveyed.*

Objective 6 : Protect, manage, restore, and monitor sites occupied by these species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that either one or both of these species could be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* Both of these species are known from fewer than 10 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state (where brackish habitats occur - LNE and NAC ecoregions).

References

Dunkle, S. W. 2000. Dragonflies through binoculars: A field guide to dragonflies of North America. Oxford Uni. Press. NY, NY. 266 pp.

Nikula, B, J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. 196 pp.

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Donnelly, T. W. 1992. The Odonata of New York. Bulletin of American Odonatology 1(1):1-27.

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Taxa Group: Insect
Species Group: Odonates of coastal plain lakes/ponds

Threats:
Little published information is available citing specific cases of negative impacts to coastal plain pond odonates, but any activities which degrade the sensitive hydrology or water quality of these habitats would threaten populations of these odonates. Examples include ditching, filling, eutrophication and changes in dissolved oxygen content, direct effects of pesticides (e.g. for mosquito control or from agricultural runoff), and other chemical contamination from runoff or discharge of agricultural, industrial or urban effluent. Introduction of fish may be a threat as some of these species are thought to be restricted to, or reach their highest population levels in fishless ponds. Historically, coastal plain ponds dried out completely during occasional severe droughts, which prevented fish from establishing themselves in these ponds. Today, many ponds in the Central Pine Barrens never go completely dry due to deep holes dug at the edge of nearly all coastal plain ponds, and several species of fish introduced by the public are permanent pond residents. Off road vehicle use of pond shores and groundwater withdrawal have been noted as specific problems in New England and New York. At the present time, only a few public water supply wells are currently located near existing coastal plain ponds on Long Island so groundwater withdrawal may not be a major threat to existing ponds. Future new supply water wells could pose a threat, if located near the ponds. While groundwater sources are protected for the majority of ponds within the Central Pine Barrens Core Preserve, they are not protected for ponds in the Compatible Growth Area.

Trends:
Enallagma recurvatum has been found at nine sites on Long Island, while Enallagma pictum has been found at three sites, and Enallagma minusculum at just two sites. There is virtually no information on population trends at any of these sites. Although none of these species are absolutely restricted to coastal plain ponds in Rhode Island and Massachusetts they are predominantly coastal plain pond species (Brown pers. comm.) and all NY sites for E. pictum and E. recurvatum are coastal plain ponds. A fourth species, Enallagma laterale, co-occurs with the other three species on Long Island, but is even less restricted to coastal plain ponds and in NY has been found at several ponds in the Hudson Highlands so this species has been placed in the lakes/ponds habitat grouping.

SEQR - No Action Alternative:
Many of the known sites on Long Island are found on lands that are protected from further development such as state or county lands in the Central Pine Barrens and Long Pond Greenbelt. Groundwater sources are protected for many, but not all ponds so no action could result in the loss of damselfly populations at these unprotected ponds. Some sites are on private lands where the water quality may be at risk and populations could be lost from these sites as well. No action could also result in the loss of sites that have not yet been documented for these species. The loss of any existing populations could lead to the need for a change in listing status to Endangered or to a higher likelihood of eventual extirpation from the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Scarlet bluet (Enallagma pictum)			S1	G3	T	Resident
Little bluet (Enallagma minusculum)			S1	G3G4	T	Resident
Pine barrens bluet (Enallagma recurvatum)			S1S2	G3	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Pine barrens bluet (Enallagma recurvatum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Little bluet (Enallagma minusculum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Scarlet bluet (Enallagma pictum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Pine barrens bluet (Enallagma recurvatum)	North Atlantic Coast	North Atlantic Coast	Unknown
Little bluet (Enallagma minusculum)	North Atlantic Coast	North Atlantic Coast	Unknown
Scarlet bluet (Enallagma pictum)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Pine barrens bluet (Enallagma recurvatum)	all	Lacustrine	coastal plain	sand/gravel bottom
Little bluet (Enallagma minusculum)	all	Lacustrine	coastal plain	sand/gravel bottom
Scarlet bluet (Enallagma pictum)	all	Lacustrine	coastal plain	sand/gravel bottom

Goal and Objectives for Odonates of coastal plain lakes/ponds

Goal: Maintain a sufficient number of self-sustaining populations of these damselflies, at sites with protected habitat, to ensure the long term perpetuation of the species within their historic range in New York State.

Objective 1 : Increase our understanding of the ecology of these damselflies including habitat preferences and threats to the species.

Measure: *Number of studies completed.*

Objective 2 : Maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these damselflies in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of the three threatened species at known extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance (compared to one another and to other sites in the species range such as MA and RI).*

Objective 4 : Obtain baseline distribution data by conducting surveys of at least 20 coastal plain ponds on Long Island (North Atlantic Coast ecoregion) where the three threatened species have not been documented.

Measure: *Number of coastal plain ponds surveyed.*

Objective 5 : Protect, manage, restore, and monitor coastal plain pond habitats occupied by these species.

Measure: *Number of ponds for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long term viability of the ponds.*

Recommended Actions

Educational signs:

* Educate the public not to introduce fish into historically fishless coastal plain ponds or new species of fish into coastal plain ponds where the species did not historically occur.

Habitat management:

* Reduce or eliminate detrimental ATV use in and around coastal plain ponds supporting state threatened damselflies
* Where possible, remove introduced fish or other aquatic animals that may be detrimental to odonate populations through excessive predation on larvae.
* Where possible, remove invasive, non-native plants from ponds and adjacent uplands that may significantly impact larval and adult odonate survival and reproduction.

Recommended Actions

Habitat monitoring:

* Identify existing and potential locations of public water supply wells and ensure that present and future water withdrawals will not alter the normal range of variation of ground and pond water elevation.
* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.
* Identify existing and potential sources of invasive species (including fish).
* Compile existing baseline data on habitat quality and threats. Include pond water quality (pH, conductivity, nutrients, toxins), pond hydrographs (fluctuations in water level with time), presence of fish, presence of characteristic native plants and invasive species, history of ATV use, history of pesticide spraying for mosquito control, extent of upland habitat around each pond.

Habitat research:

* Support and encourage research that would increase knowledge of the impact of poorly known threats to odonates (e.g. water quality degradation, atmospheric deposition, invasive species, pesticide spraying).
* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts. Include both pond and adjacent upland habitats.

Habitat restoration:

* Wherever possible, fill in non-natural , deep water-retaining holes in coastal plain ponds.
* Identify existing and potential sources of nutrients, toxins, and other chemicals originating from human activities and reduce/eliminate/prevent these where possible.

Modify regulation:

* Ensure that aerial pesticide spraying does not occur over or in close proximity to ponds and adjacent uplands that support these state listed damselflies during the period of adult emergence and flight.
* Modify regulations to provide expanded protection for uplands adjacent to coastal plain ponds that support state threatened damselflies.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* Conduct surveys for these species at potential sites throughout the state (expected range for these species is Long Island and Lower New England ecoregion, possibly Westchester County only). These species are known from fewer than 10 locations in the state, but new populations probably remain to be discovered for all of the species. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct these surveys.

References

Central Pine Barrens Joint Planning and Policy Commission, Protected Lands Council. 2003. Ecological Principles for Management and Stewardship for tl Long Island Central Pine Barrens. Pages 21-28 (Freshwater Wetlands Section).

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Carpenter, V. A. 1987. The dragonflies (Odonata) of Cape Cod, Massachusetts with notes on six state-listed species in Barnstable and Plymouth Counties. 101 pp.

Carpenter, V. A. 1990. An ecological and behavioral study of the barrens bluet damselfly (Enallagma recurvatum) including results of general odonate inventories. 43 pp.

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Taxa Group: Insect
Species Group: Odonates of high elevation lakes

Threats:
No published information is available citing specific cases of negative impacts to this species or other lake dwelling odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. Examples include eutrophication and changes in dissolved oxygen content, direct effects of pesticides, increases in the sediment load of the lake (such as might result should logging occur down to the lake edge), chemical contamination by runoff of agricultural or other discharge, acidification of lakes by airborne industrial emissions, and possibly increased predation of larvae due to stocking of fish.

Trends:
This species have been collected just two times in New York State, both records are very old, and there is no information on population trends or whether the species is still present at those two sites.

SEQR - No Action Alternative:
Without the above actions, the status of this species will remain uncertain, and if still extant in the state, it could be in jeopardy of significant declines or extirpation form the state over the long-term. While the two records for this species are from protected state lands the species is not known to be extant at either and both locations could be sensitive to airborne emissions leading to increased acidification.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ringed emerald (Somatochlora albicincta)			SH	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Ringed emerald (Somatochlora albicincta)	Upper Hudson	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Ringed emerald (Somatochlora albicincta)	Northern Appalachian/Boreal Forest	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ringed emerald (Somatochlora albicincta)				
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
	all	Palustrine	peatlands	bog/fen

Goal and Objectives for Odonates of high elevation lakes

Goal: Maintain a sufficient number of self-sustaining populations of this species at sites with protected habitat to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of this species including habitat preferences and threats to the species.

Measure: *Number of studies.*

Objective 2 : Maintain existing populations and, if needed and possible, establish or restore additional populations to ensure the long-term persistence of this species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of this species at any extant sites that are identified as a result of baseline distribution surveys.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys for Somatochlora albicincta at 2 historical locations and at least 10 other high elevation lakes/ponds in the Northern Appalachian Forest ecoregion.

Measure: *Number of lakes/ponds surveyed.*

Objective 5 : Obtain baseline distribution data by conducting surveys for Somatochlora cingulata to at least 5 lakes/ponds in the Catskills (High Allegany Plateau ecoregion). The lone historical record from that ecoregion is not from breeding habitat.

Measure: *Number of lakes/ponds surveyed.*

Objective 6 : Protect, manage, restore, and monitor sites occupied by this species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Habitat research:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.
* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is possible that this species will be recommended for listing and officially adding the species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for this species at any extant known sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* This species is known from just two locations in the state, and may no longer occur at those sites, but new populations may remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for this species at potential sites throughout the state.

References

Dunkle, S. W. 2000. Dragonflies through binoculars: A field guide to dragonflies of North America. Oxford Uni. Press. NY, NY. 266 pp.

Nikula, B, J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. 196 pp.

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Taxa Group: Insect

Species Group: Odonates of lakes/ponds

Threats:

Little published information is available citing specific cases of negative impacts to these three species or other lake dwelling odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. Examples include eutrophication and changes in dissolved oxygen content, direct effects of pesticides, increases in the sediment load of the lake (such as might result should logging occur down to the lake edge), chemical contamination by runoff of agricultural or other discharge, acidification of lakes by airborne industrial emissions. Groundwater withdrawal is also a likely threat at pond/lake sites on Long Island.

Trends:

All five of these species have been collected or observed at fewer than 15 locations in New York State and there is virtually no information on population trends. Tetragoneuria semiaquea, Enallagma laterale, and Anax longipes may also be associated with coastal plain ponds, but were left in this grouping as they are not restricted to coastal plain ponds.

SEQR - No Action Alternative:

Without the indicated actions, the status of these species will remain uncertain and at least some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. There are many lakes and ponds across the state within the likely range of Aeshna mutata and Anax longipes including many on protected lands such as state or parks, state forests, or wildlife management areas. Several sites for Enallagma laterale are on protected lands. Clarification of whether the species are widespread and abundant in these protected sites is needed before one could evaluate the impact of no action. There are far fewer lakes and ponds on Long Island and some of these may be threatened by groundwater withdrawal or other detrimental actions so no action is more likely to have the potential to lead to extirpation of Tetragoneuria semiaquea.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
New England bluet (Enallagma laterale)			S2	G3	U	Resident
Lake emerald (Somatochlora cingulata)			S1	G5	U	Resident
Mantled baskettail (Tetragoneuria semiaquea)			SH	G4	U	Resident
Comet darner (Anax longipes)			S2	G5	U	Resident
Spatterdock darner (Aeshna mutata)			S2	G3G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spatterdock darner (Aeshna mutata)	Susquehanna	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Susquehanna	Unknown
		Upper Hudson	Unknown
Comet darner (Anax longipes)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
		Upper Hudson	Unknown
Mantled baskettail (Tetragoneuria semiaquea)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Lake emerald (Somatochlora cingulata)	Upper Hudson	NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
New England bluet (Enallagma laterale)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
		Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spatterdock darner (Aeshna mutata)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
		Great Lakes	Unknown
Comet darner (Anax longipes)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Mantled baskettail (Tetragoneuria semiaquea)	North Atlantic Coast	North Atlantic Coast	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Lake emerald (Somatochlora cingulata)	High Allegheny Plateau	Northern Appalachian/Boreal Forest	Unknown
New England bluet (Enallagma laterale)	North Atlantic Coast	Lower New England Piedmont	Unknown
		North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spatterdock darner (Aeshna mutata)				
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	warm water shallow	mud bottom
Comet darner (Anax longipes)				
	all	Lacustrine	coastal plain	mud bottom
	all	Lacustrine	coastal plain	sand/gravel bottom
	all	Lacustrine	warm water shallow	mud bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
Mantled baskettail (Tetragoneuria semiaquea)				
	all	Lacustrine	coastal plain	sand/gravel bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
Lake emerald (Somatochlora cingulata)				
	all	Lacustrine	cold water deep	mud bottom
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
New England bluet (Enallagma laterale)				
	all	Lacustrine	coastal plain	sand/gravel bottom
	all	Palustrine	mineral soil wetland	pond/lake shore

Goal and Objectives for Odonates of lakes/ponds

Goal: Maintain a sufficient number of self-sustaining populations of these dragonflies and damselflies, at sites with protected habitat, to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species.

Measure: *Number of studies.*

Objective 2 : Obtain baseline distribution data by conducting surveys in the vicinity of the known historic record (Slide Mountain) for Somatochlora cingulata in the Lower New England ecoregion.

Measure: *Number of lakes/ponds surveyed.*

Objective 3 : Obtain baseline distribution data by conducting surveys in the vicinity of the two recent records for Somatochlora cingulata (records may not be from the breeding habitat) and at least 10 other lakes in the Northern Appalachian ecoregion.

Measure: *Number of lakes/ponds surveyed.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations for Aeshna mutata and Anax longipes that can be identified and accessed in the High Allegany, Lower New England, and Great Lakes ecoregions.

Measure:

Objective 5 : Obtain baseline distribution data by conducting surveys of all known historic locations for Aetna mutate, Amax loonies, and Enflame lateral that can be identified and accessed in the High Allegheny, Lower New England, and Great Lakes ecoregions.

Measure: *Number of lakes/ponds surveyed.*

Objective 6 : Obtain baseline distribution data by conducting surveys of all known historic locations in the North Atlantic Coastal Plain ecoregion for Anax longipes, Tetragoneuria semiaquea and Enallagma laterale that can be identified and accessed .

Measure: *Number of lakes/ponds surveyed.*

Objective 7 : Obtain baseline distribution data by conducting surveys of at least 25 other locations for Aeshna mutata, Anax longipes, and Enallagma laterale in the High Allegany, Lower New England, and Great Lakes ecoregions.

Measure: *Number of lakes/ponds surveyed.*

Objective 8 : Protect, manage, restore, and monitor sites occupied by these species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

Life history research:

* In some locations, Anax longipes is thought to be either episodic or migratory with many of the sight records being from locations that do not support actual populations where the larvae over winter. However, it is clearly resident in at least one location in Albany County where over-wintering larvae have been documented. Surveys for this species need to take this situation into account and incorporate larval sampling. This will add to our knowledge of the life history of this species.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that one or more of these species may be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* All five of these species are known from fewer than 15 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state.

References

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey, 14(2): 1-364.

Dunkle, S. W. 2000. Dragonflies through binoculars: A field guide to dragonflies of North America. Oxford Uni. Press. NY, NY. 266 pp.

Nikula, B, J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. 196 pp.

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Taxa Group: Insect
Species Group: Odonates of rivers/streams

Threats:
Little published information is available citing specific cases of negative impacts to the various species of river dwelling odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. The most important likely negative impacts would come from changes in the natural hydrology such as the building of dams, increases in the sediment load of the river (such as might result should logging occur down to the river edge), changes in dissolved oxygen content, direct effects of pesticides, and chemical contamination by runoff of agricultural or other discharge.

Trends:
Most of these species are known from fewer than 10 locations in New York State and there is virtually no information on population trends. Although several species have been found in a number of previously undocumented locations these new finds almost certainly reflect a new interest in looking for these species rather than a population increase or range expansion. At least two species, Calopteryx dimidiata and Calopteryx angustipennis are quite possibly extirpated from the state.

SEQR - No Action Alternative:
Without the indicated actions, the status of these species will remain uncertain and at least some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. While there are many rivers and stream located throughout the state a large number of these have been impacted by the construction of dams, increased sedimentation, channelization, and other impacts and few if any are well protected from various threats over long reaches. Some of these species probably have quite restricted distributions within the state and some may be restricted to rivers and streams in specific size ranges (e.g. large rivers). Clarification of species distributions are needed before one could evaluate the likely result of no action.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Pygmy snaketail (Ophiogomphus howei)			S1	G3	U SC	Resident
Septima's clubtail (Gomphus septima)			S1	G2	U SC	Resident
Cobra clubtail (Gomphus vastus)			SH	G5	U	Resident
Skillet clubtail (Gomphus ventricosus)			SH	G3	U	Resident
Rapids clubtail (Gomphus quadricolor)			S1S2	G3G4	U	Resident
Spine-crowned clubtail (Gomphus abbreviatus)			S2S3	G3G4	U	Resident
Green-faced clubtail (Gomphus viridifrons)			S1	G3	U	Resident
Extra-striped snaketail (Ophiogomphus anomalus)			S1	G3	U SC	Resident
Midland clubtail (Gomphus fraternus)			S1S3	G5	U	Resident
Boreal snaketail (Ophiogomphus colubrinus)			S1	G5	U	Resident

Arrow clubtail (Stylurus spiniceps)	S3	G5	U	Resident
Common sanddragon (Progomphus obscurus)	S1	G5	U SC	Resident
Appalachian jewelwing (Calopteryx angustipennis)	SH	G4	U	Unknown
Sparkling jewelwing (Calopteryx dimidiata)	SH	G5	U	Resident
American rubyspot (Hetaerina americana)	S2S3	G5	U	Resident
Blue-tipped dancer (Argia tibialis)	S1	G5	U	Resident
Riverine clubtail (Stylurus amnicola)	SH	G4	U	Resident
Elusive clubtail (Stylurus notatus)	SH	G3	U	Resident
Russet-tipped clubtail (Stylurus plagiatus)	S1	G5	U	Resident
Brook snaketail (Ophiogomphus aspersus)	S2	G3G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Midland clubtail (Gomphus fraternus)	Lake Erie	SE Lake Ontario	Unknown
	SE Lake Ontario	Upper Hudson	Unknown
		SW Lake Ontario	Unknown
Septima's clubtail (Gomphus septima)		Delaware	Unknown
		Upper Hudson	Unknown
Cobra clubtail (Gomphus vastus)	Susquehanna	Susquehanna	Unknown
	Upper Hudson	Susquehanna	Unknown
Skillet clubtail (Gomphus ventricosus)	NE Lake Ontario - St. Lawrence	Unknown	Unknown
	Upper Hudson		
Rapids clubtail (Gomphus quadricolor)	SE Lake Ontario	Delaware	Unknown
	Susquehanna	Lake Champlain	Unknown
	Upper Hudson	NE Lake Ontario - St. Lawrence	Unknown
		SE Lake Ontario	Unknown
		Susquehanna	Unknown
		Upper Hudson	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spine-crowned clubtail (Gomphus abbreviatus)	Delaware	Delaware	Unknown
	SE Lake Ontario	Lower Hudson - Long Island Bays	Unknown
	Lower Hudson - Long Island Bays	Susquehanna	Unknown
	Susquehanna		
Green-faced clubtail (Gomphus viridifrons)	Delaware	Delaware	Unknown
Extra-striped snaketail (Ophiogomphus anomalus)	Delaware	Delaware	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
Brook snaketail (Ophiogomphus aspersus)	Delaware	Delaware	Unknown
	Lower Hudson - Long Island Bays	Lake Champlain	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	Upper Hudson	Upper Hudson	Unknown
Boreal snaketail (Ophiogomphus colubrinus)	Unknown	Lake Champlain	Unknown
Pygmy snaketail (Ophiogomphus howei)	Susquehanna	Upper Hudson	Unknown
Common sanddragon (Progomphus obscurus)	Lower Hudson - Long Island Bays	Upper Hudson	Unknown
Appalachian jewelwing (Calopteryx angustipennis)	Lower Hudson - Long Island Bays	Unknown	Unknown
Sparkling jewelwing (Calopteryx dimidiata)	Lower Hudson - Long Island Bays	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American rubyspot (Hetaerina americana)	Allegheny	Allegheny	Unknown
	Lake Champlain	Delaware	Unknown
	Lake Erie	Lake Champlain	Unknown
	SE Lake Ontario	Lake Erie	Unknown
	Susquehanna	SE Lake Ontario	Unknown
	Upper Hudson	Susquehanna	Unknown
		SW Lake Ontario	Unknown
		Upper Hudson	Unknown
Blue-tipped dancer (Argia tibialis)	Upper Hudson	Lake Erie	Unknown
		SE Lake Ontario	Unknown
		SW Lake Ontario	Unknown
		Upper Hudson	Unknown
Riverine clubtail (Stylurus amnicola)	Upper Hudson	Unknown	Unknown
Elusive clubtail (Stylurus notatus)	Lake Champlain	Unknown	Unknown
	SE Lake Ontario		
	SW Lake Ontario		
Russet-tipped clubtail (Stylurus plagiatus)	Lake Champlain	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays		
	Upper Hudson		
Arrow clubtail (Stylurus spiniceps)	SE Lake Ontario	Delaware	Unknown
	Susquehanna	Lake Champlain	Unknown
	Upper Hudson	NE Lake Ontario - St. Lawrence	Unknown
		Susquehanna	Unknown
		SW Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Midland clubtail (Gomphus fraternus)	Great Lakes	Great Lakes	Unknown
		Lower New England Piedmont	Unknown
Septima's clubtail (Gomphus septima)		High Allegheny Plateau	Unknown
Cobra clubtail (Gomphus vastus)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Skillet clubtail (Gomphus ventricosus)	Lower New England Piedmont	Unknown	Unknown
	Northern Appalachian/Boreal Forest		
Rapids clubtail (Gomphus quadricolor)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Great Lakes	Great Lakes	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
Spine-crowned clubtail (Gomphus abbreviatus)	Great Lakes	Lower New England Piedmont	Unknown
	Lower New England Piedmont	High Allegheny Plateau	Unknown
	High Allegheny Plateau		
Green-faced clubtail (Gomphus viridifrons)	High Allegheny Plateau	High Allegheny Plateau	Unknown
Extra-striped snaketail (Ophiogomphus anomalus)	High Allegheny Plateau	High Allegheny Plateau	Unknown
		Northern Appalachian/Boreal Forest	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Brook snaketail (Ophiogomphus aspersus)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Northern Appalachian/Boreal Forest	Lower New England Piedmont	Unknown
	North Atlantic Coast	Northern Appalachian/Boreal Forest	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
Boreal snaketail (Ophiogomphus colubrinus)	Unknown	Northern Appalachian/Boreal Forest	Unknown
Pygmy snaketail (Ophiogomphus howei)	High Allegheny Plateau	Northern Appalachian/Boreal Forest	Unknown
Common sanddragon (Progomphus obscurus)	North Atlantic Coast	Northern Appalachian/Boreal Forest	Unknown
Appalachian jewelwing (Calopteryx angustipennis)	Lower New England Piedmont	Unknown	Unknown
Sparkling jewelwing (Calopteryx dimidiata)	Lower New England Piedmont	Unknown	Unknown
American rubyspot (Hetaerina americana)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
		Western Allegheny Plateau	Unknown
Blue-tipped dancer (Argia tibialis)	Lower New England Piedmont	Great Lakes	Unknown
		High Allegheny Plateau	Unknown
		Lower New England Piedmont	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Riverine clubtail (Stylurus amnicola)	Lower New England Piedmont	Unknown	Unknown
Elusive clubtail (Stylurus notatus)	Great Lakes	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
Russet-tipped clubtail (Stylurus plagiatus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast		
	Northern Appalachian/Boreal Forest		
Arrow clubtail (Stylurus spiniceps)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Great Lakes	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Midland clubtail (Gomphus fraternus)				
	all	Lacustrine	warm water shallow	mud bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Septima's clubtail (Gomphus septima)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Cobra clubtail (Gomphus vastus)				
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Skillet clubtail (Gomphus ventricosus)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	sand/gravel bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Skillet clubtail (Gomphus ventricosus)				
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Rapids clubtail (Gomphus quadricolor)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Spine-crowned clubtail (Gomphus abbreviatus)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Green-faced clubtail (Gomphus viridifrons)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Extra-striped snaketail (Ophiogomphus anomalus)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Brook snaketail (Ophiogomphus aspersus)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Boreal snaketail (Ophiogomphus colubrinus)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Pygmy snaketail (Ophiogomphus howei)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Common sanddragon (Progomphus obscurus)				
	all	Lacustrine	coastal plain	sand/gravel bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Appalachian jewelwing (Calopteryx angustipennis)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Sparkling jewelwing (Calopteryx dimidiata)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
American rubyspot (Hetaerina americana)				
	all	Riverine	coldwater stream	rocky bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American rubyspot (Hetaerina americana)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	rocky bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Blue-tipped dancer (Argia tibialis)				
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Riverine clubtail (Stylurus amnicola)				
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Elusive clubtail (Stylurus notatus)				
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Russet-tipped clubtail (Stylurus plagiatus)				
		Riverine	warmwater stream	mud bottom
		Riverine	warmwater stream	sand/gravel bottom
	all	Riverine	deepwater river	mud bottom
	all	Riverine	deepwater river	sand/gravel bottom
Arrow clubtail (Stylurus spiniceps)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom

Goal and Objectives for Odonates of rivers/streams

Goal: Maintain a sufficient number of self-sustaining populations of these dragonflies and damselflies, at sites with protected habitat, to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species

Measure: *Number of studies.*

Objective 2 : maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of these species at known extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations that can be identified and accessed, and by conducting surveys to at least 20 rivers and streams in each basin.

Measure: *Number of rivers/streams surveyed.*

Objective 5 : Protect, manage, restore, and monitor sites occupied by these species

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that at least a few species will be recommended for listing and officially adding these species to the list would constitute a concrete action. Four of the species are currently listed as Special Concern, but it is possible a change in their listing status may be warranted following additional surveys.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Recommended Actions

Statewide baseline survey:

* Most of these species are known from fewer than 10 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state.

References

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey, 14(2): 1-364.

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Nikula, B, J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. 196 pp.

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Taxa Group: Insect

Species Group: Odonates of seeps/rivulets

Threats:

Since seepage areas are key areas for these species for oviposition, any activities that alter the groundwater seepages in an area would be a threat to these species. Little published information is available citing specific cases of negative impacts to the various species of stream and seepage dwelling odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. The most important likely negative impacts would come from changes in the natural hydrology such as the building of dams, increases in the sediment load of the seepage or associated stream (such as might result should logging occur down to the stream edge), changes in dissolved oxygen content, direct effects of pesticides, and chemical contamination by runoff of agricultural or other discharge.

Trends:

Three of these species are known from fewer than 10 locations in New York State while the fourth (Cordulegaster obliqua), is known from fewer than 15 locations, and there is virtually no information on population trends for any of the species. Although three of the species have been found in a number of previously undocumented locations in recent years, these new finds almost certainly reflect a new interest in looking for these species rather than a population increase or range expansion, and the fourth species (Argia bipunctulata) has not been documented in the state since the early 1900s.

SEQR - No Action Alternative:

Without the indicated actions, the status of these species will remain uncertain and at least some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. While seepage areas feeding into small streams are located throughout the state the actual status of these species is unclear. Cordulegaster erronea and Argia bipunctulata appear to have, or are expected to have, very restricted ranges within the state and all four species are quite habitat specific. Clarification of species distributions are needed before one could evaluate the consequences of no action.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Seepage dancer (Argia bipunctulata)			SH	G4	U	Resident
Arrowhead spiketail (Cordulegaster obliqua)			S2S3	G4	U	Resident
Tiger spiketail (Cordulegaster erronea)			S1	G4	U	Resident
Gray petaltail (Tachopteryx thoreyi)			S2	G4	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Gray petaltail (Tachopteryx thoreyi)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Upper Hudson		
	NE Lake Ontario - St. Lawrence		
Tiger spiketail (Cordulegaster erronea)	Lake Champlain	Lower Hudson - Long Island Bays	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
		Upper Hudson	Unknown
Arrowhead spiketail (Cordulegaster obliqua)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
	Susquehanna	SE Lake Ontario	Unknown
		SW Lake Ontario	Unknown
		Susquehanna	Unknown
Seepage dancer (Argia bipunctulata)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Gray petaltail (Tachopteryx thoreyi)	Great Lakes	Great Lakes	Unknown
	Northern Appalachian/Boreal Forest	Lower New England Piedmont	Unknown
	Lower New England Piedmont		
Tiger spiketail (Cordulegaster erronea)	Northern Appalachian/Boreal Forest	Lower New England Piedmont	Unknown
	Great Lakes	Great Lakes	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Arrowhead spiketail (Cordulegaster obliqua)	High Allegheny Plateau	Great Lakes	Unknown
	Lower New England Piedmont	High Allegheny Plateau	Unknown
	North Atlantic Coast	Lower New England Piedmont	Unknown
Seepage dancer (Argia bipunctulata)	Unknown	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Gray petaltail (Tachopteryx thoreyi)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Tiger spiketail (Cordulegaster erronea)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Arrowhead spiketail (Cordulegaster obliqua)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Seepage dancer (Argia bipunctulata)				
	all	Palustrine	mineral soil wetland	pond/lake shore
	all	Palustrine	peatlands	bog/fen

Goal and Objectives for Odonates of seeps/rivulets

Goal: Maintain a sufficient number of self-sustaining populations of these dragonflies, at sites with protected habitat, to ensure the long term perpetuation of the species in New York State.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species.

Measure:

Objective 2 : Maintain existing populations and, if needed and possible, establish or restore additional populations to ensure long-term persistence of these species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of these species at known extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations that have not been reconfirmed and can be identified and accessed.

Measure: *Number of seepage areas surveyed.*

Objective 5 : Obtain baseline distribution data by conducting surveys of at least 10 seepage areas in the North Atlantic Coast ecoregion for Argia bipunctulata (this species has been found in nearby NJ).

Measure: *Number of seepage areas surveyed.*

Objective 6 : Obtain baseline distribution data by conducting surveys of at least 20 seepage areas with associated streams in each ecoregion with recent records for the three species that have recent records (Lower New England, Great Lakes, High Allegany).

Measure: *Number of seepage areas surveyed.*

Objective 7 : Protect, manage, restore, and monitor sites occupied by these species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

Recommended Actions

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. The gray petaltail, tachopteryx thoreyi is currently listed as Special Concern. It is possible that a change in this species listing status may be warranted following additional surveys or that one of the other two species may be recommended for listing and officially adding these species to the list would constitute a concrete action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* All of these species are known from fewer than 15 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state.

References

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey, 14(2): 1-364.

Dunkle, S. W. 2000. Dragonflies through binoculars: A field guide to dragonflies of North America. Oxford Uni. Press. NY, NY. 266 pp.

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Donnelly, T. W. 1999. The dragonflies and damselflies of New York. Prepared for the 1999 International Congress of Odonatology and 1st Worldwide Dragonfly Association. Colgate University, Hamilton, NY. 39 pp.

Donnelly, T. W. 1992. The Odonata of New York. Bulletin of American Odonatology 1(1):1-27.

Originator

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Taxa Group: Insect
Species Group: Odonates of small forest streams

Threats:
Little published information is available citing specific cases of negative impacts to the various species of stream dwelling odonates, but any activities which degrade the sensitive hydrology of these habitats would threaten populations of these species. The most important likely negative impacts would come from changes in the natural hydrology such as the building of dams, increases in the sediment load of the river (such as might result should logging occur down to the lake edge), changes in dissolved oxygen content, direct effects of pesticides, and chemical contamination by runoff of agricultural or other discharge.

Trends:
All three of these species are known from fewer than 10 locations in New York State and there is virtually no information on population trends for any of the species. Although all three species have been found in a few previously undocumented locations in recent years, these new finds almost certainly reflect a new interest in looking for these species rather than a population increase or range expansion.

SEQR - No Action Alternative:
Without the indicated actions, the status of these species will remain uncertain and one or more some species would probably be in jeopardy of significant population declines and possibly extirpation from the state over the long-term. While there are a great many small forest streams located throughout the state a large number of these have been impacted by the construction of dams, increased sedimentation, channelization, and other impacts. At least two of these species probably have quite restricted distributions within the state and therefore may not be found in a large number of locations. Clarification of species distributions are needed before one could evaluate the consequences of no action.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ocellated emerald (Somatochlora minor)			S2S3	G5	U	Resident
Mocha emerald (Somatochlora linearis)			S2S3	G5	U	Resident
Sable clubtail (Gomphus rogersi)			S1	G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sable clubtail (Gomphus rogersi)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Mocha emerald (Somatochlora linearis)	SE Lake Ontario	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Allegheny		
	Lake Erie		
Ocellated emerald (Somatochlora minor)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
		Upper Hudson	Unknown
		SE Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sable clubtail (Gomphus rogersi)	Lower New England Piedmont	Lower New England Piedmont	Unknown
Mocha emerald (Somatochlora linearis)	Great Lakes	Lower New England Piedmont	Unknown
	High Allegheny Plateau		
	North Atlantic Coast		
Ocellated emerald (Somatochlora minor)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sable clubtail (Gomphus rogersi)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Mocha emerald (Somatochlora linearis)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Ocellated emerald (Somatochlora minor)				
	all	Riverine	coldwater stream	sand/gravel bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ocellated emerald (Somatochlora minor)				

Goal and Objectives for Odonates of small forest streams

Goal: Document the current distribution of the small forest stream odonates in New York State and determine which species warrant official state listing and more specific conservation actions.

Objective 1 : Increase our understanding of the ecology of these species including habitat preferences and threats to the species.

Measure: *Number of studies.*

Objective 2 : Maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these species in New York State.

Measure: *Number of maintained/established populations.*

Objective 3 : Obtain baseline data on the relative abundance of these species at known extant sites where access permission can be obtained.

Measure: *Estimates of relative abundance.*

Objective 4 : Obtain baseline distribution data by conducting surveys of all known historic locations that have not been reconfirmed and can be identified and accessed.

Measure: *Number of streams surveyed.*

Objective 5 : Obtain baseline distribution data by conducting surveys of at least 20 small forest streams in each basin with recent or historical records for the species.

Measure: *Number of streams surveyed.*

Objective 6 : Protect, manage, restore, and monitor sites occupied by these species.

Measure: *Number of sites for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long-term viability of the species.*

Recommended Actions

Recommended Actions

Habitat monitoring:

* Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that one or more of these species will be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained (as indicated in the State Wildlife Grant Odonate Inventory Project).

Statewide baseline survey:

* All three of these species are known from fewer than 10 locations in the state, but new populations undoubtedly remain to be discovered. A currently approved, but not yet begun State Wildlife Grant Statewide Odonate Inventory Project will utilize volunteers, Natural Heritage Program and other staff to conduct surveys for these species at potential sites throughout the state.

References

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey, 14(2): 1-364.

Dunkle, S. W. 2000. Dragonflies through binoculars: A field guide to dragonflies of North America. Oxford Uni. Press. NY, NY. 266 pp.

Nikula, B, J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. 196 pp.

Donnelly, T. W. 1999. The dragonflies and damselflies of New York. Prepared for the 1999 International Congress of Odonatology and 1st Worldwide Dragonfly Association. Colgate University, Hamilton, NY. 39 pp.

Donnelly, T. W. 1992. The Odonata of New York. Bulletin of American Odonatology 1(1):1-27.

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Taxa Group: Insect
Species Group: Other butterflies

Threats:
Habitat loss and degradation caused by land development, the use of chemical controls (diflubenzuron and in agriculture) and fire (ill-conceived burns or suppressing natural fires) are the major threats to butterfly populations.

Competition is another threat, as is the case with Erynnis martialis and deer for the food plant Ceanothus americanus.

Succession, the increasing number of exotic species and Gypsy moth sprayings also pose threats. Pyrgus wyandot is especially threatened by Gypsy moth sprayings.

For some species it is unclear what is causing the decline in numbers (Pontia protodice).

Trends:
There is a general consensus that most species are on the decline. Many of these species have not been documented recently so there is little information on actual numbers, but it is believed that Phyciodes batesii batesii is probably extirpated from most locations in New York. Some species are experiencing recent, rapid decline while the decline among others has been more gradual.

SEQR - No Action Alternative:
Severe decline and possible extirpation of most or all species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bog elfin (Callophrys lanoraieensis)			S1	G3G4	U	Resident
Persius duskywing (Erynnis persius persius)			SH	G5T2T3	E	Resident
Southern grizzled skipper (Pyrgus wyandot)			SH	G2	E	Resident
Arogos skipper (Atrytone arogos arogos)			SH	G3G4T1T2	E	Resident
Brazilian skipper (Calpodes ethlius)			SH	G5	U	Migratory
Olympia marble (Euchloe olympia)			S1	G4G5	U SC	Resident
Hessel's hairstreak (Callophrys hesseli)			S1	G3G4	E	Resident
Mottled duskywing (Erynnis martialis)			S1S2	G3G4	U SC	Resident
Henry's elfin (Callophrys henrici)			S2S3	G5	U SC	Resident
Jutta arctic (Oeneis jutta)			S1	G5	U	Resident
Northern oak hairstreak (Fixsenia favonius ontario			S1S3	G4T4	U	Resident
Silvery blue (Glaucopsyche lygdamus lygdamus)			SH	G5T4	U	Resident

Northern metalmark (Calephelis borealis)	SH	G3G4	U	Resident
Regal fritillary (Speyeria idalia)	SH	G3	E	Resident
Gorgone checkerspot (Chlosyne gorgone)	S1	G5	U	Resident
Checkered white (Pontia protodice)	SNA	G4	U SC	Resident
Tawny crescent (Phyciodes batesii batesii)	SH	G4T1	U SC	Resident
Frosted elfin (Callophrys irus)	S1S3	G3	T	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Mottled duskywing (Erynnis martialis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	SE Lake Ontario	Delaware	Decreasing
	Lake Erie	NE Lake Ontario - St. Lawrence	Decreasing
	Susquehanna	SE Lake Ontario	Decreasing
	NE Lake Ontario - St. Lawrence	Lake Champlain	Decreasing
	Lake Champlain	SW Lake Ontario	Decreasing
	SW Lake Ontario	Lake Erie	Decreasing
	Delaware	Susquehanna	Decreasing
Persius duskywing (Erynnis persius persius)	Upper Hudson	Lake Champlain	Unknown
	Lower Hudson - Long Island Bays	Upper Hudson	Unknown
	Lake Champlain	Delaware	Unknown
	Delaware	Susquehanna	Unknown
	Susquehanna	SE Lake Ontario	Unknown
	SE Lake Ontario	SW Lake Ontario	Unknown
	SW Lake Ontario	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Southern grizzled skipper (Pyrgus wyandot)	Delaware	Lake Erie	Unknown
	Lake Erie	Lower Hudson - Long Island Bays	Unknown
	Susquehanna	SE Lake Ontario	Unknown
	SE Lake Ontario	Susquehanna	Unknown
	Lower Hudson - Long Island Bays		
Arogos skipper (Atrytone arogos arogos)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Brazilian skipper (Calpodes ethlius)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
Olympia marble (Euchloe olympia)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
Hessel's hairstreak (Callophrys hesseli)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Frosted elfin (Callophrys irus)	Upper Hudson	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	Upper Hudson	Decreasing
	Delaware	Delaware	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
Henry's elfin (Callophrys henrici)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
	Delaware	Delaware	Unknown
	Susquehanna	Susquehanna	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
Bog elfin (Callophrys lanoraieensis)	SE Lake Ontario	SE Lake Ontario	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern oak hairstreak (Fixsenia favonius ontario)	Upper Hudson	Lower Hudson - Long Island Bays	Stable
	Lower Hudson - Long Island Bays	SE Lake Ontario	Stable
	SE Lake Ontario	Upper Hudson	Stable
Silvery blue (Glaucopsyche lygdamus lygdamus)	Upper Hudson	Upper Hudson	Decreasing
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
	Susquehanna	Susquehanna	Decreasing
	SE Lake Ontario	SE Lake Ontario	Decreasing
	Lake Champlain	Lake Champlain	Decreasing
Northern metalmark (Calephelis borealis)	Lower Hudson - Long Island Bays	Upper Hudson	Decreasing
	Upper Hudson		
Regal fritillary (Speyeria idalia)	Susquehanna	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Delaware	Unknown
	Lower Hudson - Long Island Bays	Upper Hudson	Unknown
	Delaware	Susquehanna	Unknown
	Allegheny		
Gorgone checkerspot (Chlosyne gorgone)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Decreasing
Checkered white (Pontia protodice)	Lake Erie	Lake Erie	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	SE Lake Ontario	SW Lake Ontario	Decreasing
	SW Lake Ontario	SE Lake Ontario	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Tawny crescent (Phyciodes batesii batesii)	Lake Champlain	Lake Champlain	Decreasing
	SE Lake Ontario	Upper Hudson	Decreasing
	Upper Hudson	Delaware	Decreasing
	Delaware	Susquehanna	Decreasing
	Susquehanna	SE Lake Ontario	Decreasing
	Allegheny	Allegheny	Decreasing
Jutta arctic (Oeneis jutta)	Lake Champlain	Lake Champlain	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Mottled duskywing (Erynnis martialis)	North Atlantic Coast	Great Lakes	Decreasing
	Great Lakes	Northern Appalachian/Boreal Forest	Decreasing
	Lower New England Piedmont	St. Lawrence-Lake Champlain Valley	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	St. Lawrence-Lake Champlain Valley	Lower New England Piedmont	Decreasing
	Northern Appalachian/Boreal Forest	North Atlantic Coast	Decreasing
Persius duskywing (Erynnis persius persius)	North Atlantic Coast	Northern Appalachian/Boreal Forest	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Great Lakes	Great Lakes	Unknown
	Northern Appalachian/Boreal Forest	North Atlantic Coast	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Southern grizzled skipper (Pyrgus wyandot)	High Allegheny Plateau	Great Lakes	Unknown
	Great Lakes	North Atlantic Coast	Unknown
	North Atlantic Coast	High Allegheny Plateau	Unknown
Arogos skipper (Atrytone arogos arogos)	North Atlantic Coast	North Atlantic Coast	Decreasing
Brazilian skipper (Calpodes ethlius)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Olympia marble (Euchloe olympia)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
Hessel's hairstreak (Callophrys hesseli)	North Atlantic Coast	North Atlantic Coast	Decreasing
Frosted elfin (Callophrys irus)	Lower New England Piedmont	Great Lakes	Decreasing
	Great Lakes	High Allegheny Plateau	Decreasing
	High Allegheny Plateau	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
Henry's elfin (Callophrys henrici)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	Great Lakes	Great Lakes	Unknown
Bog elfin (Callophrys lanoraieensis)	Great Lakes	Great Lakes	Decreasing
Northern oak hairstreak (Fixsenia favonius ontario)	Great Lakes	Great Lakes	Stable
	North Atlantic Coast	Lower New England Piedmont	Stable
	Lower New England Piedmont	North Atlantic Coast	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Silvery blue (Glaucopsyche lygdamus lygdamus)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
Northern metalmark (Calephelis borealis)	North Atlantic Coast	Lower New England Piedmont	Decreasing
	Lower New England Piedmont		
Regal fritillary (Speyeria idalia)	Western Allegheny Plateau	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	Western Allegheny Plateau	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Gorgone checkerspot (Chlosyne gorgone)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Decreasing
Checkered white (Pontia protodice)	Great Lakes	Great Lakes	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	North Atlantic Coast	North Atlantic Coast	Decreasing
Tawny crescent (Phyciodes batesii batesii)	Northern Appalachian/Boreal Forest	High Allegheny Plateau	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	Great Lakes	Great Lakes	Decreasing
	High Allegheny Plateau	Northern Appalachian/Boreal Forest	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Jutta arctic (Oeneis jutta)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Mottled duskywing (Erynnis martialis)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	open upland	grasslands
Persius duskywing (Erynnis persius persius)				
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
Southern grizzled skipper (Pyrgus wyandot)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	cliffs & open talus
	all	Terrestrial	open upland	grasslands
Arogos skipper (Atrytone arogos arogos)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	coastal	cultural
	all	Terrestrial	coastal	other
Brazilian skipper (Calpodes ethlius)				
	all	Terrestrial	barrens/woodlands	cultural
Olympia marble (Euchloe olympia)				
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	open upland	dunes
	all	Terrestrial	open upland	grasslands
Hessel's hairstreak (Callophrys hesseli)				
		Palustrine	mineral soil wetland	pond/lake shore
	all	Palustrine	mineral soil wetland	deciduous forested
	all	Palustrine	peatlands	bog/fen

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Frosted elfin (Callophrys irus)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	barrens/woodlands	southern deciduous
Henry's elfin (Callophrys henrici)				
	all	Palustrine	mineral soil wetland	deciduous forested
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	southern deciduous
Bog elfin (Callophrys lanoraieensis)				
	all	Palustrine	peatlands	bog/fen
Northern oak hairstreak (Fixsenia favonius ontario)				
	all	Terrestrial	barrens/woodlands	southern deciduous
Silvery blue (Glaucopsyche lygdamus lygdamus)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
Northern metalmark (Calephelis borealis)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	southern deciduous
Regal fritillary (Speyeria idalia)				
	all	Palustrine	mineral soil wetland	deciduous forested
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	open upland	grasslands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Gorgone checkerspot (Chlosyne gorgone)				
	all	Terrestrial	barrens/woodlands	northern coniferous
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	open upland	cultural
Checkered white (Pontia protodice)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	open upland	grasslands
Tawny crescent (Phyciodes batesii batesii)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	open upland	grasslands
Jutta arctic (Oeneis jutta)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	alpine/mountain	other
	all	Terrestrial	barrens/woodlands	northern coniferous

Goal and Objectives for Other butterflies

Goal: Maintain healthy populations of listed butterflies in New York State in their historic ranges

Objective 1 : Determine status of listed species through surveys and assessment of population levels.

Measure: *Number of surveys and assessments*

Objective 2 : Determine the best management techniques for the particular habitat needs of each species

Measure: *Number of species for which habitat management is determined*

Objective 3 : Determine threats to butterfly species, rate by level of risk to species, and develop management and protection plans to address the threats

Measure: *Number of species for which management and protection plans are completed*

Objective 4 : Document the current distribution of listed butterfly species and determine actual conservation status

Measure: *Number of species for which surveys have been conducted and status evaluated*

Objective 5 : Evaluate the status of species habitat quantity and quality including host plants, shelter areas, predators, parasites and other components.

Measure: *Completeness of habitat evaluation*

Recommended Actions

Fact sheet:

* Develop fact sheets and other outreach material to educate the public about species at risk Lepidoptera

Habitat management:

* - Determine best management regimes for species in each locality

Habitat research:

* - Determine precise habitat needs of all life stages
  - Ascertain food plants
  - Determine the relationship between food availability and species numbers

Invasive species control:

* - Identify species which impact negatively on butterfly populations
  - Determine the best control method for those exotic species with minimal repercussions for butterfly populations

Life history research:

* - Investigate the metapopulation dynamics of those species which appear to have distinct populations
* - Establish the duration of all life stages
  -Taxonomic research for related species

Other action:

* - Determine the actual sensitivity of species to chemical formulations, particularly diflubenzuron and other commonly used agricultural pesticides
  - Determine the effect of Bacillus thuringiensis kurstaki (BTK) used in Gypsy moth sprayings on various species

Population monitoring:

* - Inventory of species within historical range

Recommended Actions

Statewide baseline survey:

* Survey all species to more adequately define the list of species that need to be addressed.

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Taxa Group: Insect
Species Group: Other moths

Threats:
The threats to moth populations have not been well documented, but habitat loss and degradation caused by land development, habitat fragmentation, natural succession of shrubland, woodland and barrens habitats, land clearing, coastal erosion and sea level rise, and the use of chemical biocides (traditional pesticides and growth regulators) are likely major threats to moth populations in varied habitats. Another likely but poorly known threat is the continued impact of biological agents introduced beginning in 1906 for control of gypsy moth and other pests. The introduced parasitoid fly Compsilura concinnata may be the cause of reported declines of silk moth populations in New England, and may impact other native Lepidoptera (Boettner et al. 2000). Although widespread spraying doesn't occur today, chemical biocides (traditional pesticides and growth regulators), and to a lesser extent Bacillus thuringiensis var. kurstaki (= BTK) applied locally continue to kill native lepidoptera (Schweitzer 2004). Extirpation of native species may occur if these biocides are applied to the entirety of localized, isolated habitats. Other possible threats to moths and their habitats are invasive plants, animals and pathogens, and the effect of night time lighting on reproductive success.

Trends:
Many of these species have only been documented a few times and trend data is largely unavailable. Some species, such as Abagrotis nefascia benjamini have declined in numbers.

SEQR - No Action Alternative:
Rapid extirpation of a large number of species and possible extinction of one or more endemic moths.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A noctuid moth (Chytonix ruperti)			S1			Unknown
Dot-lined white (Artace cribraria)			SH			Unknown
Bay underwing (Catocala badia)			S2S4			Resident
The consort underwing (Catocala consors sorsconi)			SH			Resident
Quiet or sweet underwing (Catocala dulciola)			SH			Resident
Jersey jair underwing (Catocala jair ssp 2)			S1S2			Unknown
Precious underwing (Catocala pretiosa pretiosa)			SH			Unknown
An underwing moth (Catocala sp 3)			SH			Unknown
Broad-lined catopyrrha (Erastria coloraria)			S2S3			Unknown
A moth (Lepipolys perscripta)			SH	G4	U	Resident
A noctuid moth (Chaetaglaea cerata)			S1S2			Unknown
A noctuid moth (Apamea inordinata)			SH			Unknown

A noctuid moth (Chytonix sensilis)	S1S3			Unknown
Melsheimer's sack bearer (Cicinnus melsheimeri)	SH			Unknown
Regal moth (Citheronia regalis)	S1	G4		Unknown
Pine devil (Citheronia sepulcralis)	S1			Unknown
A hand-maid moth (Datana ranaeceps)	S1S3			Unknown
Imperial moth (Eacles imperialis pini)	S?			Unknown
The little beggar (Eubaphe meridiana)	SH			Unknown
A geometrid moth (Euchlaena madusaria)	SH			Unknown
Brown-bordered geometer (Eumacaria latiferrugat	S2S4			Unknown
Bird dropping moth (Cerma cora)	S1S3			Unknown
Coastal heathland cutworm (Abagrotis nefascia be	S1S3	G4T3	U	Resident
Hairy artesta (Trichoclea artesta)	S1S3	G5	U	Resident
Maroonwing (Sideridis maryx)	S2S3	G4	U	Resident
Gray woodgrain (Morrisonia mucens)	S1S3	G4G5	U	Unknown
A noctuid moth (Orthodes obscura)	S1?	G4	U	Resident
A noctuid moth (Agrotis obliqua)	S1	GNR	U	Resident
A noctuid moth (Eucoptocnemis fimbriaris)	S1	G4	U	Resident
A noctuid moth (Euxoa pleuritica)	S2S3	G4	U	Resident
A noctuid moth (Euxoa lidia thanatologia)	SH	G5T5	U	Unknown
A noctuid moth (Richia acclivis)	S2S3	G4G5	U	Resident
Toothed apharetra (Apharetra dentata)	S2S3			Unknown
A noctuid moth (Abagrotis barnesi)	S1	G5	U	Resident
A noctuid moth (Apamea mixta)	SH			Unknown
Golden aster flower moth (Schinia tuberculum)	S2	G4	U	Resident
A noctuid moth (Schinia bifascia)	SH	G4	U	Resident
A noctuid moth (Hydraecia stramentosa)	S1S3	G4	U	Resident
A notodontid moth (Heterocampa varia)	S1S2	G3		Unknown
Herodias underwing (Catocala herodias gerhardi)				Unknown
Jair underwing (Catocala jair)				Unknown
Barrens dagger moth (Acronicta albarufa)	SH			Resident
A noctuid moth (Amphipoea erepta ryensis)	S1			Unknown
Blueberry gray (Glena cognataria)	S1S3			Unknown

A noctuid moth (Anomogyna rhaetica)				Resident
A geometrid moth (Semiothisa denticulata)	S1			Unknown
A noctuid moth (Fagitana littera)	S2S3			Unknown
A borer moth (Papaipema marginidens)	SH			Unknown
Maritime sunflower borer moth (Papaipema mariti	SH			Unknown
Culvers root borer (Papaipema sciata)	SH			Unknown
Ostrich fern borer moth (Papaipema sp 2)	S1?			Unknown
Chain fern borer moth (Papaipema stenocelis)	S1?			Unknown
Stinging rose caterpillar moth (Parasa indetermina	SH			Unknown
A noctuid moth (Phoberia orthosioides)	S2S3			Unknown
A noctuid moth (Psaphida thaxteriana)	SH			Unknown
Dark stoneroot borer moth (Papaipema duplicata)	S?			Resident
A geometrid moth (Semiothisa banksianae)	S1			Unknown
Seaside golden borer moth (Papaipema duovata)	SH	G4		Unknown
Variable sallow (Sericaglaea signata)	SH			Unknown
Gordian sphinx (Sphinx gordius)	S1S3	G4		Unknown
Chestnut clearwing moth (Synanthedon castaneae)	SH	G4		Unknown
A noctuid moth (Synedoida adumbrata)	S1S2			Unknown
Black-bordered lemon moth (Thioptera nigrofimbr	SH	G5		Unknown
Dimorphic gray (Tornos scolopacinarius)	SH	G4		Unknown
Acadian swordgrass moth (Xylena thoracica)	S1S2			Unknown
A noctuid moth (Zale largera)	S1	G4		Unknown
Pine barrens zanclognatha (Zanclognatha martha)	S1S2	G4		Unknown
Pink sallow (Psectraglaea carnosa)	S2			Resident
Black fungus moth (Metalectra tantillus)	SH			Unknown
Trichoclea artesta (Hairy artesta)	S1S3	G5		Unknown
Phyllira tiger moth (Grammia phyllira)	SH			Unknown
Coastal barrens buckmoth (Hemileuca maia ssp 5)	S2	T2	SC	Unknown
Buchholz's gray (Hypomecis buchholzaria)	SH			Unknown
Barrens itame (Itame sp 1)	S1			Resident
A looper moth (Lambdina canitiaria)	SH			Unknown
Lemmer's noctuid moth (Lithophane lemmeri)	SR	G3		Unknown

A noctuid moth (Lithophane lepida lepida)	S1	T3	E	Unknown
Pale green pinion moth (Lithophane viridipallens)	SH			Unknown
Heracleum stem borer moth (Papaipema harrisii)	SH	G4		Unknown
Doll's merolonche (Merolonche dolli)	SH	G3		Unknown
A noctuid moth (Fishia enthea)	SH			Unknown
Barrens metarranthis moth (Metarranthis apiciaria	SH			Resident
A slug moth (Monoleuca semifascia)	S1	G4		Unknown
A geometrid moth (Nemoria bifilata)	SH	G4		Unknown
A tussock moth (Orgyia detrita)	SH	G3		Unknown
A noctuid moth (Paectes abrostolella)	S1	G4		Unknown
A borer moth (Papaipema aerata)	SH			Unknown
Yellow stoneroot borer (Papaipema astuta)	SH	G3		Resident
Aweme borer moth (Papaipema aweme)	SH			Resident
Golden borer moth (Papaipema cerina)	SH	G4		Unknown
Woolly gray (Lycia ypsilon)	SH	G4		Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A moth (Lepipolys perscripta)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Hairy artesta (Trichoclea artesta)	SE Lake Ontario NE Lake Ontario - St. Lawrence	Unknown	Unknown
Maroonwing (Sideridis maryx)	NE Lake Ontario - St. Lawrence Lake Champlain	Lake Champlain	Stable
Gray woodgrain (Morrisonia mucens)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
A noctuid moth (Orthodes obscura)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Stable
A noctuid moth (Agrotis obliqua)	Lake Champlain	Lake Champlain	Stable
A noctuid moth (Eucoptocnemis fimbriaris)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A noctuid moth (Euxoa pleuritica)	Lower Hudson - Long Island Bays SW Lake Ontario	Lower Hudson - Long Island Bays SW Lake Ontario	Decreasing Decreasing
A noctuid moth (Euxoa lidia thanatologia)	Unknown	Unknown	Unknown
A noctuid moth (Richia acclivis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
A noctuid moth (Anomogyna rhaetica)	Lake Champlain	Lake Champlain	Unknown
A noctuid moth (Abagrotis barnesi)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Coastal heathland cutworm (Abagrotis nefascia benjami	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Golden aster flower moth (Schinia tuberculum)	Upper Hudson	Upper Hudson	Unknown
A noctuid moth (Schinia bifascia)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
A noctuid moth (Hydraecia stramentosa)	SE Lake Ontario	SE Lake Ontario	Unknown
A notodontid moth (Heterocampa varia)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Herodias underwing (Catocala herodias gerhardi)	Unknown	Lower Hudson - Long Island Bays	Unknown
Jair underwing (Catocala jair)	Lower Hudson - Long Island Bays	Unknown	Unknown
Barrens dagger moth (Acronicta albarufa)	Upper Hudson Lower Hudson - Long Island Bays	Unknown	Unknown
A noctuid moth (Amphipoea erepta ryensis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A noctuid moth (Apamea inordinata)	Upper Hudson	Upper Hudson	Unknown
A noctuid moth (Apamea mixta)	Unknown	Unknown	Unknown
Toothed apharetra (Apharetra dentata)	Lower Hudson - Long Island Bays	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Dot-lined white (Artace cribraria)	Unknown	Unknown	Unknown
Bay underwing (Catocala badia)	Upper Hudson Lake Champlain Lower Hudson - Long Island Bays	Unknown	Decreasing
The consort underwing (Catocala consors sorsconi)	Lower Hudson - Long Island Bays	Unknown	Unknown
Quiet or sweet underwing (Catocala dulciola)	Unknown	Unknown	Unknown
Jersey jair underwing (Catocala jair ssp 2)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Precious underwing (Catocala pretiosa pretiosa)	Upper Hudson	Unknown	Unknown
An underwing moth (Catocala sp 3)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Broad-lined catopyrrha (Erastria coloraria)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Bird dropping moth (Cerma cora)	Upper Hudson	Unknown	Unknown
A noctuid moth (Chaetaglaea cerata)	Upper Hudson Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A noctuid moth (Chytonix ruperti)	Unknown	Unknown	Unknown
A noctuid moth (Chytonix sensilis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Melsheimer's sack bearer (Cicinnus melsheimeri)	Upper Hudson Lower Hudson - Long Island Bays SW Lake Ontario Susquehanna Delaware	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Regal moth (Citheronia regalis)	Lower Hudson - Long Island Bays	Unknown	Unknown
Pine devil (Citheronia sepulcralis)	Upper Hudson	Upper Hudson	Unknown
A hand-maid moth (Datana ranaeceps)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
Imperial moth (Eacles imperialis pini)	SE Lake Ontario	SE Lake Ontario	Unknown
The little beggar (Eubaphe meridiana)	Unknown	Unknown	Unknown
A geometrid moth (Euchlaena madusaria)	Unknown	Unknown	Unknown
Brown-bordered geometer (Eumacaria latiferrugata)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A noctuid moth (Fagitana littera)	Unknown	Unknown	Unknown
A noctuid moth (Fishia enthea)	Unknown	Unknown	Unknown
Blueberry gray (Glena cognataria)	Unknown	Unknown	Unknown
Phyllira tiger moth (Grammia phyllira)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Coastal barrens buckmoth (Hemileuca maia ssp 5)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
Buchholz's gray (Hypomecis buchholzaria)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Barrens itame (Itame sp 1)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A looper moth (Lambdina canitiaria)	Susquehanna	Unknown	Unknown
Lemmer's noctuid moth (Lithophane lemmeri)	Unknown	Unknown	Unknown
A noctuid moth (Lithophane lepida lepida)	Unknown	Lake Champlain	Unknown
Pale green pinion moth (Lithophane viridipallens)	Lower Hudson - Long Island Bays	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Woolly gray (Lycia ypsilon)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Doll's merolonche (Merolonche dolli)	Lower Hudson - Long Island Bays	Unknown	Unknown
Black fungus moth (Metalectra tantillus)	Unknown	Unknown	Unknown
Barrens metarranthis moth (Metarranthis apiciaria)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
A slug moth (Monoleuca semifascia)	Unknown	Unknown	
A geometrid moth (Nemoria bifilata)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A tussock moth (Orgyia detrita)	Lower Hudson - Long Island Bays	Unknown	Unknown
A noctuid moth (Paectes abrostolella)	Unknown	Unknown	Unknown
A borer moth (Papaipema aerata)	Lake Erie SW Lake Ontario NE Lake Ontario - St. Lawrence SE Lake Ontario	Unknown	Unknown
Yellow stoneroot borer (Papaipema astuta)	Lower Hudson - Long Island Bays	Unknown	Unknown
Aweme borer moth (Papaipema aweme)	SE Lake Ontario	Unknown	Unknown
Golden borer moth (Papaipema cerina)	Unknown	Unknown	Unknown
Seaside golden borer moth (Papaipema duovata)	Unknown	Unknown	Decreasing
Dark stoneroot borer moth (Papaipema duplicata)	Unknown	Unknown	Unknown
Heracleum stem borer moth (Papaipema harrisii)	Unknown	Unknown	Unknown
A borer moth (Papaipema marginidens)	Unknown	Unknown	Unknown
Maritime sunflower borer moth (Papaipema maritima)	Unknown	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Culvers root borer (Papaipema sciata)	Lake Erie	Unknown	Unknown
	Lower Hudson - Long Island Bays		
Ostrich fern borer moth (Papaipema sp 2)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Susquehanna	Susquehanna	Unknown
Chain fern borer moth (Papaipema stenocelis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Stinging rose caterpillar moth (Parasa indetermina)	Unknown	Unknown	Unknown
A noctuid moth (Phoberia orthosioides)	Upper Hudson	Upper Hudson	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
A noctuid moth (Psaphida thaxteriana)	Unknown	Unknown	Unknown
Pink sallow (Psectraglaea carnosa)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson		
A geometrid moth (Semiothisa banksianae)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
A geometrid moth (Semiothisa denticulata)	Unknown	Unknown	Unknown
Variable sallow (Sericaglaea signata)	Unknown	Unknown	Unknown
Gordian sphinx (Sphinx gordius)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
Chestnut clearwing moth (Synanthedon castaneae)	Unknown	Unknown	Unknown
A noctuid moth (Synedoida adumbrata)	Unknown	Unknown	Unknown
Black-bordered lemon moth (Thioptera nigrofimbria)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Dimorphic gray (Tornos scolopacinarius)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Acadian swordgrass moth (Xylena thoracica)	Lower Hudson - Long Island Bays	Upper Hudson	Unknown
	Upper Hudson	Lower Hudson - Long Island Bays	Unknown
		Lake Champlain	Unknown
A noctuid moth (Zale largera)	Unknown	Unknown	Unknown
Pine barrens zanclognatha (Zanclognatha martha)	Upper Hudson	Upper Hudson	Unknown
Trichoclea artesta (Hairy artesta)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A moth (Lepipolys perscripta)	North Atlantic Coast	North Atlantic Coast	Unknown
Hairy artesta (Trichoclea artesta)	Great Lakes	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
Maroonwing (Sideridis maryx)	Northern Appalachian/Boreal Forest	St. Lawrence-Lake Champlain Valley	Stable
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Stable
Gray woodgrain (Morrisonia mucens)	North Atlantic Coast	North Atlantic Coast	Decreasing
A noctuid moth (Orthodes obscura)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable
A noctuid moth (Agrotis obliqua)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Stable
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A noctuid moth (Eucoptocnemis fimbriaris)	North Atlantic Coast	North Atlantic Coast	Decreasing
A noctuid moth (Euxoa pleuritica)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Great Lakes	Great Lakes	Decreasing
A noctuid moth (Euxoa lidia thanatologia)	Unknown	Unknown	Unknown
A noctuid moth (Richia acclivis)	North Atlantic Coast	North Atlantic Coast	Decreasing
A noctuid moth (Anomogyna rhaetica)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
A noctuid moth (Abagrotis barnesi)	North Atlantic Coast	North Atlantic Coast	Decreasing
Coastal heathland cutworm (Abagrotis nefascia benjamini	North Atlantic Coast	North Atlantic Coast	Unknown
Golden aster flower moth (Schinia tuberculum)	Lower New England Piedmont	Lower New England Piedmont	Unknown
A noctuid moth (Schinia bifascia)	North Atlantic Coast	North Atlantic Coast	Decreasing
A noctuid moth (Hydraecia stramentosa)	Great Lakes	Great Lakes	Unknown
A notodontid moth (Heterocampa varia)	North Atlantic Coast	North Atlantic Coast	Unknown
Herodias underwing (Catocala herodias gerhardi)	Unknown	North Atlantic Coast	Unknown
Jair underwing (Catocala jair)	North Atlantic Coast	Unknown	Unknown
Barrens dagger moth (Acronicta albarufa)	Lower New England Piedmont	Unknown	Unknown
	North Atlantic Coast		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A noctuid moth (Amphipoea erepta ryensis)	North Atlantic Coast	North Atlantic Coast	Unknown
A noctuid moth (Apamea inordinata)	Lower New England Piedmont	Lower New England Piedmont	Unknown
A noctuid moth (Apamea mixta)	Unknown	Unknown	Unknown
Toothed apharetra (Apharetra dentata)	North Atlantic Coast	Unknown	Unknown
Dot-lined white (Artace cribraria)	Unknown	Unknown	Unknown
Bay underwing (Catocala badia)	Northern Appalachian/Boreal Forest North Atlantic Coast	Unknown	Decreasing
The consort underwing (Catocala consors sorsconi)	North Atlantic Coast	Unknown	Unknown
Quiet or sweet underwing (Catocala dulciola)	Unknown	Unknown	Unknown
Jersey jair underwing (Catocala jair ssp 2)	North Atlantic Coast	North Atlantic Coast	Unknown
Precious underwing (Catocala pretiosa pretiosa)	Lower New England Piedmont	Unknown	Unknown
An underwing moth (Catocala sp 3)	North Atlantic Coast	North Atlantic Coast	Unknown
Broad-lined catopyrrha (Erastria coloraria)	North Atlantic Coast	North Atlantic Coast	Unknown
Bird dropping moth (Cerma cora)	Lower New England Piedmont	Unknown	Unknown
A noctuid moth (Chaetaglaea cerata)	Lower New England Piedmont Great Lakes	North Atlantic Coast	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A noctuid moth (Chytonix ruperti)	Unknown	Unknown	Unknown
A noctuid moth (Chytonix sensilis)	North Atlantic Coast	North Atlantic Coast	Unknown
Melsheimer's sack bearer (Cicinnus melsheimeri)	Western Allegheny Plateau	Unknown	Unknown
	High Allegheny Plateau		
	Lower New England Piedmont		
	North Atlantic Coast		
Regal moth (Citheronia regalis)	Unknown	Unknown	Unknown
Pine devil (Citheronia sepulcralis)	Lower New England Piedmont	High Allegheny Plateau	Unknown
	High Allegheny Plateau	Lower New England Piedmont	Unknown
A hand-maid moth (Datana ranaeceps)	North Atlantic Coast	North Atlantic Coast	Decreasing
Imperial moth (Eacles imperialis pini)	Great Lakes	Great Lakes	Unknown
The little beggar (Eubaphe meridiana)	Unknown	Unknown	Unknown
A geometrid moth (Euchlaena madusaria)	Unknown	Unknown	Unknown
Brown-bordered geometer (Eumacaria latiferrugata)	North Atlantic Coast	North Atlantic Coast	Unknown
A noctuid moth (Fagitana littera)	Unknown	Unknown	Unknown
A noctuid moth (Fishia enthea)	Unknown	Unknown	Unknown
Blueberry gray (Glena cognataria)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Phyllira tiger moth (Grammia phyllira)	North Atlantic Coast	North Atlantic Coast	Unknown
Coastal barrens buckmoth (Hemileuca maia ssp 5)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Buchholz's gray (Hypomecis buchholzaria)	North Atlantic Coast	North Atlantic Coast	Unknown
Barrens itame (Itame sp 1)	North Atlantic Coast	North Atlantic Coast	Unknown
A looper moth (Lambdina canitiaria)	High Allegheny Plateau	Unknown	Unknown
Lemmer's noctuid moth (Lithophane lemmeri)	Unknown	Unknown	Unknown
A noctuid moth (Lithophane lepida lepida)	Unknown	Unknown	Unknown
Pale green pinion moth (Lithophane viridipallens)	North Atlantic Coast	Unknown	Unknown
Woolly gray (Lycia ypsilon)	North Atlantic Coast	North Atlantic Coast	Unknown
Doll's merolonche (Merolonche dolli)	North Atlantic Coast	Unknown	Unknown
Black fungus moth (Metalectra tantillus)	Unknown	Unknown	Unknown
Barrens metarranthis moth (Metarranthis apiciaria)	North Atlantic Coast	North Atlantic Coast	Decreasing
A slug moth (Monoleuca semifascia)	Unknown	Unknown	Unknown
A geometrid moth (Nemoria bifilata)	North Atlantic Coast	North Atlantic Coast	Unknown
A tussock moth (Orgyia detrita)	North Atlantic Coast	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A noctuid moth (Paectes abrostolella)	Unknown	Unknown	Unknown
A borer moth (Papaipema aerata)	Great Lakes	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
Yellow stoneroot borer (Papaipema astuta)	North Atlantic Coast	Unknown	Unknown
Aweme borer moth (Papaipema aweme)	Great Lakes	Unknown	Unknown
Golden borer moth (Papaipema cerina)	Unknown	Unknown	Unknown
Seaside golden borer moth (Papaipema duovata)	Unknown	Unknown	Unknown
Dark stoneroot borer moth (Papaipema duplicata)	Unknown	Unknown	Unknown
Heracleum stem borer moth (Papaipema harrisii)	Unknown	Unknown	Unknown
A borer moth (Papaipema marginidens)	Unknown	Unknown	Unknown
Maritime sunflower borer moth (Papaipema maritima)	Unknown	Unknown	Unknown
Culvers root borer (Papaipema sciata)	Great Lakes	Unknown	Unknown
	Lower New England Piedmont		
Ostrich fern borer moth (Papaipema sp 2)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Chain fern borer moth (Papaipema stenocelis)	North Atlantic Coast	North Atlantic Coast	Unknown
Stinging rose caterpillar moth (Parasa indetermina)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A noctuid moth (Phoberia orthosioides)	Lower New England Piedmont	North Atlantic Coast	Unknown
	North Atlantic Coast	Lower New England Piedmont	Unknown
A noctuid moth (Psaphida thaxteriana)	Unknown	Unknown	Unknown
Pink sallow (Psectraglaea carnosa)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont		
A geometrid moth (Semiothisa banksianae)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
A geometrid moth (Semiothisa denticulata)	Unknown	Unknown	Unknown
Variable sallow (Sericaglaea signata)	Unknown	Unknown	Unknown
Gordian sphinx (Sphinx gordius)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Chestnut clearwing moth (Synanthedon castaneae)	Unknown	Unknown	Unknown
A noctuid moth (Synedoida adumbrata)	Unknown	Unknown	Unknown
Black-bordered lemon moth (Thioptera nigrofimbria)	North Atlantic Coast	North Atlantic Coast	Unknown
Dimorphic gray (Tornos scolopacinarius)	North Atlantic Coast	North Atlantic Coast	Unknown
Acadian swordgrass moth (Xylena thoracica)	North Atlantic Coast	Lower New England Piedmont	Unknown
	Lower New England Piedmont	North Atlantic Coast	Unknown
A noctuid moth (Zale largera)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Pine barrens zanclognatha (Zanclognatha martha)	Lower New England Piedmont	Lower New England Piedmont	Unknown
Trichoclea artesta (Hairy artesta)	Unknown	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A moth (Lepipolys perscripta)				
	all	Terrestrial	coastal	cultural
Hairy artesta (Trichoclea artesta)				
	all	Terrestrial	barrens/woodlands	shrublands
Maroonwing (Sideridis maryx)				
	all	Terrestrial	barrens/woodlands	shrublands
Gray woodgrain (Morrisonia mucens)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
A noctuid moth (Orthodes obscura)				
	all	Terrestrial	barrens/woodlands	shrublands
A noctuid moth (Agrotis obliqua)				
	all	Terrestrial	forested	northern coniferous
A noctuid moth (Eucoptocnemis fimbriaris)				
	all	Terrestrial	barrens/woodlands	southern deciduous
A noctuid moth (Euxoa pleuritica)				
	all	Terrestrial	coastal	dunes
A noctuid moth (Euxoa lidia thanatologia)				
	all	Unknown		
A noctuid moth (Richia acclivis)				
	all	Terrestrial	barrens/woodlands	shrublands
A noctuid moth (Anomogyna rhaetica)				
	all	Terrestrial	alpine/mountain	cliffs & open talus
	all	Terrestrial	alpine/mountain	northern coniferous
A noctuid moth (Abagrotis barnesi)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A noctuid moth (Abagrotis barnesi)				
	all	Terrestrial	barrens/woodlands	shrublands
Coastal heathland cutworm (Abagrotis nefascia benjamini)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	coastal	dunes
Golden aster flower moth (Schinia tuberculum)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
A noctuid moth (Schinia bifascia)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	maritime	other
A noctuid moth (Hydraecia stramentosa)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	open upland	heathlands
A notodontid moth (Heterocampa varia)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	shrublands
	Hibernating/Overwintering	Unknown		
Herodias underwing (Catocala herodias gerhardi)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	open upland	cliffs & open talus
Jair underwing (Catocala jair)				
	all	Terrestrial	barrens/woodlands	shrublands
Barrens dagger moth (Acronicta albarufa)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
A noctuid moth (Amphipoea erepta ryensis)				
	all	Palustrine	mineral soil wetland	other
A noctuid moth (Apamea inordinata)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A noctuid moth (Apamea inordinata)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	open upland	grasslands
A noctuid moth (Apamea mixta)				
	all	Palustrine	peatlands	bog/fen
Toothed apharetra (Apharetra dentata)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	unknown
Dot-lined white (Artace cribraria)				
	all	Terrestrial	unknown	unknown
Bay underwing (Catocala badia)				
	all	Terrestrial	coastal	other
	all	Terrestrial	forested	unknown
The consort underwing (Catocala consors sorsconi)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
Quiet or sweet underwing (Catocala dulciola)				
	all	Terrestrial	barrens/woodlands	other
	all	Terrestrial	forested	other
Jersey jair underwing (Catocala jair ssp 2)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
Precious underwing (Catocala pretiosa pretiosa)				
	all	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	all	Palustrine	mineral soil wetland	shrub swamp
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	forested	unknown
An underwing moth (Catocala sp 3)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
Broad-lined catopyrrha (Erastria coloraria)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	open upland	cliffs & open talus
Bird dropping moth (Cerma cora)				
	all	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bird dropping moth (Cerma cora)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	southern coniferous
A noctuid moth (Chaetaglaea cerata)				
	all	Terrestrial	barrens/woodlands	northern deciduous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	forested	mixed deciduous/coniferous
A noctuid moth (Chytonix ruperti)				
	all	Terrestrial	barrens/woodlands	other
	all	Terrestrial	barrens/woodlands	shrublands
A noctuid moth (Chytonix sensilis)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
Melsheimer's sack bearer (Cicinnus melsheimeri)				
	all	Terrestrial	barrens/woodlands	shrublands
Regal moth (Citheronia regalis)				
	all	Terrestrial	unknown	unknown
Pine devil (Citheronia sepulcralis)				
	all	Terrestrial	coastal	other
A hand-maid moth (Datana ranaeceps)				
	all	Terrestrial	barrens/woodlands	other
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	other
Imperial moth (Eacles imperialis pini)				
	all	Terrestrial	barrens/woodlands	northern coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern coniferous
The little beggar (Eubaphe meridiana)				
	all	Unknown		
A geometrid moth (Euchlaena madusaria)				
	all	Terrestrial	barrens/woodlands	unknown
	all	Terrestrial	forested	unknown
Brown-bordered geometer (Eumacaria latiferrugata)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	open upland	heathlands

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A noctuid moth (Fagitana littera)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	peatlands	bog/fen
A noctuid moth (Fishia enthea)				
	all	Unknown		
Blueberry gray (Glena cognataria)				
	all	Unknown		
Phyllira tiger moth (Grammia phyllira)				
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	unknown
Coastal barrens buckmoth (Hemileuca maia ssp 5)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	barrens/woodlands	southern coniferous
	Hibernating/Overwintering	Subterranean	natural	unknown
Buchholz's gray (Hypomecis buchholzaria)				
	all	Terrestrial	barrens/woodlands	unknown
Barrens itame (Itame sp 1)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	southern coniferous
	Hibernating/Overwintering	Unknown		
A looper moth (Lambdina canitiaria)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
Lemmer's noctuid moth (Lithophane lemmeri)				
	all	Unknown		
A noctuid moth (Lithophane lepida lepida)				
	all	Terrestrial	barrens/woodlands	unknown
Pale green pinion moth (Lithophane viridipallens)				
	Feeding	Terrestrial	barrens/woodlands	shrublands
	Hibernating/Overwintering	Subterranean	natural	unknown
	Nursery/Juvenile	Palustrine	peatlands	bog/fen
Woolly gray (Lycia ypsilon)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Woolly gray (Lycia ypsilon)				
	all	Terrestrial	barrens/woodlands	shrublands
Doll's merolonche (Merolonche dolli)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	southern coniferous
Black fungus moth (Metalectra tantillus)				
	all	Unknown		
Barrens metarranthis moth (Metarranthis apiciaria)				
	Breeding	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	Breeding	Terrestrial	forested	unknown
A slug moth (Monoleuca semifascia)				
	all	Terrestrial	barrens/woodlands	shrublands
A geometrid moth (Nemoria bifilata)				
	all	Terrestrial	barrens/woodlands	shrublands
A tussock moth (Orgyia detrita)				
	all	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
A noctuid moth (Paectes abrostolella)				
	all	Unknown		
A borer moth (Papaipema aerata)				
	all	Palustrine	unknown	unknown
	all	Terrestrial	unknown	unknown
Yellow stoneroot borer (Papaipema astuta)				
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	northern deciduous
Aweme borer moth (Papaipema aweme)				
	all	Terrestrial	open upland	dunes
	Hibernating/Overwintering	Unknown		
Golden borer moth (Papaipema cerina)				
	all	Unknown		
Seaside golden borer moth (Papaipema duovata)				
	all	Palustrine	mineral soil wetland	other

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Dark stoneroot borer moth (Papaipema duplicata)				
	all	Terrestrial	barrens/woodlands	southern deciduous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	Hibernating/Overwintering	Unknown		
Heracleum stem borer moth (Papaipema harrisii)				
	all	Unknown		
A borer moth (Papaipema marginidens)				
	all	Unknown		
Maritime sunflower borer moth (Papaipema maritima)				
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	open upland	grasslands
Culvers root borer (Papaipema sciata)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Terrestrial	barrens/woodlands	cultural
	all	Terrestrial	barrens/woodlands	unknown
	all	Terrestrial	forested	unknown
	all	Terrestrial	open upland	grasslands
Ostrich fern borer moth (Papaipema sp 2)				
	all	Palustrine	mineral soil wetland	mixed deciduous/coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
Chain fern borer moth (Papaipema stenocelis)				
	all	Terrestrial	unknown	unknown
Stinging rose caterpillar moth (Parasa indetermina)				
	all	Unknown		
A noctuid moth (Phoberia orthosioides)				
	all	Terrestrial	barrens/woodlands	shrublands
A noctuid moth (Psaphida thaxteriana)				
	all	Terrestrial	barrens/woodlands	unknown
	all	Terrestrial	forested	unknown
Pink sallow (Psectraglaea carnosa)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	Hibernating/Overwintering	Terrestrial	barrens/woodlands	other

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Pink sallow (Psectraglaea carnosa)				
A geometrid moth (Semiothisa banksianae)				
	all	Terrestrial	barrens/woodlands	shrublands
A geometrid moth (Semiothisa denticulata)				
	all	Terrestrial	barrens/woodlands	shrublands
Variable sallow (Sericaglaea signata)				
	all	Terrestrial	barrens/woodlands	unknown
	all	Terrestrial	forested	unknown
Gordian sphinx (Sphinx gordius)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
	all	Terrestrial	barrens/woodlands	shrublands
	all	Terrestrial	open upland	heathlands
Chestnut clearwing moth (Synanthedon castaneae)				
	all	Terrestrial	unknown	unknown
A noctuid moth (Synedoida adumbrata)				
	all	Unknown		
Black-bordered lemon moth (Thioptera nigrofimbria)				
	all	Unknown		
Dimorphic gray (Tornos scolopacinarius)				
	all	Terrestrial	unknown	unknown
Acadian swordgrass moth (Xylena thoracica)				
	all	Palustrine	peatlands	bog/fen
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
A noctuid moth (Zale largera)				
	all	Unknown		
Pine barrens zanclognatha (Zanclognatha martha)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous
Trichoclea artesta (Hairy artesta)				
	all	Unknown		

Goal and Objectives for Other moths

Goal: Maintain viable moth populations and sufficient good quality habitats to support moth species throughout their historic ranges in New York State.

Objective 1 : Determine actual conservation status

Measure: *Number of feasible habitats; Magnitude of threats*

Objective 2 : Determine the current distribution of moths

Measure: *Number of surveys conducted*

Objective 3 : Determine threats to moth species and ways to address them.

Measure: *research conducted on threats and threat reduction*

Objective 4 : Evaluate need for and feasibility of expanding moth populations numerically and spatially

Measure: *Number of populations on appropriate habitat*

Objective 5 : Maintain existing populations

Measure: *Annual surveys*

Recommended Actions

Easement acquisition:

* where appropriate, acquire easements to promote moth protection and conservation

Fact sheet:

* create fact sheets covering moths

Habitat management:

* - Determine best management regime for moth species, including fire and other forms of management

Habitat monitoring:

* Develop standardized measures of habitat parameters for each species of listed moth
* - Investigate threats to food and host plants
  - Monitor land development projects

Recommended Actions

Habitat research:

* Examine role of light pollution as threat to moths
* - Determine host/ food plant

Life history research:

* - Investigate the metapopulation dynamics of those species which warrant it
* examine role of introduced parasites and predators in threats to moths

Other action:

* Develop standard definition of what is needed for "viable" populations of moths
* research the role of pesticide use in threats to moths

Population monitoring:

* - Inventory of species within historical range
* Develop standardized survey protocols for moths

Private fee acquisition:

* where appropriate, encourage/assist private entities to acquire land for moth protection and conservation

State fee acquisition:

* where appropriate, acquire land essential to moth protection and conservation

State land unit management plan:

* incorporate needs of moths into state land management plans

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Taxa Group: Insect
Species Group: Pine barrens tiger beetles

Threats:
Suburban and other development, and natural succession of open pine barrens habitats due to fire suppression are probably the major threats to these species. Excessive use of sandy areas and sunny woods trails by ATV's are also a likely problem. The latter threat is probably especially true for Cicindela abdominalis and the consentanea subspecies of Cicindela patruela that are restricted to Long Island.

Trends:
Unknown for sure, though all three species have almost certainly declined. Only the nominate form of Cicindela patruela as been observed in recent years (and that in 2004). Cicindela abdominalis and Cicindela patruela consentanea were likely restricted to Long Island pine barrens habitats that have been greatly reduced in acreage and both of these could well be extirpated from the state. The nominate form of Cicindela patruela had also not been observed in the state for decades until 2004 when it was observed at Sams Point in the Shawangunks.

SEQR - No Action Alternative:
Without the indicated actions the status of these species will remain uncertain at best and in jeopardy of further decline or extirpation from the state. Extirpation from the state, seems especially likely, if it has not already occurred, for Cicindela abdomonalis and Cicindela patruela consentanea as these species are, or were, undoubtedly restricted to Long Island where large amounts of formerly suitable habitat have been lost. The nominate form of Cicindela patruela which was historically found elsewhere in the state, was found on a protected site in 2004 in the Shawangunks in 2004, but the species may still be limited to a small number of sites and failure to identify sites for this species could lead to significant population declines.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A tiger beetle (Cicindela abdominalis)			SH	G5	U	Resident
A tiger beetle (Cicindela unipunctata)			SH	G4	U	Resident
A tiger beetle (Cicindela patruela)			SH	G3T2T3	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A tiger beetle (Cicindela patruela)	Lower Hudson - Long Island Bays Lake Champlain Upper Hudson SW Lake Ontario SE Lake Ontario	Upper Hudson	Decreasing
A tiger beetle (Cicindela unipunctata)	Lower Hudson - Long Island Bays Lake Champlain NE Lake Ontario - St. Lawrence	Unknown	Decreasing
A tiger beetle (Cicindela abdominalis)	Lower Hudson - Long Island Bays	Unknown	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A tiger beetle (Cicindela patruela)	North Atlantic Coast St. Lawrence-Lake Champlain Valley Great Lakes	Lower New England Piedmont	Decreasing
A tiger beetle (Cicindela unipunctata)	North Atlantic Coast Northern Appalachian/Boreal Forest	Unknown	Decreasing
A tiger beetle (Cicindela abdominalis)	North Atlantic Coast	Unknown	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A tiger beetle (Cicindela patruela)				
	all	Terrestrial	barrens/woodlands	mixed deciduous/coniferous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A tiger beetle (Cicindela patruela)				
	all	Terrestrial	barrens/woodlands	southern deciduous
A tiger beetle (Cicindela unipunctata)				
	all	Terrestrial	barrens/woodlands	southern coniferous
	all	Terrestrial	forested	northern deciduous
A tiger beetle (Cicindela abdominalis)				
	all	Terrestrial	barrens/woodlands	southern coniferous

Goal and Objectives for Pine barrens tiger beetles

Goal: Maintain a sufficient number of self-sustaining populations of these species throughout their historic range in New York to ensure that the species are not extirpated from the state.

Objective 1 : Determine the distribution and population status of these species in New York State.

Measure: *Number of sites surveyed to determine presence of the species and population size.*

Objective 2 : Increase our understanding of the ecology of these beetles including habitat preferences and threats to the species.

Measure: *Number of studies completed.*

Objective 3 : Maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these damselflies in New York State.

Measure: *Number of maintained/established populations.*

Objective 4 : Protect, manage, restore, and monitor barrens or other habitats occupied by these species.

Measure: *Number of barrens or other habitats for which threats are adequately abated and are under protection/management/monitoring directed toward ensuring the long term viability of the species.*

Recommended Actions

Habitat management:

* Reduce or eliminate detrimental ATV use in barrens habitats that support, or may support, these species.

Recommended Actions

Habitat research:

* Support and encourage research that would increase knowledge of threats facing these species of tiger beetles.
* Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

* Recommendations for official state endangered, threatened, or special concern listing are an anticipated result of the State Wildlife Grant Tiger Beetle Inventory. It is expected that one or more of the species will be recommended for listing and officially adding these species to the list would constitute a concrete action.

Population monitoring:

* Conduct repeatable surveys for these species at a selected number of sites in order to monitor populations trends over time.

Statewide baseline survey:

* Conduct surveys for these species at potential sites throughout the state (expected range for two species is Long Island only. These species are known from fewer than 10 locations in the state, but new populations probably remain to be discovered for at least two of the species. A currently approved, but not yet begun State Wildlife Grant Tiger Beetle Inventory Project will utilize Natural Heritage Program staff and other biologists to conduct these surveys.

References

Blanchard, O. 2004. Rare Animal Survey Form for Cicindela patruela patruela at Sam's Point Dwarf Pine Ridge on August 9, 2004.

Kinsley, C. B., and T. D. Schultz. 1997. The Biology of Tiger Beetles and a guide to the species of the South Atlantic States. Virginia Museum of Natural History, Special Publication Number 5. 210 pp.

Gordon, W. M. 1939. The Cicindelidae of New York With Reference to their Ecology. M. S. Thesis. Cornell University, Ithaca, NY. 136 pp.

Originator

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Taxa Group: Insect

Species Group: Riparian tiger beetles

Threats:

Alteration of natural flooding regimes, primarily due to construction of dams, is probably the primary threat to both species (Novak 1999, Knisley and Shultz 1997). Dams will inundate cobble bar habitat upstream of the dam while the natural flooding regime is altered downstream of the dam. When natural flooding regimes are altered cobble bars become overgrown with dense herbaceous and shrub vegetation becoming unsuitable for the beetles. Gravel mining of cobble bars, an activity regulated by NYSDEC but for which permits are given, is also a major threat. There are a number of existing permits on both the Genesee River (Taft 2002) and Cattaraugus Creek that have the potential to negatively impact populations of Cicindela marginipennis. Off road vehicle use of cobble bars can destroy larval habitat and has been noted as a threat both in the literature and during on site surveys in western New York. Intensive collecting by private collectors has been noted as a threat to some species of tiger beetle and is a potential threat primarily to Cicindela marginipennis.

Trends:

It is difficult to assess population trends for either species as historical data gives little sense of population sizes and as new locations for both species probably represent populations that were always present, but had not yet been documented. The strong indication that the Delaware River population of Cicindela marginipennis is extirpated would suggest a downward trend for this species at least.

SEQR - No Action Alternative:

Without the indicated actions, the status of these species will remain uncertain and both species could be in jeopardy of population declines or, over the long-term, extirpation from the state. Population declines would be expected to occur should gravel mining of cobble bar habitat and ATV use of cobble bar habitat continue and/or if additional dams, and channelization projects take place on rivers and creeks that support these species. Cicindela marginipennis, if truly present on just two rivers in the state, could especially face extirpation if gravel mining and other threats are widespread on the two rivers.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A tiger beetle (Cicindela ancocisconensis)			S1	G3	U	Resident
Cobblestone tiger beetle (Cicindela marginipennis)			S1	G2G3	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Cobblestone tiger beetle (Cicindela marginipennis)	Delaware	Lake Erie	Unknown
	Lake Erie	SW Lake Ontario	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A tiger beetle (Cicindela ancocisconensis)	Delaware	Delaware	Unknown
	Lake Erie	Lake Champlain	Unknown
		Lake Erie	Unknown
		SW Lake Ontario	Unknown
		Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Cobblestone tiger beetle (Cicindela marginipennis)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
A tiger beetle (Cicindela ancocisconensis)	High Allegheny Plateau	Great Lakes	Unknown
	Great Lakes	High Allegheny Plateau	Unknown
		Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Cobblestone tiger beetle (Cicindela marginipennis)	all	Terrestrial	open upland	sand/gravel bar
A tiger beetle (Cicindela ancocisconensis)	all	Terrestrial	open upland	sand/gravel bar

Goal and Objectives for Riparian tiger beetles

Goal: Document the current distribution of these two rare riparian tiger beetles in New York State, and maintain a sufficient number of self-sustaining populations to ensure the long-term perpetuation of the species within New York State.

Objective 1 : Document the full extent of the occurrence of Cicindela marginipennis on the Genesee River and Cattaraugus Creek.

Measure: *Occupied cobble bars surveyed and mapped in the NY Natural Heritage Program database and Master Habitat Databank and available for regional and central office permit review and conservation planning.*

Objective 2 : Increase our understanding of the ecology of these species including adult and larval habitat characteristics and adult dispersal.

Measure: *Data on distances moved by adult beetles, data describing adult and larval habitat.*

Objective 3 : Maintain existing populations and, if needed and possible, establish or restore additional populations, to ensure the long-term persistence of these tiger beetles in New York State.

Measure: *Number of maintained/established populations.*

Objective 4 : Obtain baseline distribution data by conducting surveys of cobble/gravel bar habitat on rivers/ streams in each ecoregion or watershed in the state where potential habitat can be identified (potential habitat may not be present on LI).

Measure: *Number of rivers/streams surveyed.*

Objective 5 : Protect, manage, restore existing or potentially suitable habitat for these species.

Measure: *Number of rivers/streams with cobble bars maintained by natural stream flooding regimes and protected from detrimental gravel mining and off road vehicle activities.*

Recommended Actions

Habitat management:

* Reduce or eliminate detrimental ATV use on cobble bars where these species occur or could occur if such activity was lacking or reduced .

Habitat monitoring:

* Compile baseline data on existing threats to these species including existing gravel mine permits, exiting areas of high ATV use, existing hydrological flow alterations.

Habitat research:

* Larval habitat for Cicindela marginipennis should be determined by excavation of a limited number of larval burrows and adult beetle dispersal should be identified through a mark-recapture effort . Vegetation density, cobble size, and sand/cobble interspersion are habitat characteristics that probably need to be determined for both species as well as common species that co-occur with them.

Recommended Actions

* Support and encourage research that would increase knowledge of the impact of poorly known threats to these species (e.g. invasion by aggressive, non-native plants such as Polygonum cuspidatum and Lythrum salicaria, in riparian areas; development in riparian areas).

Habitat restoration:

* Determine if there are streams/rivers with existing dams where restoration of more natural flow regimes could result in restoration of suitable habitat for these species.
* Determine if there is a means of restoring suitable (as in not overgrown) cobble bar habitat on the Delaware River where Cicindela marginipennis appears to have been extirpated.

New regulation:

* Recommendations for official state endangered, threatened, or special concern listing are an anticipated result of the statewide inventory. It is expected that one or both species will be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

* Conduct surveys to obtain repeatable, transect count, baseline population assessments at occupied sites where the species occur.

Statewide baseline survey:

* Conduct surveys for these species at potential sites throughout the state. Cicindela marginipennis is known from just two rivers in the state while Cicindela ancocisconensis is currently known from less than 10 streams/rivers. A currently approved, but not yet begun State Wildlife Grant Tiger Beetle Project will utilize Natural Heritage Program staff and other biologists to conduct surveys for these species at potential sites throughout the state.

References

Gordon, W. M. 1939. The Cicindelidae of New York With Reference to their Ecology. M. S. Thesis. Cornell University, Ithaca, NY. 136 pp.

Taft, K. 2002. E-mail of October 7, 2002 to Paul Novak regarding Mined Land Reclamation Permits for gravel removal on the Genesee River.

Novak, P. 1999. Zoar Valley tiger beetles. Results of surveys for Cicindela marginipennis and Cicindela ancocisconensis at Zoar valley in 1998. Unpublished report prepared for the Central/Western New York Chapter of The Nature Conservancy. 12 pp.

Kinsley, C. B., and T. D. Schultz. 1997. The Biology of Tiger Beetles and a guide to the species of the South Atlantic States. Virginia Museum of Natural History, Special Publication Number 5. 210 pp.

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Taxa Group: Insect
Species Group: Stoneflies/Mayflies of lentic waters

Threats:
Siphlonurus barbaroides is vulnerable to any activity which affects water quality. Increased silt loading, loss of vegetation, water-level fluctuation and pollution are some of the more imminent threats.

Trends:
The current status of Siphlonurus barbaroides cannot be determined since there is little recent documentation of the species.

SEQR - No Action Alternative:
Without further surveys to determine the status of the species there is the possibility that the species could be lost from the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A mayfly (Siphlonurus barbaroides)			SNR	G3	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A mayfly (Siphlonurus barbaroides)	SE Lake Ontario	SE Lake Ontario	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A mayfly (Siphlonurus barbaroides)	High Allegheny Plateau	Great Lakes	Unknown
	Great Lakes	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A mayfly (Siphlonurus barbaroides)				
	all	Lacustrine	cold water shallow	SAV

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A mayfly (Siphlonurus barbaroides)	all	Riverine	unknown	unknown

Goal and Objectives for Stoneflies/Mayflies of lentic waters

Goal: Document the current distribution of Siphlonurus barbaroides and ensure its perpetuation in its historic locations.

Objective 1 : Determine the presence of Siphlonurus barbaroides in its historical range.

Measure: *Number of surveys conducted.*

Objective 2 : Maintain existing populations of Siphlonurus barbaroides.

Measure: *Number of sites earmarked for protection within the historical range of the species.*

Recommended Actions

Habitat management:

* Control the timing and intensity of activity in the riparian zone of historical waters.

Habitat research:

* Determine the critical habitat of the species.

Population monitoring:

* Survey sites outside the historical range of the species that may contain potential habitats.
* Survey potential sites in the historical range of the species.

References

The James Needham Ephemeroptera Slide Collection (Cornell University). Http://entomology.cornell.edu/CUIC/Info/Needham/. Accessed August 27th 2004.

Jacobus, Luke and W.P. McCafferty. 2001. The Mayfly Fauna of New York State (Insecta: Ephemeroptera). Journal of the New York Entomological Society. 109(1): 47-80.

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Taxa Group: Insect
Species Group: Stoneflies/Mayflies of lotic waters

Threats:
These species would be vulnerable to any activity which affects water quality. Increased silt loading, loss of vegetation, water-level fluctuation and pollution are some of the more imminent threats.

Trends:
The current status of many of the species remain undetermined since there is little recent documentation on population sizes for these species.

SEQR - No Action Alternative:
Without further surveys to determine the status of these species there is the possibility that they could be lost from the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A mayfly (Epeorus frisoni)			SNR	G1Q	U	Resident
A mayfly (Ameletus tertius)			SNR	G3	U	Resident
A mayfly (Ameletus tarteri)			SNR	G1	U	Resident
A mayfly (Siphlonurus barbarus)			SNR	G1	U	Resident
A mayfly (Baetis rusticans)			SNR	G2	U	Resident
A mayfly (Eurylophella bicoloroides)			SNR	G3	U	Resident
A mayfly (Heptagenia culacantha)			SNR	G3	U	Resident
A mayfly (Heptagenia julia)			SNR	G4	U	Resident
A mayfly (Brachycercus maculatus)			SNR	G3Q	U	Resident
A mayfly (Rhithrogena uhari)			SNR	G3	U	Resident
A stonefly (Pteronarcys comstocki)			SNR	G3	U	Resident
A mayfly (Epeorus punctatus)			SNR	G3	U	Resident
A mayfly (Epeorus suffusus)			SNR	G1Q	U	Resident
A mayfly (Nixe rusticalis)			SNR	G2	U	Resident
A mayfly (Procloeon mendax)			SNR	G2	U	Resident
A mayfly (Procloeon ozburni)			SNR	G2	U	Resident
A stonefly (Allocapnia illinoensis)			SNR	G3	U	Unknown

A stonefly (Alloperla vostocki)	SNR	G3	U	Resident
A stonefly (Utaperla gaspesiana)	SNR	G3	U	Unknown
A mayfly (Rhithrogena anomala)	SNR	G2	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A mayfly (Brachycercus maculatus)	Upper Hudson	Upper Hudson	Unknown
A mayfly (Ameletus tertius)	Susquehanna	Susquehanna	Unknown
A mayfly (Ameletus tarteri)	Susquehanna	Susquehanna	Unknown
A mayfly (Siphlonurus barbarus)	Upper Hudson	Unknown	Unknown
A mayfly (Baetis rusticans)	NE Lake Ontario - St. Lawrence	Unknown	Unknown
A mayfly (Eurylophella bicoloroides)	Delaware	Delaware	Unknown
	Upper Hudson	Upper Hudson	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
A mayfly (Heptagenia culacantha)	Lake Champlain	Lake Champlain	Unknown
	Upper Hudson	Upper Hudson	Unknown
	Delaware	Delaware	Unknown
	Susquehanna	Susquehanna	Unknown
A mayfly (Heptagenia julia)	SE Lake Ontario	Unknown	Unknown
A mayfly (Rhithrogena anomala)	Lake Champlain	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence		
	SE Lake Ontario		
A mayfly (Rhithrogena uhari)	Unknown	Lake Champlain	Unknown
A mayfly (Epeorus frisoni)	Unknown	Unknown	Unknown
A mayfly (Epeorus punctatus)	Lake Erie	Unknown	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A mayfly (Epeorus suffusus)	Upper Hudson	Upper Hudson	Unknown
	SE Lake Ontario		
A mayfly (Nixe rusticalis)	SE Lake Ontario	Unknown	Unknown
A mayfly (Procloeon mendax)	NE Lake Ontario - St. Lawrence	Unknown	Unknown
	Lake Champlain		
A mayfly (Procloeon ozburni)	SE Lake Ontario	Unknown	Unknown
A stonefly (Allocapnia illinoensis)	Unknown	Unknown	Unknown
A stonefly (Alloperla vostocki)			
A stonefly (Utaperla gaspesiana)	Unknown	Unknown	Unknown
A stonefly (Pteronarcys comstocki)	SE Lake Ontario	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A mayfly (Brachycercus maculatus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
A mayfly (Ameletus tertius)	High Allegheny Plateau	High Allegheny Plateau	Unknown
A mayfly (Ameletus tarteri)	High Allegheny Plateau	High Allegheny Plateau	Unknown
A mayfly (Siphlonurus barbarus)	High Allegheny Plateau	Unknown	Unknown
A mayfly (Baetis rusticans)	St. Lawrence-Lake Champlain Valley	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A mayfly (Eurylophella bicoloroides)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Great Lakes	Great Lakes	Unknown
A mayfly (Heptagenia culacantha)	High Allegheny Plateau	Great Lakes	Unknown
	Great Lakes	High Allegheny Plateau	Unknown
A mayfly (Heptagenia julia)	Great Lakes	Unknown	Unknown
A mayfly (Rhithrogena anomala)	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown
	Great Lakes		
A mayfly (Rhithrogena uhari)	Unknown	Northern Appalachian/Boreal Forest	Unknown
A mayfly (Epeorus frisoni)	Unknown	Unknown	Unknown
A mayfly (Epeorus punctatus)	Great Lakes	Unknown	Unknown
A mayfly (Epeorus suffusus)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
	Great Lakes		
A mayfly (Nixe rusticalis)	Great Lakes	Unknown	Unknown
A mayfly (Procloeon mendax)	Northern Appalachian/Boreal Forest	Unknown	Unknown
A mayfly (Procloeon ozburni)	Great Lakes	Unknown	Unknown
A stonefly (Allocapnia illinoensis)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A stonefly (Alloperla vostocki)			
A stonefly (Utaperla gaspesiana)	Unknown	Unknown	Unknown
A stonefly (Pteronarcys comstocki)	Great Lakes	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A mayfly (Brachycercus maculatus)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
A mayfly (Ameletus tertius)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	SAV
A mayfly (Ameletus tarteri)				
	Nursery/Juvenile	Riverine	coldwater stream	unknown
A mayfly (Siphlonurus barbarus)				
	all	Lacustrine	cold water shallow	unknown
	all	Riverine	coldwater stream	unknown
A mayfly (Baetis rusticans)				
	all	Riverine	coldwater stream	unknown
	Nursery/Juvenile	Riverine	coldwater stream	SAV
	Nursery/Juvenile	Riverine	coldwater stream	structure
A mayfly (Eurylophella bicoloroides)				
	all	Riverine	unknown	unknown
A mayfly (Heptagenia culacantha)				
	Nursery/Juvenile	Riverine	coldwater stream	structure
A mayfly (Heptagenia julia)				
	all	Riverine	unknown	unknown
A mayfly (Rhithrogena anomala)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A mayfly (Rhithrogena anomala)				
A mayfly (Rhithrogena uhari)				
	all	Lacustrine	cold water shallow	unknown
	Nursery/Juvenile	Riverine	coldwater stream	mud bottom
A mayfly (Epeorus frisoni)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
A mayfly (Epeorus punctatus)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
A mayfly (Epeorus suffusus)				
	all	Riverine	unknown	unknown
A mayfly (Nixe rusticalis)				
	all	Riverine	coldwater stream	sand/gravel bottom
	Nursery/Juvenile	Riverine	coldwater stream	mud bottom
A mayfly (Procloeon mendax)				
	all	Lacustrine	cold water shallow	unknown
	Nursery/Juvenile	Riverine	coldwater stream	sand/gravel bottom
A mayfly (Procloeon ozburni)				
	all	Lacustrine	cold water shallow	unknown
	Nursery/Juvenile	Riverine	coldwater stream	SAV
A stonefly (Allocapnia illinoensis)				
	all	Riverine	unknown	unknown
A stonefly (Alloperla vostocki)				
	all	Riverine	coldwater stream	unknown
A stonefly (Utaperla gaspesiana)				
	all	Riverine	unknown	unknown
A stonefly (Pteronarcys comstocki)				
	all	Riverine	coldwater stream	unknown

Goal and Objectives for Stoneflies/Mayflies of lotic waters

Goal: Document the current distribution of these mayflies and stoneflies and ensure their perpetuation in their historic locations.

Objective 1 : Determine the presence of these species in their historical ranges.

Measure: *Number of surveys conducted.*

Objective 2 : Maintain existing populations of these mayflies and stoneflies.

Measure: *Number of sites chosen for protection.*

Recommended Actions

Habitat management:

* Monitor activity in the riparian zone and actual waters where these mayflies and stoneflies are found (or will potentially be found).

Habitat research:

* Determine the critical habitat for these species.

Population monitoring:

* Survey sites within the historical ranges of these species.

References

The James Needham Ephemeroptera Slide Collection (Cornell University). Http://entomology.cornell.edu/CUIC/Info/Needham/. Accessed August 27th 2004.

Jacobus, Luke and W.P. McCafferty. 2001. The Mayfly Fauna of New York State (Insecta: Ephemeroptera). Journal of The New York Entomological Society. 109(1): 47-80.

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Taxa Group: Insect
Species Group: Stoneflies/Mayflies of uncertain habitat

Threats:
These species would be vulnerable to any activity which affects water quality. Increased silt loading, loss of vegetation, water-level fluctuation and pollution are some of the more imminent threats.

Trends:
The current status of many of the species remain undetermined since there is little recent documentation on population sizes for these species.

SEQR - No Action Alternative:
Without further surveys to determine the status of these species there is the possibility that they could be lost from the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
A mayfly (Procloeon vicinum)			S?	G2	U	Resident
A stonefly (Alloperla voinae)			SNR	G3	U	Unknown
A mayfly (Dannella provonshai)			SNR	G2	U	Resident
A mayfly (Plauditus gloveri)			SNR	G2	U	Resident
A mayfly (Procloeon vicinum)			SNR	G2	U	Resident
A mayfly (Procloeon simile)			SNR	G2	U	Resident
A mayfly (Leucrocuta thetis)			SNR	G3	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A mayfly (Leucrocuta thetis)	Susquehanna	Unknown	Unknown
A mayfly (Procloeon simile)	Upper Hudson NE Lake Ontario - St. Lawrence Lower Hudson - Long Island Bays	SE Lake Ontario	Unknown
A mayfly (Procloeon vicinum)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
A mayfly (Plauditus gloveri)	SW Lake Ontario	SW Lake Ontario	Unknown
A mayfly (Dannella provonshai)	SE Lake Ontario	SE Lake Ontario	Unknown
A stonefly (Alloperla voinae)	Unknown	Unknown	Unknown
A mayfly (Procloeon vicinum)	NE Lake Ontario - St. Lawrence	Unknown	

Species Distribution - Ecoregion

Species	Historical	Current	Stability
A mayfly (Leucrocuta thetis)	High Allegheny Plateau	Unknown	Unknown
A mayfly (Procloeon simile)	Lower New England Piedmont St. Lawrence-Lake Champlain Valley North Atlantic Coast	Great Lakes	Unknown
A mayfly (Procloeon vicinum)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown
A mayfly (Plauditus gloveri)	Great Lakes	Great Lakes	Unknown
A mayfly (Dannella provonshai)	Great Lakes	Great Lakes	Unknown
A stonefly (Alloperla voinae)	Unknown	Unknown	Unknown
A mayfly (Procloeon vicinum)	Northern Appalachian/Boreal Forest	Unknown	

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

A mayfly (Leucrocuta thetis)

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
A mayfly (Leucrocuta thetis)				
	all	Riverine	unknown	unknown
A mayfly (Procloeon simile)				
	all	Lacustrine	cold water shallow	unknown
	all	Riverine	coldwater stream	unknown
A mayfly (Procloeon vicinum)				
	all	Lacustrine	cold water shallow	unknown
	all	Riverine	unknown	unknown
A mayfly (Plauditus gloveri)				
	all	Riverine	unknown	unknown
A mayfly (Dannella provonshai)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
A stonefly (Alloperla voinae)				
	all	Riverine	unknown	unknown
A mayfly (Procloeon vicinum)				

Goal and Objectives for Stoneflies/Mayflies of uncertain habitat

Goal: Document the current distribution of these mayflies and stoneflies and ensure their perpetuation in their historical waters.

Objective 1 : Determine the presence of the species in their historical ranges.

Measure: *Number of surveys conducted.*

Objective 2 : Maintain existing populations of these mayfly and stonefly species.

Measure: *Number of sites selected for protection.*

Recommended Actions

Recommended Actions

Habitat management:

* Control the activity level and intensity in and around historic waters where these species are known to have habitats.

Habitat research:

* Determine the critical habitat for these species.

Population monitoring:

* Survey potential sites in the historical range of the species.

References

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Jacobus, Luke and W.P. McCafferty. 2001. The Mayfly Fauna of New York State (Insecta: Ephemeroptera). Journal of The New York Entomological Society. 109(1): 47-80.

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Taxa Group: Insect

Species Group: Sylvan hygrotus diving beetle

Threats:

Threats to this aquatic beetle are unknown given the few locations ever recorded for the species and the scant information on the species and its life history. As an aquatic species it can be assumed that changes in water quality and hydrology could have a negative impact on the species where it occurs.

Trends:

The species has only been collected a few times and there is no information on population trends although the type location (and the only confirmed New York location) recorded only as a "pond in the woods; Peekskill, NY", may no longer exist.

SEQR - No Action Alternative:

Without the indicated actions, the status of this species will remain uncertain at best and could be in jeopardy of significant population declines and/or extirpation from the state over the long-term.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Sylvan hygrotus diving beetle (Hygrotus sylvanus)			SH	G1	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sylvan hygrotus diving beetle (Hygrotus sylvanus)	Lower Hudson - Long Island Bays	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sylvan hygrotus diving beetle (Hygrotus sylvanus)	Lower New England Piedmont	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sylvan hygrotus diving beetle (Hygrotus sylvanus)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sylvan hygrotus diving beetle (Hygrotus sylvanus)				
	all	Lacustrine	warm water shallow	unknown
	all	Palustrine	mineral soil wetland	unknown

Goal and Objectives for Sylvan hygrotus diving beetle

Goal: Determine the status of Sylvan Hygrotus diving beetle in New York State and maintain a sufficient number of self-sustaining populations to ensure the long-term perpetuation of the species in New York State.

Objective 1 : Conduct surveys of small ponds in the Dryden area to see if the species is still present in this area (assuming the Ringwood specimen was identified correctly).

Measure: *Number of ponds surveyed*

Objective 2 : Conduct surveys of small ponds in the Peekskill area to see if the species is still present in this area.

Measure: *Number of ponds surveyed*

Objective 3 : Confirm the identification of the specimen in the Cornell collection from Ringwood Preserve, Dryden, NY.

Measure: *Report from an entomologist that is considered an expert with dytiscids indicating whether the Ringwood specimen is or is not Hygrotus sylvanus.*

Objective 4 : Identify habitat characteristics of any specific, known sites for this species in order to model and predict other sites that warrant surveys for this species.

Measure: *Known locations for the species mapped in GIS.*

Objective 5 : Increase our understanding of the ecology of this species including habitat preferences and threats to the species.

Measure: *Search of literature for existing previous studies, number of studies undertaken at any new sites that are found.*

Recommended Actions

Recommended Actions

Habitat research:

* Known locations for the species in other states should be mapped and used with GIS in an attempt to model and predict other sites that warrant survey for this species.

Life history research:

* Should the species be re-located in the Peekskill area and/or confirmed to be present in in the Dryden area, research on the life history aspects of the species should be undertaken. This research should include characterization of the occupied habitat which would feed into additional baseline surveys of similar habitats expanding outward from known occupied locations.

Statewide baseline survey:

* The type locality for this species is Peekskill, NY where the species was "taken in a pond in the woods no longer existent". While the pond for the type specimens may no longer occur it is reasonable to believe that other ponds in the vicinity of Peekskill could still support the species and these ponds should be surveyed where access permission can be obtained. In addition, there is a specimen in the Cornell University Insect Collection that is labeled as this species. The specimen is from Ringwood Preserve, Dryden, NY, 1982. The accuracy of the specimen identification should be confirmed and if the specimen is indeed this species then this location should be re-surveyed and additional, similar wetlands in the vicinity of Dryden should also be surveyed.

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Anderson, R. D.1976. A revision of the Nearctic species of Hygrotus groups II and III (Coleoptera: Dytiscidae). Ann of Entom. Soc. Amer. 69:577-584.

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Taxa Group: Insect
Species Group: Tomah mayfly

Threats:
Because most of its life is spent as an aquatic nymph, mayflies are threatened by activities which degrade water quality including the introduction of pollutants into the water and chemical application for pesticide control. This species is also vulnerable activities which alter the seasonal discharge patterns of rivers . The construction of dams and alteration of the floodplains by dredging or filling are especially detrimental (Gibbs 1993). Alteration of the riparian habitat, principally forests, along occupied rivers was noted as a potential threat in Maine (deMaynadier pers. comm.).

Trends:
There is no information to assess trends for this species in New York State. The historical location on the Sacandaga River has been lost due to inundation through the creation of the Sacandaga Reservoir. There is no long term information to assess trends for the population on the Black River. New sites have been found through targeted surveys in recent years in Maine, but these undoubtedly reflect increased survey effort rather than population increases.

SEQR - No Action Alternative:
The Black River population may be stable, but there is no information to assess that possibility and it is possible that the population in that river has been negatively impacted by dams and other activities and is declining. Without the indicated actions the status of this unique species will remain uncertain at best, and there is the possibility that the species could be lost from the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Tomah mayfly (Siphlonisca aerodromia)			S1	G2	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Tomah mayfly (Siphlonisca aerodromia)	Upper Hudson	Upper Hudson	Unknown
	NE Lake Ontario - St. Lawrence		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Tomah mayfly (Siphlonisca aerodromia)	Lower New England Piedmont St. Lawrence-Lake Champlain Valley	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Tomah mayfly (Siphlonisca aerodromia)				
	Breeding	Riverine	coldwater stream	sand/gravel bottom
	Hibernating/Overwintering	Riverine	coldwater stream	sand/gravel bottom
	Nursery/Juvenile	Palustrine	mineral soil wetland	meadow

Goal and Objectives for Tomah mayfly

Goal: Document the current distribution of the Tomah mayfly in New York State and ensure the perpetuation of the species as part of the NY fauna.

Objective 1 : Conduct more complete surveys of the Black River to determine the full extent of the occurrence in that system and monitor the population over time.

Measure: *Number of sites surveyed, full extent of occurrence defined and mapped, standardized counts of number of individuals from sampling of sites on the Black River.*

Objective 2 : Identify other rivers and streams that appear to have potential habitat for the species and conduct surveys. Focus should be on sites in the Appalachian, NE Lake Ontario-St. Lawrence, and Lake Champlain watersheds.

Measure: *Number of potential sites identified and number of sites surveyed.*

Objective 3 : Increase our understanding of the ecology of this species including habitat preferences and threats, especially as they apply to the sole, known, existing occurrence in New York State, the Black River.

Measure: *Full extent of the Black River occurrence defined and mapped, knowledge of larval and adult habitat usage on the Black River, understanding of threats to the species on this river.*

Objective 4 : Maintain the existing Black River population and, if needed and possible, establish or restore additional populations to ensure the long-term persistence of this mayfly in New York State.

Measure: *Number of maintained/established populations.*

Objective 5 : Obtain baseline distribution data by conducting surveys of the Sacandaga River tributaries in the Upper Hudson watershed (historical location) to determine if the species is still present in this river system.

Measure: *Number of sites surveyed.*

Recommended Actions

Habitat monitoring:

* Review development or other proposals that could impact the flow, water quality, or other factors that could threaten the population in the Black River.

Habitat research:

* Support and encourage research that would increase knowledge of the impact of poorly known threats to this species (e.g. water quality degradation, removal of forested riparian buffers, hydrological flow alterations from existing or new dams).
* Conduct more complete surveys of the Black River to define larval and adult mayfly habitat usage and ecology in the Black River and any new sites that may be located as a result of statewide surveys.

Population monitoring:

* Conduct more complete surveys of the Black River to completely define the extent of the occurrence and develop and apply a standardized sampling scheme that will result in long-term monitoring of the population.

Statewide baseline survey:

* Identify rivers and streams with the necessary spring inundated sedge meadow habitat and conduct surveys for new locations including in the vicinity of the historical Sacandaga River occurrence (the exact historical location is inundated, but suitable habitat may exist elsewhere in the watershed).

References

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new york state
Comprehensive Wildlife Conservation Strategy

Appendix A6:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Mammals

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Mammal
Species Group: Allegheny Woodrat

Threats:
An experimental release and radio-tracking project conducted by DEC at two sites at the Mohonk Preserve, Ulster County, in 1990 resulted in the recovery of 22 of the 50 animals that were monitored. All died within one year of the release. Twelve animals were suitable for complete necropsies. Of these 11 contained at least one raccoon roundworm Baylisascaris procyonis larvae in the brain, which was determined to be the cause of death. The 12th had sign of infection but no worm was located. Subsequent surveys revealed that parasite levels at other extirpated sites were similar or higher than those at the study sites (McGowan 1993).

It appears that the widespread contamination of woodrat habitat by infected raccoon feces, in combination with both raccoon and woodrat behavior, is the primary cause of extirpation in New York and a major component of the decline in other portions of its range ((McGowan 1993 , Logiudice 2003, Owen et al 2004)

Trends:
Although not widely distributed in the state, this species has a long history here. There is a carbon dated record as early as 25,000 years B.P. from a specimen collected within a cave in the town of Bethlehem Albany County (David Steadman, Florida Museum of Natural History, pers com) and there is a regular record of occurrence at archeological sites in southeastern NY (Funk and Steadman 1974, Funk 1976). Within historical times the first museum specimen was collected near Piermont, Rockland county, in 1855 (US National Museum accession # 375, 38468). Existing records suggest that woodrats inhabited islands of habitat formed by the talus slopes and creviced rocky outcropping, of southeastern NY primarily within the Hudson Highlands and the Schuangunk ridge. The species distribution appears to have been bounded to the east by the Hudson River although Goodwin (1935)reported seeing a specimen collected at Skunemunk Mt.. on the NY CT border that apparently no longer exists. It seems unlikely that the species could have existed on the east side of the Hudson on a regular basis without being more widely known from that region.

Woodrats were documented throughout its historical range as recently as the mid 1960's and appears to be occupying all available habitat at that time. The fist evidence of decline was noted by Daniel Smiley (Mohonk NY) in 1977 in and around what is now the Mohonk Preserve, Ulster County. Surveys initiated by DEC in 1979 found old evidence of occupation wherever suitable habitat existed within the historical range but found only 5 sites occupied . Staff were able to live capture more than two animals at only one site, Storm King Mountain, Orange county. By the spring of 1987 only 2 males could be captured there. Both were removed and provided to the Baltimore zoo (Baltimore MD) for captive propagation (DEC files).

Currently, the only woodrats in the state are immigrants which occasionally occupy a small patch of habitat on the New York- New Jersey border. This is the northern extreme of the habitat for the last remaining New Jersey woodrat population.

A similar decline is noted throughout the northern portions of the species range New Jersey has just one population but that appears to be persisting. (Melissa Craddock New Jersey Fish and Game, pers com). The woodrat in Maryland has been in decline for over two decades and continues to decline (Dan Feller, Maryland Natural Heritage Program, pers com). Pennsylvania’s population is still widely distributed but is increasingly more fragmented and slowly declining (Cal Butchcoski Pennsylvania Game Commission, pers com.). The West Virginia population appears to be stable in most areas (Craig Stihler, West Virginia Department of Natural Resources, pers com).

SEQR - No Action Alternative:
It appears that the woodrat continues to decline slowly throughout the region . A lack of action to repopulate currently

suitable, but historically extirpated sites, will eventually result in a lack of source populations to sustain the species in the Northeast. Regional extirpation is likely to result in the species becoming a candidate for federal listing and extirpation from all nearby states.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Allegheny woodrat (Neotoma magister)		X	S1	G3G4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Allegheny woodrat (Neotoma magister)	Upper Hudson Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Allegheny woodrat (Neotoma magister)	Lower New England Piedmont	Lower New England Piedmont	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Allegheny woodrat (Neotoma magister)	all	Terrestrial	alpine/mountain	cliffs & open talus

Goal and Objectives for Allegheny Woodrat

Goal: To restore a secure breeding population of the Allegheny woodrat within the state of New York.

Objective 1 : Determine if apparently suitable woodrat sites can sustain a population by conducting and monitoring an experimental release.

Measure: *Monitor survival and reproductive success of released animals.*

Objective 2 : Determine if suitable sites (low raccoon latrine densities) remain favorable over multiple years

Measure: *Resurvey apparently suitable sites for two additional years*

Objective 3 : Determine when, or if, historical sites are again suitable for occupation by woodrats

Measure: *Compare raccoon latrine densities and roundworm infection rates with rates at extant sites at the five largest (or otherwise most suitable) historical woodrat sites in the state.*

Recommended Actions

Habitat monitoring:

* Monitor raccoon latrine densities within historical woodrat sites following the protocol designed by DEC in 1990 (DEC files)

Relocation/reintroduction:

* Conduct a experimental release of woodrats at appropriate sites and monitor the results through radio tracking and live trapping.

References

McGowan E. M. 1993. Experimental release and fate study of the Allegheny woodrat (Neotoma magister).15 pp. Appendix 1. IN : New York Federal Aid Project Performance Report W-166-E; E-1 Job VIII-7 1992-93. 6 pp.

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Owen F.S., J.W. Edwards, W.M. Ford, J. M. Crum, and P.B. Wood. 2004. Raccoon roundworm in Raccoons in Central West Virginia. Northeastern naturalist. 11(2):137-142

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Taxa Group: Mammal
Species Group: Extirpated large mammals

Threats:
All large mammals that were extirpated from all or large portions of the state were perceived as particularly desirable as a source of food or income, or particularly undesirable as a potential threat to life or livelihood and were unable to cope with changes associated with European intrusions. Those considered particularly desirable have largely returned (white-tailed deer, moose, beaver). Of those that have not, the wolf, cougar are still perceived as threats. The elk today is considered largely incompatible with all but low density human populations. The lynx was likely on the edge of its range in New York and probably could not adjust to the additional pressure from trapping and hunting. The issues for all extirpated species remain the same today. Is there enough habitat for them to meet their needs and, equally important, is the public willing to accept and accommodate their presence?

Trends:

Large mammals were extirpated as the last of their habitat was occupied by Europeans. The last reported elk was shot in Alleghany county in 1834 (Dekay 1842), the last cougar, wolf and lynx disappeared around the turn of the twentieth century from the Adirondack region (Miller1899, Merriam 1899). These species were extirpated from the entire Northeast and there are no established populations of wolves or cougars in the area today. A large- scale release of lynx into the Adirondacks during the late 1980's failed to result in the establishment of a population (DEC files) although a few of that species have recently been confirmed in Northern Maine. Efforts to gauge public support for wolf restoration n NY during the mid 1990's suggested that opposition was still too strong at that time (Duda 1996, Hodgson 1997,Paquet et al 1999)

SEQR - No Action Alternative:
No action in regards to these species will maintain the status quo

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Eastern cougar (Felis concolor cougar)	E		SX	G5TH	E	Resident
Canada lynx (Lynx canadensis)	T	X	SX	G5	G	Resident
Gray wolf (Canis lupus)	E		SX	G4	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Gray wolf (Canis lupus)	Upper Hudson	Unknown	Unknown
	SW Lake Ontario		
	Susquehanna		
	SE Lake Ontario		
	NE Lake Ontario - St. Lawrence		
	Lower Hudson - Long Island Bays		
	Lake Erie		
	Lake Champlain		
	Delaware		
	Allegheny		
Canada lynx (Lynx canadensis)	Upper Hudson	Unknown	Unknown
	Lake Champlain		
	NE Lake Ontario - St. Lawrence		
Eastern cougar (Felis concolor cougar)	Upper Hudson	Unknown	Unknown
	SW Lake Ontario		
	Susquehanna		
	SE Lake Ontario		
	NE Lake Ontario - St. Lawrence		
	Lower Hudson - Long Island Bays		
	Lake Erie		
	Lake Champlain		
	Delaware		
	Allegheny		

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Gray wolf (Canis lupus)	Western Allegheny Plateau	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
	Northern Appalachian/Boreal Forest		
	North Atlantic Coast		
	Lower New England Piedmont		
	High Allegheny Plateau		
	Great Lakes		
Canada lynx (Lynx canadensis)	Northern Appalachian/Boreal Forest	Unknown	Unknown
Eastern cougar (Felis concolor cougar)	Western Allegheny Plateau	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
	Northern Appalachian/Boreal Forest		
	North Atlantic Coast		
	Lower New England Piedmont		
	High Allegheny Plateau		
	Great Lakes		

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Gray wolf (Canis lupus)				
	all	Terrestrial	unknown	unknown
Canada lynx (Lynx canadensis)				
	all	Terrestrial	alpine/mountain	northern deciduous
	all	Terrestrial	alpine/mountain	northern deciduous
Eastern cougar (Felis concolor cougar)				
	all	Terrestrial	unknown	unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern cougar (Felis concolor cougar)				

Goal and Objectives for Extirpated large mammals

Goal: To restore all extirpated mammals to the state of NY when it is biologically feasible and socially acceptable

Objective 1 : Implement restoration for appropriate candidates, and monitor the results.

Measure: *maintaining a self sustaining population for at least 25 years.*

Objective 2 : In the event that social consent is obtained, then a biological assessment of the likelihood of a successful restoration is appropriate.

Measure: *Greater than 70% likelihood of there being a self sustaining population over the next 50 years*

Objective 3 : Informally monitor public attitudes towards extirpated mammals to determine when a species might become a socially appropriate candidate. Conduct more formal attitude surveys at that time.

Measure: *There are no formal measures or specific action levels relating to public consent for restoration; those will be a judgment call by decision makers. Informal measures would include determining the level of consent among an informed public.*

Objective 4 : Monitor confirmed reports of currently extirpated species including determining the source of any collected animals.

Measure: *Investigate or respond to 100% of reports that are confirmed through indisputable physical evidence.*

Objective 5 : Secure habitat patches of sufficient quality, size, and distribution, so as to maintain or improve the potential for future large mammal restoration.

Measure: *% of the landscape that is maintained as potential habitat.*

Recommended Actions

Habitat research:

* Conduct biological assessment for species shown to be socially acceptable.

Recommended Actions

Other action:

* Conduct public attitude surveys when decision makers are of the opinion that there is a reasonable chance of public support for the restoration of an extirpated species.

Relocation/reintroduction:

* Restore species believed likely to succeed and that are socially acceptable and monitor their progress.

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Taxa Group: Mammal
Species Group: Furbearers

Threats:
American marten and river otter are harvested (trapped) furbearer species. In the case of American marten, their range is generally thought to be restricted to portions of northern New York. Historically (prior to 1990), river otter primarily occupied northern New York, and most of eastern New York, in an area roughly east and southeast of Syracuse. Both marten and otter harvest are carefully regulated and mandatory reporting requirements are in place. Marten trapping is further restricted because special permits are required and submission of biological specimens (carcasses) are required to facilitate population modeling and harvest monitoring. Presently river otter are the most valuable furbearer harvested in New York, with individual animals valued at $100 or more. Marten are highly valued as well, with the strongest market evidently based on the sale of full taxidermy mounts. Both species require careful monitoring to ensure that sustained yield harvest regimens are in place. In the 1990s, river otter were moved from places where they are abundant to watershed basins where they were absent or scarce. Since that time, the fur market for otter pelts became highly robust and market demands appear very strong. River otter in most of central and western New York require careful monitoring to gauge the effect of potential unlawful or accidental harvesting (primarily in conjunction with beaver trapping), and to evaluate the success of the restoration project. The annually reported harvest of American marten is highly variable with reports ranging from a low of 14 to a high of 225 in the last five years, making an accurate assessment of population status using harvest data is very difficult. In the absence of such assessments, the confidence that marten are managed in a sustained yield manner is weakened. Since marten and their prey consume beechnuts, changes in forest health (e.g., the spread of beech bark disease) may have long term negative consequences on marten populations. Moreover, the potential affects of long-term climate change on forest health and habitat suitability for marten should be monitored. In Central and Western New York, otter/vehicle collisions are a significant source of mortality.

Trends:
The population trend of American marten is poorly understood because only harvest-based indices are currently available. Marten in New York are an isolated population within the geographic (northeast) region. New York's population is not contiguous with other populations. Furthermore, since most marten are harvested through the use of food attractants (I.e., baits), the harvest is greatly affected by temperatures (energy requirements) and the availability of natural marten foods such as small mammals and beechnuts. While their population in the core range appears to be stable, or even possibly increasing, their population density or population trend has not been fully documented. The high variation in reported harvest means that those data are not useful for population monitoring. Additional harvest-independent data are required to draw sound conclusions about the status of marten in New York. Since the historical date selected for this assessment (1990), the river otter range has expanded because of the Department of Environmental Conservation's actions to establish river otter in central and western New York. However, since the restoration effort was completed (2000), active monitoring has not been thorough enough to establish a clear picture of their population status. While otter are reported in the restoration area, reliable measures of population trend are not available. In the Northern Atlantic Coast ecoregion (Lower Hudson River and Long Island Bays), river otter are occasionally reported. These anecdotal and poorly documented sightings lead to uncertainty about their status in saltwater, estuarine, and brackish environments.

SEQR - No Action Alternative:
Failure to monitor population status of river otter and American marten may result in failure to detect significant population change, and to match management actions to population status.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
American marten (Martes americana)			S3	G5	G	Resident
River otter (Lontra canadensis)			S5	G5	G	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
River otter (Lontra canadensis)	Delaware	Lake Champlain	Stable
	Upper Hudson	Susquehanna	Stable
	NE Lake Ontario - St. Lawrence	Delaware	Stable
	Lake Champlain	Upper Hudson	Stable
	Susquehanna	SW Lake Ontario	Unknown
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Stable
	Allegheny	Allegheny	Unknown
	Lake Erie	Lake Erie	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	SW Lake Ontario	SE Lake Ontario	Stable
American marten (Martes americana)	NE Lake Ontario - St. Lawrence	Upper Hudson	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Upper Hudson	NE Lake Ontario - St. Lawrence	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability

Species Distribution - Ecoregion

Species	Historical	Current	Stability
River otter (Lontra canadensis)	Great Lakes	Northern Appalachian/Boreal Forest	Stable
	Lower New England Piedmont	Lower New England Piedmont	Stable
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Stable
	Northern Appalachian/Boreal Forest	Western Allegheny Plateau	Unknown
	High Allegheny Plateau	North Atlantic Coast	Unknown
	North Atlantic Coast	High Allegheny Plateau	Unknown
	Western Allegheny Plateau	Great Lakes	Unknown
American marten (Martes americana)	Northern Appalachian/Boreal Forest	Northern Appalachian/Boreal Forest	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
River otter (Lontra canadensis)				
	all	Estuarine	unknown	unknown
	all	Lacustrine	cold water deep	mud bottom
	all	Lacustrine	cold water deep	rocky bottom
	all	Lacustrine	cold water deep	sand/gravel bottom
	all	Lacustrine	cold water deep	SAV
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	cold water shallow	rocky bottom
	all	Lacustrine	cold water shallow	sand/gravel bottom
	all	Lacustrine	cold water shallow	SAV
	all	Lacustrine	warm water deep	mud bottom
	all	Lacustrine	warm water deep	rocky bottom
	all	Lacustrine	warm water deep	sand/gravel bottom
	all	Lacustrine	warm water deep	SAV
	all	Lacustrine	warm water shallow	mud bottom
	all	Lacustrine	warm water shallow	rocky bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Lacustrine	warm water shallow	SAV
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
American marten (Martes americana)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American marten (Martes americana)				
	all	Terrestrial	alpine/mountain	northern coniferous
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern coniferous

Goal and Objectives for Furbearers

Goal: Establish or maintain river otter and American marten populations in all areas of suitable habitat.

Objective 1 : On an annual and long term basis, determine the population status (distribution and population trend) of river otter and American marten in watershed basins where population status is unknown by April 1st of each year.

Measure: *Population status trends will be reported and used in support of the development of statewide management plans, and implementation of regulatory decisions to ensure population viability in support of the goal.*

Recommended Actions

Habitat research:

* Monitor production of important food supplies for marten via regional (northeastern) mast monitoring project (I.e., beechnuts) to evaluate relationships between food availability, marten populations, and marten harvest.
* Assess potential marten habitat outside of the core marten range in the central Adirondacks, and evaluate limiting factors affecting range expansion.

Life history research:

* For American marten, evaluate through research relationships between home range and population dynamics related to fluctuations in food resources and forest health (e.g., beech bark disease).

Other action:

* Develop methods to mathematically model available harvest-based information to predict marten and river otter population trends, and to define sustainable harvest levels. For river otter, analyze DNA samples from restored otters and compare that data with all otter recovered from the restoration area.

Recommended Actions

Population monitoring:

* The primary conservation need for river otter and American marten is the development of robust measures of population status to inform management actions, primarily adjustment of trapping regulations and reporting requirements. Moreover, non-harvest-based data are needed to develop harvest independent measures of population status. The potential to develop methods to "mark" marten through unique "fingerprints" should be assessed (this technique appears valid for fisher studies).

Statewide management plan:

* Based on the development of robust measures of population status, statewide management plans will be established and implemented, including identification of watershed basins where marten or river otter populations should be augmented through direct action.

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Taxa Group: Mammal

Species Group: Game species of concern

Threats:

We do not know why this species is in decline. It is clear that the New England cottontail is continuing to decrease in distribution and is being replaced by the eastern cottontail (Sylvilagus floridanus). However, it is not certain that there is a causal relationship, or if there is, the degree of causality. Changing habitat and development within its historical range may be a contributing factor (Amaral 2004).

Trends:

The historical record of the New England cottontail is clouded because of the similarity of appearance with the eastern cottontail and a lack of museum specimens to confirm what species was being discussed by early authors. We do know of extant specimens collected as far north as Lake George in 1907 (USNM specimen #150680) and west of the Hudson River in the Kaaterskill region of the Catskills in 1896 (USNM specimen #83111) . Connor (1971) believed it was historically the predominate species on Long Island. More recent distribution is thought to be limited to the east side of the Hudson River . In the 1960's the species was still found in Rennselaer county (Benton and Atkinson 1964) Low intensity surveys since the 1980's suggests its distribution has declined still further and is now limited to the counties of Dutchess, Putman , Westchester and Columbia where its exists in a few fragmented populations (Clark 2002, 2003, 2004). A greater survey effort may well expand its distribution within the state . There has been a similar decline across the rest of the species range in New England and the species is now under review for listing as threatened or endangered under the endangered species act (Amaral 2004).

SEQR - No Action Alternative:

if current trends continue, the species faces certain extirpation from New York State and possible extinction range wide within the next few decades.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
New England cottontail (Sylvilagus transitionalis)		X	SH	G4	G SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
New England cottontail (Sylvilagus transitionalis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing
	Lake Champlain		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
New England cottontail (Sylvilagus transitionalis)	Lower New England Piedmont	Lower New England Piedmont	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
New England cottontail (Sylvilagus transitionalis)				
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	northern deciduous

Goal and Objectives for Game species of concern

Goal: Insure the perpetuation of the New England Cottontail in New York state

Objective 1 : Within 5 years resolve the issues of historical distribution and the taxonomic status of S. transitionalis verses S. obscurus to the extent possible.

Measure: *Resolve the confusion surrounding the taxonomic status of S. transitionalis and S. obscurus based on a rigorous review of current information by qualified taxonomists.*

Objective 2 : Within the next 5 years gain a thorough understanding of the species current boundaries of its distribution within the state.

Measure: *define where the species is and is not located*

Objective 3 : Within the next 5 years gain a thorough understanding of the species distribution and density within those boundaries.

Measure: *Define population density and distribution with its range*

Objective 4 : Within the next 5 years, identify the likely causes of the decline and begin implementing actions to reverse their effects.

Measure: *Change in population resulting from the application of various potential remedies.*

Recommended Actions

Recommended Actions

Habitat research:

* Compare the habitat within extant and extirpated sites to see if there are significant differences between the two .

Habitat restoration:

* If significant habitat characteristics are found, identify suitable areas within the historical range and modify the habitat to the advantage of the species. Reintroduce the species to that area if necessary.

Other action:

* conduct an investigation into the taxonomic separation of S. transitionalis and S. obscurus and determine if in fact they deserve separate status.

Population monitoring:

* Conduct high intensity surveys in and around the areas where the species is discovered during low intensity surveys to better understand their local distribution.
* Continue low intensity surveys of the distribution of NEC through fecal collections. Conduct follow- up live trapping where animals are detected for confirmation . These surveys will be conducted throughout the region where the species had been detected since the early 1960's. (Washington to Westchester co)

References

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Taxa Group: Mammal
Species Group: Indiana Bat

Threats:
The reason for the overall decline of this species, and the reason for the decline occurring primarily in the southern regions, continues to be a mystery (US Fish and Wildlife Service 1999). For the time being, the Indiana bat appears to be secure in New York as populations are stable to increasing (Hicks and Novak 2002). The Indiana bat in New York is most important as a standard of a success in the face of a range- wide decline, and as a means of understanding the causes of the decline. The only obvious long term potential threat to the species in the state will likely be widespread development in the lower elevation regions of the lower Hudson Valley, where roughly 70% of the state's population winters. Although apparently capable of doing well in suburban settings, Indiana bats appear to need interspersed patches of undeveloped mature woods as maternity roosts and feeding areas. We do not know how densely developed a region can be before the species is put in jeopardy. Widespread development of wind turbines and other tall structures may also present a risk to migrants, although the degree of risk, if any, is unknown at this time. There is some concern that the warming of hibernacula temperatures may be a cause of decline in the southern portions of the species range.

Trends:
Indiana bats is listed as endangered by both the Federal government and the State of New York (US Fish and Wildlife Service 1999). It comprises roughly 7% of the wintering bats counted to date in the state; the second most common species by number (Hicks 2003,Hicks and Novak 2002). However they are found in just 10 of the roughly 140 caves and mines surveyed to date, with 80% wintering in just three mines. (Hicks 2003,Hicks and Novak 2002) New York's wintering population of roughly 33,000 of the federally endangered Indiana bat and numbers within the state appear to be at least stable and probably increasing (Hicks 2003). New York harbors 9% of the range wide population and the fourth largest state total. (Clawson 2002). The state's contribution to the Indiana bat population continues to grow in importance as range wide numbers continue to drop.

SEQR - No Action Alternative:

Given recent population trends it seems unlikely that the species will be at risk of extirpation from New York within the next ten years. However, without New York's involvement, it is unlikely that the cause of the overall decline will be identified and addressed. A continued downward trend range wide will continue to elevate the importance of New York's population and the need for more rigorous protective measures.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Indiana bat (Myotis sodalis)	E		S1	G2	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Indiana bat (Myotis sodalis)	Lake Champlain	Lower Hudson - Long Island Bays	Increasing
	Lower Hudson - Long Island Bays	Upper Hudson	Increasing
	Upper Hudson	SE Lake Ontario	Increasing
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Stable
	NE Lake Ontario - St. Lawrence	Lake Champlain	Increasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Indiana bat (Myotis sodalis)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Increasing
	Lower New England Piedmont	Lower New England Piedmont	Increasing
	Great Lakes	Great Lakes	Increasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Indiana bat (Myotis sodalis)				
	Breeding	Terrestrial	forested	southern deciduous
	Hibernating/Overwintering	Subterranean	cultural	mines
	Hibernating/Overwintering	Subterranean	natural	terrestrial caves
	Roosting/Congregating	Subterranean	cultural	mines
	Roosting/Congregating	Subterranean	natural	terrestrial caves

Goal and Objectives for Indiana Bat

Goal: Assure the perpetuation of the Indiana bat within the state of New York.

Objective 1 : Within 6 months, develop and implement efficient criteria for reviewing applications for residential developments that will identify the likely loss of Indiana bat maturity colonies and result in a decline in the population

Measure: *% of likely habitat vs. unlikely habitat that is included in the review.*

Objective 2 : Develop a temperature profile for all New York Indiana bat hibernacula within 5 years . This will include at least three years of data with comparative information from existing and historical roosts and a sample of conditions throughout the site.

Measure: *% of sites monitored to the above listed standards*

Objective 3 : Conduct complete surveys of all hibernacula with greater than 30,000 bats once every 10 years and 5 selected non-sodalis sites every 5 years.

Measure: *% of sites with greater than 30,000 bats that are surveyed.*

Objective 4 : Conduct semi-annual winter surveys of hibernating Indiana bats at all Indiana bat hibernacula, with counts of all species as sites with less than 30,000 total individuals.

Measure: *% of known hibernacula surveyed*

Objective 5 : Regulate access to the six largest Indiana bat hibernacula (Barton Hill, Glen Park, Jamesville Quarry, Williams Complex - Preserve, Hotel and Lake Mines) within 5 years.

Measure: *The number of hibernacula that are gated.*

Objective 6 : Survey new potential hibernacula as they are discovered.

Measure: *% of newly discovered sites that are surveyed*

Objective 7 : Within 10 years, determine the likely effects of wind turbines on Indiana bats, including but not limited to, identifying migratory corridors, height of travel above the ground, summer distribution of the species, and kill rates at turbines.

Measure: *% of the population that uses likely turbine sites and the % of animals on those sites that are likely to be killed .*

Objective 8 : Within 3 years, determine the timing of the spring emergence, fall swarm and fall entry into hibernation of Indiana bats at least one new York hibernacula.

Measure: *% of the hibernating population that is monitored at the site.*

Objective 9 : Within 5 years develop and implement (if feasible) hydrogen isotope analysis techniques for use with hair samples to identify the broad scale distribution of maternity colonies.

Measure: *Using samples of known origin, compare predicted locations based on isotope analysis with the source location.*

Objective 10 : Within 5 years radio track no less than 1% of the reproductive females from each of the 5 largest hibernacula to their summer range to determine summer distribution and habitat preferences.

Measure: *% of reproductive females in the hibernacula that are successfully tracked to summer range.*

Objective 11 : Within 5 years, determine the relationship between the density of development and the abundance and success of Indiana bat populations.

Measure: *The difference in abundance (catch /unit effort, density of detections) between heavily developed, lightly developed and intermediately developed areas of the lower Hudson river valley.*

Objective 12 : Within 8 years , design and implement field investigations to determine the consequences of the destruction of maternity colonies on the survival and success of the individual bats from that colony.

Measure: *survival rates, reproductive success.*

Objective 13 : Within 8 years, determine the likely mark retention rates and the effects on survival resulting from the application of wing bands and Passive Integrated Transponders (PIT) tags to Indiana bats.

Measure: *recapture rates for the various treatment methods.*

Objective 14 : Within 8 years, develop an alternative means of monitoring Indiana bat populations other than direct counts at hibernacula.

Measure: *unknown*

Recommended Actions

Habitat management:

* Work with landowners to erect gates to regulate access to the selected hibernacula.

Habitat monitoring:

* Complete three years of roost temperature monitoring at all sodalis sites using continually monitoring temperature probes.
* Survey for Indiana bats using vocalization detectors and mist netting at sites that are geographically similar but that have differences in the density of development over large areas.

Recommended Actions

Habitat research:

* Identify the specific summer habitat requirements for the Indiana bats by radio tracking 1% or more of the hibernating reproductive females from winter to summer range.

Other action:

* Conduct marking studies during the summer maternity , fall swarm and spring emergence that will detect differences in mark retention and survival rates for PIT tags, and at least two types of wing bands.

Population monitoring:

* live trap and mark sodalis during the fall swarm , fall entry and spring emergence at one hibernacula to determine the arrival and departure periods of the species by age and sex.
* Continue to survey new potential hibernacula as they are discovered.
* survey winter populations as indicated in the objectives, develop alterative population monitoring techniques

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Taxa Group: Mammal

Species Group: Marine mammals

Threats:

Threats to cetaceans are primarily human interaction such as; boat strikes, pollution and entanglement in fishing gear. It has been documented that the blue, fin, sei, sperm, right, humpback, and harbor porpoise have all experienced some form of human interaction. Through tools such as; aerial surveys, radio and satellite tagging, genetic analysis we would have the opportunity to obtain more stock data and therefore have the ability to maintain the population at or above its current level.

Trends:

There is insufficient data to establish a trend for this species. However, with current technology and methodology we should be able to monitor populations and compare results to present broad scale surveys in the Northwest Atlantic.

SEQR - No Action Alternative:

If no action is taken we will not know current abundance and distribution. Without more surveys to better understand habitat usage we can not thoroughly assess movement and population levels. The information obtained through aerial surveys, radio and satellite tagging, and genetic analysis will assist in research on these species in New York marine waters.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Northern right whale (Eubalaena glacialis)	E		SNA	G1	E	Migratory
Humpback whale (Megaptera novaeangliae)	E		SNA	G3	E	Migratory
Blue whale (Balaenoptera musculus)	E		SNA	G3G4	E	Migratory
Sei whale (Balaenoptera borealis)	E		SNA	G3	E	Migratory
Fin whale (Balaenoptera physalus)	E		S1	G3G4	E	Migratory
Harbor porpoise (Phocoena phocoena)		X	S4	G4G5	U SC	Migratory
Sperm whale (Physeter catodon)	E		SNA	G3G4	E	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sperm whale (Physeter catodon)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Harbor porpoise (Phocoena phocoena)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Fin whale (Balaenoptera physalus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Sei whale (Balaenoptera borealis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Blue whale (Balaenoptera musculus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Humpback whale (Megaptera novaeangliae)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Northern right whale (Eubalaena glacialis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sperm whale (Physeter catodon)	North Atlantic Coast	North Atlantic Coast	Unknown
Harbor porpoise (Phocoena phocoena)	North Atlantic Coast	North Atlantic Coast	Unknown
Fin whale (Balaenoptera physalus)	North Atlantic Coast	North Atlantic Coast	Unknown
Sei whale (Balaenoptera borealis)	North Atlantic Coast	North Atlantic Coast	Unknown
Blue whale (Balaenoptera musculus)	North Atlantic Coast	North Atlantic Coast	Unknown
Humpback whale (Megaptera novaeangliae)	North Atlantic Coast	North Atlantic Coast	Unknown
Northern right whale (Eubalaena glacialis)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sperm whale (Physeter catodon)	Feeding	Marine	deep subtidal	pelagic
Harbor porpoise (Phocoena phocoena)	Feeding	Marine	deep subtidal	pelagic
Fin whale (Balaenoptera physalus)	Feeding	Marine	deep subtidal	pelagic
Sei whale (Balaenoptera borealis)	Feeding	Marine	deep subtidal	pelagic
Blue whale (Balaenoptera musculus)	Feeding	Marine	deep subtidal	pelagic
Humpback whale (Megaptera novaeangliae)	Feeding	Marine	deep subtidal	pelagic
Northern right whale (Eubalaena glacialis)	Feeding	Marine	deep subtidal	pelagic

Goal and Objectives for Marine mammals

Goal: To study abundance and habitat usage.

Objective 1 : Obtain baseline data on seasonal variation in abundance and distribution.

Measure: *Aerial and shipboard surveys*

Objective 2 : Obtain data on habitat selection and usage, along with information on inshore and offshore movements.

Measure: *Radio and satellite tag*

Objective 3 : Use stranding data to compare work being done on stock structure and provide insight on movements on a broad scale.

Measure: *Genetic analysis*

Recommended Actions

Recommended Actions

Curriculum development:

* To provide public outreach programs about local species and their environment within the Long Island Sound and the New York Bight. Partnering with agencies such as the New York State Marine Mammal and Sea Turtle Rescue Program, NY DEC, NOAA, U.S. Coast Guard and local law enforcement, will assist the Riverhead Foundation's educational efforts of informing the public about the marine environment and how they can aid in its preservation.

Fact sheet:

* To provide literature for local communities, as well as law enforcement agencies, regarding marine mammals and their environment within the Long Island Sound and the New York Bight. The information distributed by the Riverhead Foundation to these people will provide a more effective response to strandings and sightings of animals.

Habitat monitoring:

* Genetic analysis on stranding data can be compared to work being done on stock structure and provide insight on movements on a broad scale. Thereby revealing the scope of the management initiative required.

Population monitoring:

* Radio and satellite tags can be combined with aerial and shipboard survey work to study abundance, distribution, and movements of habitat as they are coupled with seasonal changes.

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Taxa Group: Mammal

Species Group: Small mammals of uncertain/questionable residency

Threats:

None have been identified. Neither species (least weasel or least shrew) has been reported frequently enough within the state to determine if there are any threats. The least shrew generally inhabits old, fallow, and mixed species hay fields. The continuing loss of these habitat types across the state have undoubtedly decreased the amount of available habitat.

Trends:

The least shrew is so rarely encountered in the state (only about a dozen specimens exist) that it is impossible to identify a population trend.
Earliest records for New York include a specimen from West Point, Orange County in 1900 (USNM No. 254049) and North Rose , Wayne County in October 1913 (USNM No. 197050). More recent records occur from Staten Island, Tompkins county and Long Island. To our knowledge none have been reported in the state since the 1930's. There has not been large scale or wide spread surveys to locate Least shrews in the state since then. The one exception was during the 1950's, when John Whitaker (Indiana state University pers com) set thousands of traps in fields in New York without collecting any. He has subsequently captured over 150 in Indiana. There has not been sufficient effort dedicated to this species to determine its current status.

New York is on the northern fringe of the species distribution and it is not known to be at risk over the majority of its range, although it is rarely encountered in some areas. It is listed as endangered in Connecticut and Pennsylvania. It has apparently diminished substantially in Pennsylvania and is now known from only one location in the south- central portion of the state (Cal Butchkoski, Pennsylvania Game Commission pers. com.).

The least weasel has only been reported on five occasions in New York State , Four were reported taken by trappers in the Pennsylvania border regions of Chautauqua County in the late 1940's, of which one was examined and its identification was confirmed (Cook 1951). Another was collected within a mile of Fredonia, Chautauqua County in 1981. That specimen is currently in the collection of the New York State Museum, Albany. The species is widely distributed, occurring to the south west and north of New York State, although it is sporadically distributed or rarely encountered across much of its range (Svendsen1982).

SEQR - No Action Alternative:

Without an understanding of either species' current status and population trends, it is impossible to determine the consequences of no action.
Therefore , we need that basic information.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Least weasel (Mustela nivalis)			SH	G5	G	Resident
Least shrew (Cryptotis parva)		X	SH	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Least shrew (Cryptotis parva)	SW Lake Ontario	Unknown	Unknown
	Susquehanna		
	Allegheny		
	Delaware		
	SE Lake Ontario		
	Lower Hudson - Long Island Bays		
	Lake Erie		
Least weasel (Mustela nivalis)	Allegheny	Unknown	Unknown
	Lake Erie		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Least shrew (Cryptotis parva)	North Atlantic Coast	Unknown	Unknown
	Western Allegheny Plateau		
	Great Lakes		
Least weasel (Mustela nivalis)	Western Allegheny Plateau	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Least shrew (Cryptotis parva)				
	all	Terrestrial	open upland	grasslands
Least weasel (Mustela nivalis)				
	all	Terrestrial	forested	southern deciduous
	all	Terrestrial	open upland	

Goal and Objectives for Small mammals of uncertain/questionable residency

Goal: To insure the perpetuation of the least shrew and least weasel in New York state if populations exist here.

Objective 1 : within 6 years determine the current distribution and status of the least shrew

Measure: *Captures per unit of effort in suitable habitat within the species historic range.*

Objective 2 : Within 6 years determine the current status and distribution of the least weasel in NY

Measure: *Captures per unit of effort in suitable habitat within the species historic range.*

Recommended Actions

Population monitoring:

* if the species is found within the historic range, extend surveys to likely habitat outside of the known historic range
* Conduct trapping efforts for both species in likely habitats within their known historic distribution in the state.

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Taxa Group: Mammal
Species Group: Small-Footed Bat

Threats:
Little is known about the true status of this species and too little is known to suggest threats. Our interest is in confirming our suspicion that the species is more common that it currently appears and indeed is facing no threats.

Trends:
Based on winter records, the species is rare in New York but the population appears to be stable (DEC files). Other states within the range that express concern about the species, base their concerns on the lack of animals found in hibernacula . Winter surveys suggest that this is the rarest of the cave bats in New York and probably the eastern US , with roughly 4,000 having been detected range wide. Nearly 3,000 have been counted in New York, almost all in just two sites (DEC files). Summer records, particularly in the south, suggest that the species is far more common than winter records would imply (Craig Stihler, West Virginia Department of Natural resources pers com). This view is supported by the hardy nature of the bat as a hibernator (Barbour and Davis 1969), which probably allows it to winter in relatively unprotected sites in southern areas. It also has a habit of roosting in crevices and under rocks (Martin et all 1966), which would make most individuals hidden from the view of surveyors.

SEQR - No Action Alternative:
Conducting the appropriate surveys will likely allow us to confirm the species true status in the state. It will likely remove this species from Department concern and allow us to focus on other species in greater need. A lack of action will prevent us from doing so.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Small-footed bat (Myotis leibii)						Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Small-footed bat (Myotis leibii)	Lake Champlain	Lake Champlain	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Small-footed bat (Myotis leibii)	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Small-footed bat (Myotis leibii)	Feeding	Terrestrial	open upland	cliffs & open talus

Goal and Objectives for Small-Footed Bat

Goal: Insure the perpetuation of the small-footed bat

Objective 1 : Monitor populations at selected hibernacula at no greater than 10 year intervals

Measure: *% of occupied sites that are surveyed*

Objective 2 : Determine the percentage of the wintering population of small-footed bats that is available for counting by surveyors.

Measure: *% of transmitter bats that are roosting in various roost types within the hibernacula.*

Objective 3 : Determine the summer distribution and habitat preferences of reproductive females within the state .

Measure: *Distribution and habitat characteristics of recovered transmitter animals*

Recommended Actions

Life history research:

* radio tag , release and track 20 reproductive female M. leibii as the exit the hibernacula and track them to their summer range.
* radio tag and release 20 leibii as they enter the largest hibernacula for the winter. Relocate them within the mine to determine their roost selection.

Population monitoring:

* continue to survey hibernating leibii in conjunction with sodalis hibernacula surveys

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Taxa Group: Mammal
Species Group: Tree bats

Threats:

Unknown at this time. Tree bats do migrate seasonally over long distances and seem to be more susceptible to collisions with towers and wind turbines than other species. It is uncertain if this might adversely affect their populations.

Trends:

There has never been a systematic survey of any of these species in the state of New York. Most work that has been recently conducted (mist netting) has been limited in extent and would tend to underestimate the abundance of these species, especially hoary and silver-haired. What historical evinces there is suggests that the silver-haired was the most common bat in the Adirondacks during the 1880's, more common than all others combined (Merriam 1884). Outside of the Adirondacks the silver-haired was rarely encountered , but was more common during migration. The hoary bat was uncommon, less so in the Adirondacks. Red bats appear to be more common that the other tree species, especially in warmer regions of the state. (Merriam 1884, Miller 1899, Dekay 1842)

Most work that has been recently conducted in New York has been limited to mist netting at just a few sites. This method would tend to underestimate the abundance of these species as they generally fly above net heights, especially the hoary and silver-haired. Surveys by DEC in the last few years at some of Merriam's primary collecting locations revealed no evidence of the silver-haired bats, suggesting that it has undergone a severe decline over the last century. We know of only four summer records of silver-haired bats in the state in recent decades. The hoary appears to be widely distributed but in low numbers. The red bat does not appear to be common but is more frequently encountered than the other two, especially in warmer portions of the state (DEC files).

Regionally, the status (or lack of information) of these bats is similar to that in New York except that the red bat is clearly more common to the south (Scott Darling , Vermont Fish and wildlife pers com, Cal Butchkoski Pennsylvania Game Commission pers com, Jenny Dickson Connecticut Fish and Wildlife pers com) . The silver haired bat appears to be more common to the west and is one of the most common bats in the prairie parklands (vanZell de Jong 1985)

SEQR - No Action Alternative:

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Silver-haired bat (Lasionycteris noctivagans)		X	S4B	G5	U	Resident
Hoary bat (Lasiurus cinereus)		X	S4B	G5	U	Resident
Eastern red bat (Lasiurus borealis)		X	S5B	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern red bat (Lasiurus borealis)	Upper Hudson	Upper Hudson	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Lake Erie	Lake Erie	Unknown
	Lake Champlain	Lake Champlain	Unknown
	Delaware	Delaware	Unknown
	Allegheny	Allegheny	Unknown
Hoary bat (Lasiurus cinereus)	Upper Hudson	Allegheny	Unknown
	SW Lake Ontario	Delaware	Unknown
	Susquehanna	Lake Champlain	Unknown
	SE Lake Ontario	Upper Hudson	Unknown
	NE Lake Ontario - St. Lawrence	SW Lake Ontario	Unknown
	Lake Erie	Susquehanna	Unknown
	Lower Hudson - Long Island Bays	SE Lake Ontario	Unknown
	Lake Champlain	NE Lake Ontario - St. Lawrence	Unknown
	Delaware	Lower Hudson - Long Island Bays	Unknown
	Allegheny	Lake Erie	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Silver-haired bat (Lasionycteris noctivagans)	Upper Hudson	Upper Hudson	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Susquehanna	Susquehanna	Unknown
	SE Lake Ontario		
	NE Lake Ontario - St. Lawrence		
	Lower Hudson - Long Island Bays		
	Lake Erie		
	Lake Champlain		
	Delaware		
	Allegheny		

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern red bat (Lasiurus borealis)	Great Lakes	Great Lakes	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Hoary bat (Lasiurus cinereus)	Great Lakes	Western Allegheny Plateau	Unknown
	Western Allegheny Plateau	St. Lawrence-Lake Champlain Valley	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
	Northern Appalachian/Boreal Forest	North Atlantic Coast	Unknown
	North Atlantic Coast	High Allegheny Plateau	Unknown
	Lower New England Piedmont	High Allegheny Plateau	Unknown
	High Allegheny Plateau	Great Lakes	Unknown
Silver-haired bat (Lasionycteris noctivagans)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
	Great Lakes	St. Lawrence-Lake Champlain Valley	Unknown
	High Allegheny Plateau	Northern Appalachian/Boreal Forest	Unknown
	Lower New England Piedmont	North Atlantic Coast	Unknown
	North Atlantic Coast	Lower New England Piedmont	Unknown
	Northern Appalachian/Boreal Forest	High Allegheny Plateau	Unknown
	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern red bat (Lasiurus borealis)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
Hoary bat (Lasiurus cinereus)				
	all	Terrestrial	forested	mixed deciduous/coniferous
	all	Terrestrial	forested	northern deciduous
	all	Terrestrial	forested	southern deciduous
Silver-haired bat (Lasionycteris noctivagans)				
	all	Terrestrial	forested	northern deciduous

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Silver-haired bat (Lasionycteris noctivagans)				
	all	Terrestrial	forested	southern coniferous
	all	Terrestrial	forested	southern deciduous

Goal and Objectives for Tree bats

Goal: Insure the perpetuation of the tree bats as resident species in the state of New York

Objective 1 : Determine migratory patterns for tree bats through NY state

Measure: *unknown*

Objective 2 : Determine the level of threat posed to tree bats by wind turbines and other tall structures.

Measure: *Mortality rates for animals passing structures, percent of the population likely to be affected. Overall effect on the population.*

Objective 3 : Develop and implement a methodology to identify the origin (resident or migrant) of individual tree bats so as to distinguish between residents and migrants among captured animals and recovered mortalities.

Measure: *% of animals of known origin that are correctly identified.*

Objective 4 : within 8 years determine the current summer status and distribution of each species in NY state.

Measure: *% of habitats within the states ecozones that have been adequately sampled.*

Recommended Actions

Other action:

* review and respond to projects involving tall structures that are likely to adversely effect the population.

Statewide baseline survey:

* Conduct surveys of migrants to determine the timing, distribution, species composition and elevation of migrating bats. This is likely to include combinations of acoustical monitoring , radar, and visual monitoring.
* conduct summer surveys of tree bats that will include capturing individuals and acoustical monitoring

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Comprehensive Wildlife Conservation Strategy

Appendix A7:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Marine fish

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Marine fish

Species Group: Alewife - marine district population

Threats:

Possible over harvest of adults on the spawning grounds for bait in the recreational and commercial fisheries, loss of access to historic spawning grounds, and degradation of spawning and juvenile habitat - primarily in inshore areas.

Trends:

NY has no long term data series to suggest population trends.

SEQR - No Action Alternative:

Difficult to predict. Without data on spawning population it is unclear what the future direction of the stock is.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Alewife (Alosa pseudoharengus)					U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Alewife (Alosa pseudoharengus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Alewife (Alosa pseudoharengus)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Alewife (Alosa pseudoharengus)				
	Breeding	Estuarine	shallow subtidal	sand/gravel

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Alewife (Alosa pseudoharengus)				
	Breeding	Riverine	coastal plain stream	sand/gravel bottom
	Breeding	Riverine	deepwater river	sand/gravel bottom
	Breeding	Riverine	warmwater stream	sand/gravel bottom
	Feeding	Marine	deep subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel
	Nursery/Juvenile	Riverine	coastal plain stream	sand/gravel bottom
	Nursery/Juvenile	Riverine	deepwater river	pelagic

Goal and Objectives for Alewife - marine district population

Goal: Restore and maintain stock of alewives at levels that meet bioenergetic requirements of predators and provide for sustainable recreational and bait fishing consumption.

Objective 1 : By 2010 determine a biomass threshold and target for maintenance of a sustainable stock and fishery in the Hudson River estuary.

Measure: *Annual indices of relative abundance of adult and yoy fish*

Objective 2 : Establish a condition index for potential alewife predators in the Hudson River estuary by 2008

Measure: *Length and weight of predators in Hudson River estuary.*

Objective 3 : For the Hudson Estuary alewife population, collect adults and spawning stock abundance information to determine acceptable levels of fishing mortality by 2008.

Measure: *Annual estimates of adult abundance and mortality rate*

Objective 4 : Identify alewife predators in the Lower Hudson/ Long Island Bays

Measure: *Conduct food habits survey to identify major predators*

Objective 5 : Maintain condition index of alewife predators at established level in the Hudson River by 2020

Measure: *Up-to-date condition index*

Objective 6 : Quantify upstream spawning habitat that could be opened on X streams in the Lower Hudson/Long Island Bays and Atlantic Ocean watersheds by 2025.

Measure: *quantitative habitat survey of Lower Hudson/Long Island Bays and Atlantic Ocean watersheds, amount of accessible/ inaccessible spawning habitat identified in each watershed*

Recommended Actions

Habitat research:

* Document habitat use by alewife at various life stages.

Life history research:

* Develop basic biological data: fecundity, maturity, age structure, longevity.

Population monitoring:

* Develop method to index annual abundance of age zero and adult fish
* Develop annual data on age structure of spawning stock

Originator

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Taxa Group: Marine fish
Species Group: American eel

Threats:
American eels are a long-lived, late maturing, panmictic, semelparous species. Due to these complicated life history traits the population cannot withstand sustained harvest rates at or above natural mortality. However, American eels have been traditionally harvested at every life-stage within various parts of their range, which extends from Greenland to Venezuela. A catadromous fish, American eels inhabit diverse habitats, including salinities from freshwater to oceanic. Therefore, in addition to directed harvest, American eels are threatened by barriers to migration, especially dams constructed for water control and hydroelectric production where upstream and downstream passage are inadequate or absent. American eels are also susceptible to contamination resulting from industrial pollution, studies have indicated that the effects of pollution and migration barriers may have contributed to the suppression of female development in the species. Due to their wide ranging life history cycle, American eel recruitment is also thought to be affected by climate, weather, and oceanic circulation patterns.

Trends:
There is evidence from fishery dependent and fishery independent data that the abundance of American eels is declining in the Lake Ontario/St. Lawrence River, and Lake Champlain/Richelieu River systems. There is also evidence that recruitment has declined in these systems. Both trends point to a localized recruitment failure, and stock collapse, occurring within a distinct segment of the population. This trend causes imminent concern. Most eels from these systems are female, and are thought to contribute the majority of female biomass to the spawning stock. In response, Ontario Ministry of Natural Resources has closed all commercial fisheries for American eel in the province of Ontario. Canada Department of Fisheries and Oceans has proposed to reduce all human-induced mortality by 50% in the maritime provinces . The Great Lakes Fisheries Commission, as well as an international group of concerned scientists, have issued declarations of concern for the American eel population, as well as other anguillid eel populations worldwide. Information on abundance and recruitment from other portions of the range is scant, incomplete or short-lived, not indicating trends observed in the northern part of the range.

SEQR - No Action Alternative:
No action will most assuredly result in complete stock collapse, and possible extirpation of the species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
American eel (Anguilla rostrata)			S5	G5	U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American eel (Anguilla rostrata)	SW Lake Ontario	SE Lake Ontario	Decreasing
	Lower Hudson - Long Island Bays	NE Lake Ontario - St. Lawrence	Decreasing
	Atlantic Ocean - NY Bight	Allegheny	Unknown
	SE Lake Ontario	Upper Hudson	Unknown
	Upper Hudson	Lake Erie	Unknown
	NE Lake Ontario - St. Lawrence	Atlantic Ocean - NY Bight	Unknown
	Allegheny	Lower Hudson - Long Island Bays	Unknown
	Lake Champlain	Susquehanna	Unknown
	Delaware	SW Lake Ontario	Decreasing
	Susquehanna	Delaware	Unknown
		Lake Champlain	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American eel (Anguilla rostrata)	Great Lakes	Great Lakes	Decreasing
	North Atlantic Coast	North Atlantic Coast	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American eel (Anguilla rostrata)				
	Breeding	Marine	unknown	unknown
	Nursery/Juvenile	Estuarine	cultural	structure
	Nursery/Juvenile	Estuarine	deep subtidal	mud
	Nursery/Juvenile	Estuarine	deep subtidal	structure
	Nursery/Juvenile	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Lacustrine	coastal plain	mud bottom
	Nursery/Juvenile	Riverine	coastal plain stream	sand/gravel bottom
	Nursery/Juvenile	Riverine	deepwater river	mud bottom

Goal and Objectives for American eel

Goal: To conserve and protect the American eel resource to ensure its continued role in the ecosystems while providing the opportunity for its commercial, recreational, scientific, and educational use.

Objective 1 : Assure that fishery removals in NY are in compliance with the Interstate Fishery Management Plan.

Measure: *New York remains in compliance with the Interstate Fishery Management Plan.*

Objective 2 : Determine annual catch per unit effort of all commercial American eel fisheries.

Measure: *Commercial CPUE of all eel fisheries.*

Objective 3 : Determine relative abundance of outmigrating silver eels in NE Lake Ontario-St. Lawrence, Lower Hudson/Long Island Bays, Susquehanna, and Delaware Watersheds.

Measure: *X silver eel surveys.*

Objective 4 : Determine relative abundance of yellow phase eels in the NE Lake Ontario-St. Lawrence River, Lower Hudson/Long Island Bays, Susquehanna, and Delaware Watersheds.

Measure: *X Yellow eel surveys.*

Objective 5 : Determine relative index of annual recruitment of glass eels in the Lower Hudson/Long Island Bays, Susquehanna, and Delaware Watersheds.

Measure: *X glass eel surveys.*

Objective 6 : Develop a listing of protective timeframes for activities known or suspected of adversely affecting all life stages of eels and their habitats.

Measure: *Number of activities under guidance*

Objective 7 : Develop systematic research program for eels based on ASMFC Fishery Management Plan by 2006

Measure: *Number of eel research projects funded annually*

Objective 8 : Economic valuation of eel fishery by 2015

Measure: *Regulatory economic impact statement by 2015*

Objective 9 : Full implementation of the ACCSP for eels to meet monitoring and reporting requirements of the eel Fishery Management Plan

Measure: *?*

Objective 10 : Identify important American eel habitat within the state and categorize and prioritize them in terms of their value to the overall state population.

Measure: *Number of water bodies surveyed/evaluated*

Objective 11 : Increase upstream passage of eels at Robert Moses Power Dam through construction of an additional eel ladder.

Measure: *Increased numbers of upstream migrant eels.*

Objective 12 : Institute licensing and reporting mechanisms to ensure that annual effort and landings information by life stage are provided to the state by harvesters

Measure: *Ratio of reports received to licenses issued*

Objective 13 : Investigate, develop, and improve technologies for eel passage both up- and downstream

Measure: *Reduction in migratory mortality of eels by 2015*

Objective 14 : Reduce hydropower related mortality of outmigrating adult eels in NE Lake Ontario-St. Lawrence Watershed by 50% in 10 years. (Check on other Great Lakes mortality issues)

Measure: *Annual mortality of adult outmigrating eels.*

Objective 15 : Reestablish American eels into historic habitats

Measure: *Number of water bodies with eel populations*

Objective 16 : Statewide stock assessment including fishing mortality rates, growth rates, and calculated sustainable harvest rate by 2015

Measure: *Working model of NY American eel pop. by 2015*

Recommended Actions

Fact sheet:

* Develop appropriate information relative to this species.

Recommended Actions

Habitat restoration:

* Restoration of habitat for American eels in many cases involves the design and construction of upstream and downstream passage around barriers impassable to eels. In many cases, such passage facilities can also serve as sampling frames to collect abundance and life history information necessary to evaluate and manage the species. As eels reside in a variety of diverse habitats, including salt marshes, protection and restoration of aquatic habitats becomes a crucial element in any eel conservation and management plan. Aspects of habitat protection, including salt marsh, will be included in the final watershed recommendations.

Life history research:

* Research is needed to develop methods of determining age and identifying sex. Examination of fecundity at age and mechanism of maturation and recruitment to the spawning stock is also needed to develop population life history models.

Modify regulation:

* Existing regulations need to be modified so that all eel harvesters within the State , both commercial and recreational, inland and marine, are subject to the same regulations and requirements.

New legislation:

* New Legislation may be necessary to require operators of various water withdrawal and water diversion projects, especially hydroelectric dams, to upgrade their mechanical systems so as to minimize the impingement and entrainment and maximize survival of impinged and entrained American eel through such systems, and to install and maintain adequate fish passage devices for both continuous upstream and downstream passage of American eels.

New regulation:

* New regulations are needed to identify and permit commercial harvesters, and dealers, in support of the collection of accurate landings and effort data. New regulations may be necessary which limit or prohibit the possession of American eels for use or sale as bait.

Other action:

* Working in cooperation with USFWS, incorporate eel passage needs, to reduce mortality of all life stages of eels, during licensing and relicensing at hydropower facilities. Methods should include possible short duration shut down of facilities during peak migration, bypass methods that effectively attract eels, and other methods to deter their entrainment.

Other management plan:

* Because the range of American eel and that of anguillid eels in general extends beyond the boundaries of the State's and the Atlantic States Marine Fisheries Commission jurisdiction's, contemplation of additional management planning is reasonable. It is possible that New York would be a participant in international agreements protecting American eels throughout their range, and anguillid eels worldwide.

Recommended Actions

Population monitoring:

* Monitoring studies are needed within the various habitats to examine abundance by age, size, and sex of intermediate and adult life stage members of the stock. Recruitment indices of young , and adults are necessary to examine the effects of management on the population and spawning stock. Study efforts must be designed and coordinated to ensure valid results.

Relocation/reintroduction:

* If necessary, and if found to be scientifically sound, a relocation/reintroduction program may be necessary for the Lake Ontario/St. Lawrence River system where elvers are collected and transported from the coast to locations within Lake Ontario.

Statewide management plan:

* To complement unification of the regulations governing harvest, use, and possession of American eels by recreational and commercial stakeholders, a Statewide management plan which conveys the State's policies on inter-jurisdictional, intergovernmental, and international management of the State's American eel resource is necessary.

Web page:

* Develop appropriate web based information relative to the American eel.

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Taxa Group: Marine fish
Species Group: American shad

Threats:
Overfishing on adult stock. Gaunlet fisheries in near shore ocean on spring migratory runs; followed by terminal fishery in river system.
Unknown level of bycatch on adults and sub-adults in variety of fisheries on coast (weakfish, bluefish etc) from VA north to Canadian Maritimes.

Hudson- Shallow spawning habitat threatened with continued shoreline development and related dredging activities due to increased commercial boat traffic.

Susquehanna- dams (located in PA) are still a threat to the use of the migratory spawning stock. However, work on fish passage at all major dams in the drainage continues.

Trends:
Hudson R. stock appears to have stabilized at the lowest level observed in the past 120 years.

Delaware R. stock recovered slightly from major overfishing event during WWII , after the dissolved oxygen block in the Philadelphia area was cleaned up in the late 1970 early 1980s. This stock also appears to have stabilized at an historic low level.

SEQR - No Action Alternative:
Clupeid stocks are notorious for remaining at suppressed population levels. Stocks may remain at very low levels for the foreseeable future, or may begin to decline if fishing pressure continues.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
American shad (Alosa sapidissima)			S4	G5	P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
American shad (Alosa sapidissima)	Upper Hudson	Upper Hudson	Stable
	Atlantic Ocean - NY Bight	Lower Hudson - Long Island Bays	Stable
	Lower Hudson - Long Island Bays	Atlantic Ocean - NY Bight	Unknown
	Delaware	Delaware	Unknown
	Susquehanna	Susquehanna	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
American shad (Alosa sapidissima)	High Allegheny Plateau	Lower New England Piedmont	Stable
	Lower New England Piedmont	High Allegheny Plateau	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
American shad (Alosa sapidissima)				
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Breeding	Riverine	deepwater river	sand/gravel bottom
	Nursery/Juvenile	Estuarine	intertidal	sand/gravel
	Nursery/Juvenile	Riverine	deepwater river	sand/gravel bottom

Goal and Objectives for American shad

Goal: Restore Hudson River American shad stock to abundance level prior to WWII (pre 1930s). Allow spawning American shad access to NY waters of the Susquehanna River.

Objective 1 : By 2006, reduce mortality rate on adult stock to acceptable rates as defined in NYSDEC /ASMFC American shad stock assessment.

Measure: *Monitor adult spawning stock and estimate annual mortality rates.*

Objective 2 : By 2008, identify and protect spawning and nursery habitat.

Measure: *Implementation of dredge/ shoreline development permit restrictions to spawning and nursery habitat.*

Objective 3 : By 2008, reduce bycatch mortality of American shad stocks in coastal ocean waters.

Measure: *Bycatch sampling program of off shore fisheries in Nyman other (as per ASMFC) states coastal waters.*

Objective 4 : By 2025, establish a spawning population of American shad in NY waters of the Susquehanna River.

Measure: *As per goals of the Susquehanna River Anadromous Fish Restoration Committee, increase counts of shad at barriers (dams) in the watershed by building state of art fish passage facilities.*

Recommended Actions

Life history research:

* need to know basic biology: develop fecundity at age estimates ; better information needed on maturity schedules

Modify regulation:

* may need to increase escapement period, enlarge spawning area closures

Other action:

* Determine ocean bycatch : identify fisheries, ages taken

Population monitoring:

* continue to monitor spawning stock and young of year
  need to develop alternative relative abundance index for adults ; in past used in-river Hudson commercial fishery data, fishers no longer fishing

References

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Hattala, K. and A. Kahnle. In prep. (2004) Stock Assessment of American shad of the Hudson River Estuary, New York. NY Dept of Environmental Conservation. To be submitted as part of Atlantic States Marine Fisheries Commission coast wide stock assessment for American shad.

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Taxa Group: Marine fish
Species Group: Atlantic sturgeon

Threats:
Dredge and development activities in spawning and nursery areas

At current overfished status, ocean bycatch throughout its migratory range may further erode status. Unknown contaminant effect on juveniles

Trends:
Stock at the lowest level in 120 years. May be stable at this very low level.

SEQR - No Action Alternative:
Unknown. Ocean bycatch issues need to be identified and addressed.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Atlantic sturgeon (Acipenser oxyrinchus)	T	X	S1	G3	T	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic sturgeon (Acipenser oxyrinchus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Atlantic sturgeon (Acipenser oxyrinchus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Atlantic sturgeon (Acipenser oxyrinchus)				
	Breeding	Estuarine	deep subtidal	unknown
	Nursery/Juvenile	Estuarine	deep subtidal	unknown

Goal and Objectives for Atlantic sturgeon

Goal: Restore Hudson River Atlantic sturgeon to fishable level.

Objective 1 : Identify habitat use of juvenile/immature Atlantic sturgeon in nearshore waters along the south shore of Long Island

Measure: *survey presence over time and space by bottom trawl.*

Objective 2 : Maintain broad range of ages in adult spawning stock

Measure: *Age structure of fish in spawning stock*

Objective 3 : Monitor the effects of the current 40 year coast-wide moratorium on adult stock status.

Measure: *Annual index of relative abundance of mature fish*

Objective 4 : Monitor the effects of the current 40 year coast-wide moratorium on juvenile abundance

Measure: *Estimates of annual juvenile abundance*

Objective 5 : Protect spawning and nursery habitat within the estuary and nursery habitat in the near shore ocean

Measure: *Location of spawning and nursery habitat within the Hudson and location of areas of concentration of juveniles and sub-adult fish in the near shore ocean.*

Objective 6 : Reduce bycatch of Atlantic sturgeon in Atlantic Ocean commercial fisheries

Measure: *Periodic estimates of bycatch in numbers and size by fishery and over time*

Objective 7 : Understand adult and sub-adult Atlantic sturgeon movement on the Atlantic coast.

Measure: *Employ use of archival tags to gain data on marine habitat use. Coordinate all current and future sampling programs that encounter Atlantic sturgeon for tracking tagged fish.*

Recommended Actions

Fact sheet:

* need public info sheet

Habitat research:

* Conduct trawl survey in near shore ocean waters along south shore of Long Island to identify concentration areas of juvenile a sub-adult fish
  Sonic tag and follow wild juveniles to identify seasonal habitat use within the Hudson River Estuary
  Sonic tag and follow wild adult fish to identify spawning locations and any pre and post spawning aggregation areas.
  Employ use of archival tags to gain data on marine habitat use of adult sturgeon

Life history research:

* Develop age length data to allow age estimates of juvenile fish from length

Other management plan:

* Restrict fisheries over time and space that have the greatest sturgeon bycatch.

  Maintain moratorium on possession

Population monitoring:

* Develop and implement sample program to obtain annual index of abundance of juvenile fish by age within the estuary

  Develop and implement survey every five years to identify age composition of mature fish in spawning population

  Develop and implement survey to estimate relative annual abundance of mature fish in the spawning population.

  Develop and implement method to estimate absolute abundance of age one juveniles in Estuary every five years.

  Conduct sea sampling to learn bycatch in number and size of Atlantic sturgeon by fishery over space and time in Commercial fisheries of the Atlantic ocean.

References

see complete reference list in #1 above

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Taxa Group: Marine fish
Species Group: Blueback herring

Threats:
Possible overfishing by both recreational and commercial bait fisheries

Trends:
No data to indicate trend. Hudson stock has colonized the Mohawk River system through the State Barge Canal system. Access to the Mohawk / canal system is artificial. It is unclear what the overall effect of this additional spawning area has had on the stock.

Anecdotal information suggests that the sub-stock using the Mohawk system has been increasing in recent years, with some fluctuation.

SEQR - No Action Alternative:
Difficult to predict. Without data on spawning population it is unclear what the future direction of the stock is.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Blueback herring (Alosa aestivalis)					P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Blueback herring (Alosa aestivalis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blueback herring (Alosa aestivalis)	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Blueback herring (Alosa aestivalis)				
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Breeding	Riverine	warmwater stream	sand/gravel
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel
	Nursery/Juvenile	Riverine	shallow subtidal	sand/gravel

Goal and Objectives for Blueback herring

Goal: Maintain stock at levels that support predators and fishing (recreational and commercial)

Objective 1 : By 2010, Develop and maintain a target mortality rate at and maintain it at or below acceptable rate

Measure: *annual estimates of adult mortality rate*

Objective 2 : Determine predator/ prey relationship of blueback herring and its major predators in the Lower Hudson and Long Island Bays.

Measure: *Results of food habits surveys to identify major predators*

Objective 3 : Develop a spawning stock survey to understand stock status of blueback herring in the Hudson River Estuary.

Measure: *annual indices of adult abundance*

Objective 4 : Maintain stock abundance at current or higher levels

Measure: *annual indices of relative abundance of adult and yoy fish*

Recommended Actions

Habitat research:

* Current habitat use specifics unknown.

Life history research:

* Need basic biological data: fecundity, maturity, age structure, longevity.

Recommended Actions

Modify regulation:

* Given decline in other neighboring systems, may be prudent to institute some bag limits on take.

Population monitoring:

* Develop monitoring program for adult stock abundance, annual data on age structure of spawning stock

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Taxa Group: Marine fish
Species Group: Demersal sharks

Threats:
The major threat to the demersal sharks is overfishing even with the implementation of strict state and federal regulations there remains a large worldwide harvest of these species. New York's commercial and recreational fisheries for sharks are moderate, however, there is great recreational interest fishing for these species.

Trends:
The trends for all three of these species is downward. Rebuilding these species to former levels will take several decades because of their low fecundity, slow rates of maturity and high incidences of mortality from overfishing, and bycatch losses.

SEQR - No Action Alternative:
New York has implemented regulations consistent with the National Marine Fisheries Service regulations and needs to continue to sustain these regulations. A no action alternative would allow these regulations to slip or lapse thus placing additional pressure on these species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Dusky shark (Carcharhinus obscurus)					P	Migratory
Sand tiger shark (Carcharias taurus)					P	Migratory
Tiger shark (Galeocerdo cuvier)					P	Migratory
Sandbar shark (Carcharhinus plumbeus)					P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Sandbar shark (Carcharhinus plumbeus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Tiger shark (Galeocerdo cuvier)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Sand tiger shark (Carcharias taurus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Dusky shark (Carcharhinus obscurus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Sandbar shark (Carcharhinus plumbeus)	North Atlantic Coast	Lower New England Piedmont	Decreasing
Tiger shark (Galeocerdo cuvier)	North Atlantic Coast	North Atlantic Coast	Unknown
Sand tiger shark (Carcharias taurus)	North Atlantic Coast	North Atlantic Coast	Unknown
Dusky shark (Carcharhinus obscurus)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Sandbar shark (Carcharhinus plumbeus)	Feeding	Marine	deep subtidal	sand/gravel
Tiger shark (Galeocerdo cuvier)	Feeding	Marine	deep subtidal	sand/gravel
Sand tiger shark (Carcharias taurus)	Feeding	Marine	deep subtidal	sand/gravel
Dusky shark (Carcharhinus obscurus)	all	Marine	deep subtidal	sand/gravel

Goal and Objectives for Demersal sharks

Goal: Rebuild domestic stocks of sharks consistent with the National Standards contained in the Magnuson-Stevens Fishery Conservation and Management Act (Pub Law 104-297)

Objective 1 : Assemble additional inshore data necessary for assessing and managing shark stocks of interest to New York by 2010.

Measure: *Support data additional collections relative recreational and commercial fisheries of shark in New York State or by New York State vessels.*

Objective 2 : Collect historic information relative to the utilization of inshore habitats as pupping and nursery grounds for demersal sharks by 2010.

Measure: *Support a review of historic commercial and recreational records, historic fishery data collections and accounts to determine the level and extent of inshore habitat utilization by demersal sharks.*

Objective 3 : Minimize, to the extent practicable, bycatch of sharks by 2015.

Measure: *Implement appropriate management actions and educational information for marine fisherman who might encounter sharks under protection.*

Objective 4 : Prevent or end over fishing of sharks by 2015.

Measure: *Implement appropriate management to protect inshore species of shark.*

Recommended Actions

Habitat research:

* Based upon available literature, evaluate New York's inshore habitat's as potential pupping grounds and nursery grounds.

Life history research:

* Collect available data and where practicable new data on all life stages of demersal sharks found in New York or harvested by New York fisherman.

Modify regulation:

* Insure that New York's Rules and Regulations remain consistent with the Federal Rules and Regulations for sharks.

Population monitoring:

* Collect available data and where practicable new data on demersal shark populations found in or adjacent to New York's Marine District.

Web page:

* Provide current population and life history information relative to demersal sharks in New York and throughout there range as an education tool for our citizens.

References

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Taxa Group: Marine fish
Species Group: Estuarine associates of SAV

Threats:
Loss of salt marsh and SAV beds from tidal flow restrictions and habitat degradation reduces the amount of habitat for fish that are dependent on SAV's for some or all of their life stages

Trends:
Data from NYSDEC fishery independent surveys demonstrate a general decline from the mid-1980s for some SAV dependent species (northern pipefish, sticklebacks). These surveys are not directed toward SAV dependent species and may not sample well in these habitats.

SEQR - No Action Alternative:
The no action alternative would not provide information necessary to manage and protect this species group appropriately.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Lined seahorse (Hippocampus erectus)					U	Resident
N. American ninespine stickleback (Pungitius pungi					U	Migratory
Fourspine stickleback (Apeltes quadricus)			N/A	N/A	U	Migratory
Common pipefish (Syngnathus fuscus)					U	Resident
Threespine stickleback (Gasterosteus aculeatus)			N/A	N/A	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Threespine stickleback (Gasterosteus aculeatus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
Common pipefish (Syngnathus fuscus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown
Fourspine stickleback (Apeltes quadricus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
N. American ninespine stickleback (Pungitius pungitius	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Lined seahorse (Hippocampus erectus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Threespine stickleback (Gasterosteus aculeatus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Common pipefish (Syngnathus fuscus)	North Atlantic Coast	North Atlantic Coast	Unknown
Fourspine stickleback (Apeltes quadricus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
N. American ninespine stickleback (Pungitius pungitius o	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Lined seahorse (Hippocampus erectus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Threespine stickleback (Gasterosteus aculeatus)				
	all	Estuarine	shallow subtidal	SAV
	all	Marine	shallow subtidal	SAV
Common pipefish (Syngnathus fuscus)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Common pipefish (Syngnathus fuscus)				
	all	Estuarine	shallow subtidal	SAV
	all	Marine	shallow subtidal	SAV
Fourspine stickleback (Apeltes quadricus)				
	all	Estuarine	shallow subtidal	SAV
	all	Marine	unknown	unknown
N. American ninespine stickleback (Pungitius pungitius occidentalis)				
	all	Estuarine	deep subtidal	pelagic
	all	Estuarine	intertidal	shoreline
	all	Estuarine	shallow subtidal	SAV
	all	Marine	deep subtidal	pelagic
	all	Marine	shallow subtidal	SAV
Lined seahorse (Hippocampus erectus)				
	all	Estuarine	intertidal	shoreline
	all	Estuarine	shallow subtidal	SAV
	all	Estuarine	shallow subtidal	shoreline
	all	Marine	intertidal	shoreline
	all	Marine	shallow subtidal	SAV
	all	Marine	shallow subtidal	shoreline

Goal and Objectives for Estuarine associates of SAV

Goal: Increase our knowledge of SAV dependent fish, specifically their life history, inter- and intra-species relationships, habitat, ecology, response to anthropogenic and natural impacts, and determine their population status and trends

Objective 1 : By 2007 examine current and historic information on submerged aquatic vegetation and develop a list of reference and impacted SAV beds for the lower Hudson - Long Island bays watershed,

Measure: *List of reference and impacted SAV beds.*

Objective 2 : By 2010 develop a region specific program for integrated monitoring of SAV dependent species and the submerged aquatic vegetation (SAV) that they are dependent on which includes abundance and distribution, in reference and impacted sites.

Measure: *Implementation of monitoring program*

Objective 3 : By 2015 know how inter- and intra-species relationships relates to SAV dependent species population trends.

Measure: *Understand the inter- and intra-species relationships and population trends.*

Objective 4 : By 2015 know how SAV loss relates to SAV dependent species population trends.

Measure: *Understand the relationship ob habitat loss and population trends.*

Recommended Actions

Habitat management:

* Submerged aquatic vegetation habitat protection and restoration are crucial elements in any conservation and management plan for SAV dependent species. Aspects of submerged aquatic vegetation habitat protection and restoration will be included in the final watershed recommendations.
* Salt marsh habitat protection and restoration may be important elements in any conservation and management plan for SAV dependent species. Aspects of salt marsh habitat protection and restoration will be included in the final watershed

Habitat monitoring:

* Update SAV habitat maps and collect appropriate information on fisheries utilization.

Life history research:

* Collect information relative to the life history and inter- and intra-species relationships of SAV dependent species.

Population monitoring:

* Continue existing survey's which capture SAV dependent species and develop new directed surveys as appropriate to assess the needs of this species group.

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Taxa Group: Marine fish

Species Group: Estuarine forage species

Threats:

Potential over harvest to support fish bait industry, water quality degradation, the unknown impacts of mosquito control, and habitat loss or degradation, especially tidal wetlands.

Trends:

There is insufficient data to verify observations relative to these species and their trends at this time for New York waters. Anecdotal information from bait industry in recent years indicates there may have been problems with local supplies of mummichog and Atlantic silversides, though this is not supported with any real evidence.

SEQR - No Action Alternative:

Without knowledge of the stocks status or trends, or the impacts of potential threats, it is difficult to say what will happen if no action is taken regarding these species. Regardless, their importance to the ecology of the Marine District should not be underestimated.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Striped killifish (Fundulus majalis)					U	Resident
Atlantic silverside (Menidia menidia)			S2S3	G5	U	Migratory
Inland silverside (Menidia beryllina)			S2S3	G5	U	Resident
Mummichog (Fundulus heteroclitus)					U	Resident
Spotfin killifish (Fundulus luciae)			S1	G4	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Spotfin killifish (Fundulus luciae)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Mummichog (Fundulus heteroclitus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Inland silverside (Menidia beryllina)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic silverside (Menidia menidia)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Striped killifish (Fundulus majalis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spotfin killifish (Fundulus luciae)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Mummichog (Fundulus heteroclitus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Inland silverside (Menidia beryllina)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown
Atlantic silverside (Menidia menidia)	North Atlantic Coast	North Atlantic Coast	Unknown
Striped killifish (Fundulus majalis)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spotfin killifish (Fundulus luciae)				
	all	Estuarine	intertidal	emergent marsh
	all	Estuarine	shallow subtidal	mud
	all	Estuarine	shallow subtidal	SAV
	Breeding	Estuarine	intertidal	emergent marsh

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Spotfin killifish (Fundulus luciae)				
Mummichog (Fundulus heteroclitus)				
	all	Estuarine	shallow subtidal	mud
	all	Estuarine	shallow subtidal	SAV
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	mud
	Nursery/Juvenile	Estuarine	intertidal	emergent marsh
Inland silverside (Menidia beryllina)				
	all	Estuarine	intertidal	emergent marsh
	all	Estuarine	shallow subtidal	SAV
	Breeding	Estuarine	unknown	unknown
Atlantic silverside (Menidia menidia)				
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	pelagic
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Estuarine	shallow subtidal	SAV
	Hibernating/Overwintering	Marine	deep subtidal	unknown
	Nursery/Juvenile	Estuarine	intertidal	emergent marsh
	Nursery/Juvenile	Estuarine	intertidal	shoreline
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	SAV
Striped killifish (Fundulus majalis)				
	all	Estuarine	shallow subtidal	sand/gravel
	Breeding	Estuarine	intertidal	sand/gravel

Goal and Objectives for Estuarine forage species

Goal: Maintain estuarine forage base at levels adequate to sustain their ecological function and continue to support harvest for bait and food

Objective 1 : By 2006, the participants in the bait fisheries for silversides and killifishes will be identified and the annual harvest of the fishery will be known through the use of vessel trip reports (VTRs).

Measure: *The participants, scope and impacts of the fishery are known.*

Objective 2 : By 2010, an estimate of fishing mortality will be developed using the annual harvest estimate and the stock status data obtained from our survey programs.

Measure: *Fishing mortality (F) is known.*

Objective 3 : By 2010, critical habitats for estuarine forage fish will be identified and impacts of habitat loss and degradation on their ecology will be known.

Measure: *These critical habitats are identified and impacts of loss or degradation are known.*

Objective 4 : By 2010, the distribution, abundance, status of stocks and trends in populations of silversides and killifishes will be known.

Measure: *The distribution, abundance, stock status and trends in populations of silversides and killifishes are known.*

Objective 5 : By 2010, the impacts of entrainment and impingement in power plant cooling intakes is known for estuarine forage fish.

Measure: *The impacts of entrainment and impingement are known.*

Objective 6 : By 2010, the impacts of mosquito control on estuarine forage fish ecology will be known.

Measure: *The impacts of mosquito control on estuarine forage fish are known.*

Objective 7 : By 2012, a strategic plan for managing the fisheries and sustaining the populations of estuarine forage fish is developed and adopted.

Measure: *Plan developed and adopted.*

Recommended Actions

Habitat management:

* Habitat protection and restoration are crucial elements in any strategic plan for fisheries conservation and management. Aspects of protection and restoration of critical habitat for estuarine forage species will be included in the final watershed recommendations.

Habitat research:

* Conduct field studies to determine the critical habitat requirements for all life stages of the fish species in question.

Recommended Actions

Life history research:

* Conduct field and laboratory research to determine the effects of mosquito control measures on all life stages of the fish species in question, their habitat and their forage.
* Conduct field and laboratory research to determine the effects of predation on all life stages of the fish species in question, their habitat and their forage.

New legislation:

* Seek regulatory authority over the fish species in question or seek legislation to implement management measures proposed in the strategic plan.

New regulation:

* If regulatory authority is granted, develop pursuant regulations to implement management measures proposed in the strategic plan.

Other action:

* Conduct an investigation into the bait fish fishery which will identify participants; identify locations where the fishery is conducted; estimate harvest; estimate by-catch; and assess potential impacts on fish stocks and habitat.
* Conduct compliance monitoring of vessel trip reporting (VTRs) which will be used to determine fishing mortality (F).
* Conduct an investigation to determine the impacts of power plant cooling intake entrainment and impingement on stocks of estuarine forage fish.

Statewide baseline survey:

* Continue existing surveys that document distribution and abundance of this species group, adjusting if possible to more adequately characterize stock status. Implement additional sampling program to fill in data gaps. Analyze these data to identify trends.

Statewide management plan:

* Develop a strategic plan for fishery management that also addresses needs for mitigating impacts (if any) from other identified sources, including mosquito control, water quality and habitat degradation, and others.

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Taxa Group: Marine fish
Species Group: Estuarine migratory pelagic

Threats:
Over harvest to support commercial (bait and reduction purposes) and recreational bait needs, increased predation from increases in abundance of predators, habitat destruction especially inshore estuarine areas, increased summer water temperatures and reduced oxygen levels in major estuaries, Power Plant entrainment and impingement.

Trends:
Trends have generally been downward or unknown. The most information is know about menhaden since there is a fishery management plan through ASMFC.
Menhaden - There has been a general downward trend since 1990 in the menhaden stock, however, the 2004 stock assessment revealed a large 2002 year class (406 billion young-of-the-year). There is no estimate available for 2003 year class so we cannot tell whether production stayed at the higher level or returned to the levels observed for the previous seven years (1995 -2001) when year class production was below 300 billion young-of-the-year.

Bay Anchovy - Unknown

Sand Lance - abundance is down from the 1980's

SEQR - No Action Alternative:
Menhaden - The no action alternative would most likely have limited effect given that this species is managed under an Atlantic State Marine Fisheries Commission Fishery Management Plan.

Bay Anchovy and sand lance - No information for an important prey species for marine and estuarine fisheries, birds, and marine mammals.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bay anchovy (Anchoa mitchilli)			S3	G5	U	Migratory
Menhaden (Brevoortia tyrannus)			SNRN	G5	U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Menhaden (Brevoortia tyrannus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bay anchovy (Anchoa mitchilli)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Menhaden (Brevoortia tyrannus)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Bay anchovy (Anchoa mitchilli)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Menhaden (Brevoortia tyrannus)				
	Breeding	Marine	deep subtidal	pelagic
	Feeding	Estuarine	deep subtidal	pelagic
	Feeding	Estuarine	shallow subtidal	pelagic
	Feeding	Marine	deep subtidal	pelagic
	Feeding	Marine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	deep subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
Bay anchovy (Anchoa mitchilli)				
	all	Estuarine	deep subtidal	pelagic
	all	Marine	deep subtidal	pelagic

Goal and Objectives for Estuarine migratory pelagic

Goal: Restore and maintain stocks of estuarine migratory pelagic fish at levels that meet bioenergetic requirements of predators and provide for sustainable bait and reduction fisheries

Objective 1 : By 2006 collect harvest and landings data consistent with the Atlantic Coastal Cooperative Statistics Program (ACCSP).

Measure: *Implement all aspects of the ACCSP program relative to lobster in New York.*

Objective 2 : By 2010 determine habitat use of estuarine migratory pelagic fish (menhaden, bay anchovy, and sand lance) in the lower Hudson - Long Island bays and Atlantic Ocean watersheds.

Measure: *Know the habitat use of menhaden, bay anchovy, and sand lance.*

Objective 3 : By 2010 determine major predators of estuarine migratory pelagic fish (menhaden, bay anchovy, and sand lance) in the lower Hudson - Long Island bays and Atlantic Ocean watersheds.

Measure: *Know the major predators of menhaden, bay anchovy, and sand lance.*

Objective 4 : By 2012 develop a monitoring program for estuarine migratory pelagic fish (menhaden, bay anchovy, and sand lance) in the lower Hudson - Long Island bays and Atlantic Ocean watersheds based on the habitat information collected above.

Measure: *Implementation of the monitoring program.*

Objective 5 : By 2013 establish condition indices for major predators of estuarine migratory pelagic fish (menhaden, bay anchovy, and sand lance) in the lower Hudson - Long Island bays and Atlantic Ocean watersheds.

Measure: *Know the Length and weight of predators in the lower Hudson - Long Island bays and Atlantic Ocean watersheds.*

Objective 6 : By 2018 determine fishery thresholds and targets for maintenance of sustainable stocks and fisheries of estuarine migratory pelagic fish (menhaden, bay anchovy, and sand lance) in the lower Hudson - Long Island bays and Atlantic Ocean watersheds.

Measure: *Know the thresholds and targets.*

Recommended Actions

Habitat management:

* If entrainment, impingement, or thermal impacts are major threats, determine the appropriate measures to mitigate these threats

* Once the important habitats for estuarine migratory pelagic species are determined, the protection and restoration of these habitats will be a crucial element in their conservation and management plan. Aspects of habitat protection and restoration will be included in the final watershed recommendations.

Recommended Actions

Habitat research:

* Determine habitat use of Atlantic menhaden, bay anchovy, and sand lance.
* Determine if entrainment, impingement or thermal impacts are major threats to estuarine migratory pelagic populations.

Life history research:

* Determine major predators of estuarine migratory pelagic species and determine their condition.
* Collect size, age, and maturity data from estuarine migratory pelagic species collected around the Marine and Coastal District of New York.

Other action:

* Collect harvest and landings information for estuarine migratory pelagic species

Population monitoring:

* Develop multi-species models to assess whether estuarine migratory pelagic populations are sufficient to support the needs of the resource and resource users.
* Develop or continue fishery independent monitoring programs for Atlantic menhaden, sand lance, and bay anchovy.

Regional management plan:

* Develop thresholds and targets for estuarine migratory pelagic species

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Taxa Group: Marine fish
Species Group: Labrids

Threats:
Because both labrids tend to aggregate on or near structure, they are susceptible to fishing pressure, particularly from recreational anglers. Juveniles of both species are found in shallow near-shore waters on vegetated bottom, generally eelgrass beds but also in the macroalgae Ulva spp. and Codium fragile. Loss or degradation of this type of habitat could have potential negative impacts on survival. These species could also be vulnerable to water quality degradation and could be considered indicators of water quality in shallow, near-shore fish habitat. They both rely heavily on crustacean prey, so could be impacted by mosquito controls if the controls used negatively affect crustaceans.

Trends:
Recreational fishing catch is the only long-term indicator of population trends available for both labrids.

Cunner catch has declined dramatically in the last twenty years, with catches generally between 800,000 and 1.8 million fish for 1981-1990 dropping to catches generally less than 200,000 fish from 1995 to the present. The cause of this decline is unknown, though recreational anglers have blamed a burgeoning commercial fishery for the live market. Commercial landings in New York have dramatically increased from generally less than 1 metric ton from 1950 through 1997 to nearly 10 metric tons in 2002, the last year for which data are available. The decline in recreational catch started well before 1998, however.

Tautog catch has shown a similar trend though the fishery has been covered by a fishery management plan since 1996. Commercial landings have trended downward as well.

SEQR - No Action Alternative:
There is no current fishery management plan for cunner, and it is unknown what will happen if no plan is enacted. While the tautog fishery is being managed, it is unclear if this management is sufficient to sustain populations. It is also unclear what effect, if any, lower population levels of labrids is having on the ecology of near-shore waters. These two species may be important controls on decapod crustacean populations, particularly tautog, which probably prey heavily on the invasive species Carcinus maenas and Hemigrapsus sanguineus. Growth in populations of these decapod invaders may suppress bivalve population restoration efforts.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Cunner (Tautogolabrus adspersus)					U	Migratory
Tautog (Tautoga onitis)			SNRN	GNR	P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Tautog (Tautoga onitis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
Cunner (Tautogolabrus adspersus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Tautog (Tautoga onitis)	North Atlantic Coast	North Atlantic Coast	Unknown
Cunner (Tautogolabrus adspersus)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Tautog (Tautoga onitis)				
	all	Estuarine	deep subtidal	mud
	all	Estuarine	deep subtidal	rocky
	all	Estuarine	deep subtidal	sand/gravel
	all	Estuarine	deep subtidal	structure
	all	Marine	cultural	structure
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	sand/gravel
	all	Marine	deep subtidal	structure
	Nursery/Juvenile	Estuarine	shallow subtidal	mud
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel
Cunner (Tautogolabrus adspersus)				
	all	Estuarine	deep subtidal	mud
	all	Estuarine	deep subtidal	rocky
	all	Estuarine	deep subtidal	sand/gravel
	all	Estuarine	deep subtidal	structure
	all	Marine	cultural	structure
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	sand/gravel

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Cunner (Tautogolabrus adspersus)				
	all	Marine	deep subtidal	structure
	Nursery/Juvenile	Estuarine	shallow subtidal	mud
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel

Goal and Objectives for Labrids

Goal: Maintain populations at levels adequate to sustain their ecological function and continue to support harvest for food and recreation

Objective 1 : By 2010, critical habitats for all life stages of labrids will be identified and the impacts of habitat loss and degradation on their ecology will be known.

Measure: *These critical habitats are identified and the impacts of loss and degradation are known.*

Objective 2 : By 2010, the distribution, abundance, stock status and trends in populations of tautog and cunner will be known.

Measure: *The distribution, abundance, stock status and trends in populations of these labrids are known.*

Objective 3 : By 2010, the impacts of mosquito control on tautog and cunner ecology will be known.

Measure: *The impacts of mosquito control on tautog and cunner are known.*

Objective 4 : By 2012, a strategic plan for managing the fisheries and sustaining the populations of labrids will be developed and adopted.

Measure: *Plan developed and adopted.*

Objective 5 : Over fishing of tautog will be ended by reducing exploitation to a sufficient level.

Measure: *Target Fishing Mortality (F) = 0.29 according to Addendum III of the ASMFC Fishery Management Plan for tautog*

Objective 6 : The total biomass of tautog will be rebuilt to a desirable level that would produce significantly higher sustainable landings at a much lower exploitation rate.

Measure: *Target Biomass (B) = ?*

Objective 7 : Yield will be optimized and the economic benefits to the various fishing sectors will be maximized

Measure: *Optimum Yield = Target F multiplied by the Current Stock B*

Recommended Actions

Habitat management:

* Habitat protection and restoration are crucial elements in any strategic plan for fisheries conservation and management. Aspects of protection and restoration of critical habitat for labrids will be included in the final watershed recommendations.

Habitat research:

* Conduct field studies to determine the critical habitat requirements for all life stages of the fish species in question.

Life history research:

* Conduct field and laboratory research to determine the effects of mosquito control on all life stages of the fish species in question, their habitat and their forage.
* Conduct field and laboratory research to determine the effects of predation on all life stages of the fish species in question, their habitat and their forage.

Modify regulation:

* Implement appropriate regulatory modifications as necessary to protect tautog from over harvest and to assist in the rebuilding of this population to self-sustaining levels.

New legislation:

* Seek regulatory authority over cunner or seek legislation to implement management measures proposed in the strategic plan.

New regulation:

* If regulatory authority over cunner is granted, develop pursuant regulations to implement management measures proposed in the strategic plan.

Other action:

* Conduct compliance monitoring of vessel trip reporting (VTRs) which will be used to determine fishing mortality.

Population monitoring:

* Support monitoring efforts which will provide the necessary data with which to assess the status of the tautog population.
* Implement sampling programs to fill data gaps.

Recommended Actions

Statewide management plan:

* Develop a strategic plan for fishery management that also addresses needs for mitigating impacts (if any) from other identified sources, including mosquito control, water quality and habitat degradation, and others

References

Bigelow and Schroeder's Fishes of the Gulf of Maine / edited by Bruce B. Collette and Grace Klein-MacPhee, 3rd edition. 2002. Smithsonian Institution Press. Washington D.C.

Fishery Management Report No 25c of the Atlantic States Marine Fisheries Commission. Addendum III to the Fishery Management Plan for Tautog. 200

Originator

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Taxa Group: Marine fish
Species Group: Northern puffer

Threats:
Northern puffer populations in New York are currently subject to unregulated harvest by recreational and commercial interests. The potential effects of environmental changes or habitat degradation on populations of northern puffer in New York are unknown.

Trends:
Very little data is available on the status of northern puffer populations in New York. This species traditionally supported small but popular commercial and recreational fisheries in New York. Northern puffer were reported to be commonly found and abundant in near shore areas throughout the middle Atlantic until the late 1960's. Since 1981, New York's commercial fishery has landed an average of 15,000 pounds per year, and NY's recreational fishery has landed an average of 17,000 pounds per year. Most of these landings occurred in the 1980's and early 1990's, and landings in recent years have declined markedly. NYSDEC's trawl survey has collected data on northern puffer since 1987. Trawl survey cue (catch per tow) shows catches (predominantly young of the year) increasing through the early 1990's, peaking in 1992, then declining fairly steadily through 2003. The last above average year class appeared in 2001. There are no estimates available of fishing mortality rates, spawning stock biomass or other biological reference points. Documented evidence on changes in environmental factors or habitat availability or suitability is scarce.

SEQR - No Action Alternative:
Failure to take action to collect additional biological and fisheries information, to determine estimates of fishing mortality, allowable harvest levels and biomass targets will likely result in continued chronically low levels of northern puffer populations in New York waters. Management of the northern puffer resource in New York would lead to improved protection for spawning populations of puffer in New York, minimizing recruitment and growth overfishing and providing a sustainable and increased yield to recreational and commercial fisheries.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Northern puffer (Sphoeroides maculatus)			SNRN	G5	U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Northern puffer (Sphoeroides maculatus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Northern puffer (Sphoeroides maculatus)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Northern puffer (Sphoeroides maculatus)				
	all	Estuarine	shallow subtidal	emergent marsh
	all	Estuarine	shallow subtidal	mudflats
	all	Estuarine	shallow subtidal	sand/gravel
	all	Estuarine	shallow subtidal	shoreline
	all	Estuarine	shallow subtidal	submerged aquatic vegetation
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	pelagic
	all	Marine	deep subtidal	sand/gravel
	all	Marine	shallow subtidal	mud
	all	Marine	shallow subtidal	sand/gravel
	all	Marine	shallow subtidal	submerged aquatic vegetation

Goal and Objectives for Northern puffer

Goal: Maintain populations of northern puffer at levels necessary to ensure the long term health and abundance of the resource, sustain its ecological function and continue to support limited harvest.

Objective 1 : A strategic plan for managing fisheries and sustaining populations of northern puffer is developed and adopted.

Measure: *Plan developed and adopted.*

Objective 2 : The critical habitat requirements of northern puffer will be determined.

Measure: *The habitat needs of northern puffer are known.*

Objective 3 : The role of northern puffer in the local estuarine ecology will be assessed.

Measure: *The role of northern puffer in estuarine ecology is known.*

Objective 4 : The status of the northern puffer population will be assessed.

Measure: *Population status of northern puffer is known.*

Recommended Actions

Fact sheet:

* Develop appropriate fact sheet relative to the northern puffer in New York.

Habitat management:

* Habitat protection and restoration are crucial elements in any strategic plan for fisheries conservation and management. Aspects of protection and restoration of critical habitat for northern puffer will be included in the final watershed recommendations.

Habitat research:

* Develop investigations which examines habitat needs of the northern puffer.

Life history research:

* Develop fishery independent research which collect appropriate life history data on this species.

Population monitoring:

* Maintain and support investigations which collect northern puffer biological and harvest information.

Regional management plan:

* Develop as appropriate a regional fishery management plan for this species.

Web page:

* Develop appropriate web based information relative to northern puffer.

References

Weber, Grahn and Havens. 1998. Species composition, seasonal occurrence, and relative abundance of finfish and macroinvertebrates taken by small mes otter trawl in Peconic Bay, New York. NYSDEC Marine Finfish Unit. 123pp

Able and Fahay. 1998. The first year in the life of estuarine fishes in the middle Atlantic bight. Rutgers University Press. 341pp

Sibunka and Pacheco. 1981 Biological and fisheries data on northern puffer, Sphoeroides maculatus. NEFC, NMFS Technical Series Report No. 26.

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Taxa Group: Marine fish
Species Group: Oyster toadfish

Threats:
Toadfish may be particularly vulnerable to fishing pressure, as well as loss of eelgrass habitat. Eelgrass is likely a critical habitat for juvenile toadfish, as it is for several other species of finfish.

Trends:
There is insufficient data available on toadfish populations in New York waters to make any kind of meaningful assessment. The DEC's trawl survey in the Peconic Estuary documented a mean number of fish per trawl at 0.4 in 1987, increasing to 1.6 in 1991 and decreasing since. Available data on annual commercial landings in New York showed landings of nearly 6 metric tons in 1992, spiking to over 19 metric tons in 1993, then plummeting to 100 pounds or less since 2000. Fishing mortality and spawning stock biomass are unknown.

SEQR - No Action Alternative:
Toadfish have been used as experimental subjects for studies on behavior, sound production, physiology, endocrine analyses, insulin and diabetes, and others. Several studies have shown that their predatory behavior on xanthid crabs may keep numbers of these hard-clam predators in check. Failure to take action to understand, manage and restore toadfish populations may result in the loss of an important component of the ecology of New York's estuaries.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Oyster toadfish (Opsanus tau)					U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Oyster toadfish (Opsanus tau)	Atlantic Ocean - NY Bight	Lower Hudson - Long Island Bays	Decreasing
	Lower Hudson - Long Island Bays	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Oyster toadfish (Opsanus tau)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Oyster toadfish (Opsanus tau)				
	all	Estuarine	shallow subtidal	mud
	all	Estuarine	shallow subtidal	rocky
	all	Estuarine	shallow subtidal	sand/gravel
	all	Estuarine	shallow subtidal	SAV
	all	Estuarine	shallow subtidal	structure
	Hibernating/Overwintering	Estuarine	deep subtidal	unknown

Goal and Objectives for Oyster toadfish

Goal: Maintain populations of oyster toadfish at levels necessary to ensure the long term health and abundance of the resource and sustain its ecological function.

Objective 1 : A strategic plan for managing fisheries and sustaining populations of oyster toadfish is developed and adopted.

Measure: *Plan developed and adopted.*

Objective 2 : The critical habitat requirements of oyster toadfish will be determined.

Measure: *The habitat needs of oyster toadfish are known.*

Objective 3 : The role of oyster toadfish in the local estuarine ecology will be assessed.

Measure: *The role of oyster toadfish in estuarine ecology is known.*

Objective 4 : The status of the oyster toadfish populations in New York waters will be assessed.

Measure: *Population status of oyster toadfish is known.*

Recommended Actions

Habitat management:

* Habitat protection and restoration are crucial elements in any strategic plan for fisheries conservation and management. Aspects of protection and restoration of eelgrass beds and other critical habitat for oyster toadfish will be included in the final watershed recommendations.

Recommended Actions

Habitat research:

* Conduct investigations which examine habitat needs of the oyster toadfish.

Life history research:

* Conduct fishery-independent investigations which collect appropriate life history data on oyster toadfish.

Population monitoring:

* Maintain and support investigations which collect oyster toadfish biological data and fishery harvest data.

Regional management plan:

* Develop a strategic plan for fishery management and restoration of oyster toadfish.

References

Bigelow and Schroeder's Fishes of the Gulf of Maine, edited by Bruce B. Collette and Grace Klein-MacPhee, 3rd edition. Washington: The Smithsonian Institution, 2002.

Able, Kenneth W. and Michael P. Fahay. The first year in the life of estuarine fishes in the Middle Atlantic Bight. New Brunswick: The Rutgers University Press, 1998.

Weber, Alice, Christina Grahn and Benjamin Havens. Species composition, seasonal occurrence and relative abundance of finfish and macroinvertebrates taken by small-mesh otter trawl in Peconic Bay, NY. NYS DEC report, June 1998, East Setauket, NY.

Originator

Name: None Given
Organization:
Street:
TownCity:
State:
Zip:
Phone:
Email:

Taxa Group: Marine fish
Species Group: Pelagic sharks

Threats:
The major threat to all coastal sharks is overfishing, coupled with a life history strategy that makes them vulnerable to over harvest. Most pelagic sharks are long lived, slow maturing and produce small numbers of offspring. Many of these sharks, not all, utilize inshore waters as summer habitat, for pupping, and as nursery grounds for juveniles. With the increased competition for the utilization of these waters for boating, swimming, fishing, other commerce addition strain is being placed upon those species of shark which utilize these waters.

Trends:
There is a declining trend in population status for all coastal sharks. Recent management actions may arrest that trend to a degree but further actions may be necessary in order to control other losses due to bycatch and international harvest.

SEQR - No Action Alternative:
The no action alternative would leave current shark management in place, which provides protection consistent with the Federal regulations for these species. New York must continue to provide regulations which are consistent with the needs of these species and the federal management for these species. Further New York, should undertake actions to understand the inshore habitat and habitat needs of coastal sharks for pupping, and as juvenile nursery grounds. As the populations rebuild there will be increased human interaction, New York must be in a position to address there interactions and to address concerns that will ultimately be raised.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
White shark (Carcharodon carcharias)					P	Migratory
Bigeye thresher shark (Alopias superciliosus)					P	Migratory
Longfin mako shark (Isurus paucus)					P	Migratory
Basking shark (Cetorhinus maximus)					P	Migratory
Porbeagle shark (Lamna nasus)					P	Migratory
Thresher shark (Alopias vulpinus)					P	Migratory
Shortfin mako shark (Isurus oxyrhinchus)					P	Migratory
Blue shark (Prionace glauca)					P	Migratory
Bonnethead shark (Sphyrna tiburo)					P	Migratory
Smooth hammerhead shark (Sphyrna zygaena)					P	Migratory
Scalloped hammerhead shark (Sphyrna lewini)					P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Scalloped hammerhead shark (Sphyrna lewini)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Smooth hammerhead shark (Sphyrna zygaena)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Bonnethead shark (Sphyrna tiburo)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Blue shark (Prionace glauca)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Shortfin mako shark (Isurus oxyrhinchus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Thresher shark (Alopias vulpinus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Porbeagle shark (Lamna nasus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Basking shark (Cetorhinus maximus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Longfin mako shark (Isurus paucus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Bigeye thresher shark (Alopias superciliosus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
White shark (Carcharodon carcharias)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Scalloped hammerhead shark (Sphyrna lewini)	North Atlantic Coast	North Atlantic Coast	Decreasing
Smooth hammerhead shark (Sphyrna zygaena)	North Atlantic Coast	North Atlantic Coast	Unknown
Bonnethead shark (Sphyrna tiburo)	North Atlantic Coast	North Atlantic Coast	Decreasing
Blue shark (Prionace glauca)	North Atlantic Coast	North Atlantic Coast	Decreasing
Shortfin mako shark (Isurus oxyrhinchus)	North Atlantic Coast	North Atlantic Coast	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Thresher shark (Alopias vulpinus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Porbeagle shark (Lamna nasus)	North Atlantic Coast	Lower New England Piedmont	Decreasing
Basking shark (Cetorhinus maximus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Longfin mako shark (Isurus paucus)	North Atlantic Coast	North Atlantic Coast	Decreasing
Bigeye thresher shark (Alopias superciliosus)	North Atlantic Coast	North Atlantic Coast	Decreasing
White shark (Carcharodon carcharias)	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Scalloped hammerhead shark (Sphyrna lewini)				
	all	Marine	deep subtidal	pelagic
Smooth hammerhead shark (Sphyrna zygaena)				
	all	Marine	deep subtidal	unknown
	all	Marine	shallow subtidal	unknown
Bonnethead shark (Sphyrna tiburo)				
	all	Marine	deep subtidal	pelagic
Blue shark (Prionace glauca)				
	all	Marine	deep subtidal	pelagic
Shortfin mako shark (Isurus oxyrhinchus)				
	all	Marine	deep subtidal	pelagic
Thresher shark (Alopias vulpinus)				
	all	Marine	deep subtidal	pelagic
Porbeagle shark (Lamna nasus)				
	all	Marine	deep subtidal	pelagic
Basking shark (Cetorhinus maximus)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Basking shark (Cetorhinus maximus)	all	Marine	deep subtidal	pelagic
Longfin mako shark (Isurus paucus)	all	Marine	deep subtidal	pelagic
Bigeye thresher shark (Alopias superciliosus)	all	Marine	deep subtidal	pelagic
White shark (Carcharodon carcharias)	all	Marine	deep subtidal	pelagic

Goal and Objectives for Pelagic sharks

Goal: Rebuild over fished pelagic shark stocks in as short a time as possible, control all components of fishing mortality so as to insure the long-term sustainability of the stocks and promote stock recovery to the optimum sustainable yield.

Objective 1 : Ensure sustainable pelagic shark catches from directed and non-directed fisheries by 2015.

Measure: *Implement management measures consistent with the federal rules and regulations designed to protect pelagic shark stocks.*

Objective 2 : Improve species-specific catch and landings data and monitoring of shark catches and to improve and facilitate reporting of species biological and trade data by 2010.

Measure: *Implement state level rules and regulations which require the reporting of all sharks caught and landed in New York through vessel trip reporting at all level (commercial and recreational) and implement necessary dealer reporting requirements.*

Objective 3 : Minimize incidental catches of sharks by 2015.

Measure: *Implement management measures and educational programs which prevent or reduce the unintentional mortalities of unwanted sharks.*

Recommended Actions

Recommended Actions

Fact sheet:

* Develop fact sheets for distribution to commercial and recreational fisherman regarding the well being of the pelagic shark stocks.

Life history research:

* Conduct literature review to determine the pupping and juvenile habitat requirements for pelagic coastal sharks in the Middle Atlantic bight.

Modify regulation:

* Modify New York's regulations as necessary to conform to the federal protection of sharks.

Population monitoring:

* Initiate a volunteer shark data collection program which would collect additional catch and biological information from New York's recreational anglers.

Web page:

* Develop appropriate webpage information relative to the shark species found in the Mid-Atlantic bight and there status.

References

Final Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks. 1999. Department of Commerce, NOAA, NMFS, Highly Migratory Species Management Division, Silver Spring, Maryland. Vol I - III.

Collette, Bruce B., and Grace Klein-MacPhee. 2002. Bigelow and Schroeder's Fishes of the Gulf of Maine. Third edition. Smithsonian Institution Press, Washington D.C. 748 pgs.

Camhi, Merry. 1998. Sharks on the Line, A State by State Analysis of sharks and their Fisheries. Linving Oceans, National Audubon Society, Islip, NY. 158 pgs.

Final United States Plan of Action for the Conservation and Management of Sharks. 2001. Department of Commerce, NOAA, NMFS, Silver Spring, MD 90 pgs.

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Taxa Group: Marine fish

Species Group: Rainbow smelt

Threats:

Smelt are coldwater species on southern limit of their range on Atlantic coast. Ocean and climate warming trends may be indicative of decline seen in remnant Hudson stock.

Trends:

Anadromous population has just about disappeared from the Hudson drainage. Suspected relationship to ocean and documented climate warming.

SEQR - No Action Alternative:

Suspect species may become extirpated from Hudson drainage in future.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Rainbow smelt (Osmerus mordax)			S5	G5	U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Rainbow smelt (Osmerus mordax)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Upper Hudson	Upper Hudson	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Rainbow smelt (Osmerus mordax)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Rainbow smelt (Osmerus mordax)				
	Breeding	Estuarine	intertidal	sand/gravel
	Breeding	Riverine	coastal plain stream	sand/gravel bottom
	Feeding	Estuarine	intertidal	structure
	Feeding	Marine	intertidal	structure
	Feeding	Riverine	coastal plain stream	structure
	Nursery/Juvenile	Estuarine	unknown	unknown
	Nursery/Juvenile	Marine	intertidal	structure
	Nursery/Juvenile	Riverine	coastal plain stream	sand/gravel bottom

Goal and Objectives for Rainbow smelt

Goal: Restore smelt to faunal community of Hudson River Estuary

Objective 1 : To determine available spawning habitat within the Marine and Estuarine waters of New York State.

Measure: *Conduct a literature survey for known and historically known spawning streams on Long Island and in the Hudson River. Followed up by field surveys to determine whether the spawning sites still exist and whether there is any remaining spawning activity.*

Objective 2 : To identify management measures necessary to protect adult Rainbow smelt in the Marine and Estuarine waters of New York State.

Measure: *After the identification of existing spawning habitats, and identifying local partners, review existing Rules and Regulations and Environmental Conservation law protecting the Rainbow smelt and if necessary, suggest other appropriate measures.*

Objective 3 : To protect identified Rainbow smelt spawning sites through partnerships with local land owners, town and county governments and NGOs.

Measure: *Upon identification, review appropriate mechanisms to protect existing spawning habitat by working with local landowners and local governments.*

Objective 4 : Identify extirpation causes of rainbow smelt in Marine and Estuarine waters of New York State in relation to documented climate (warming) change and ocean warming.

Measure: *examine historic long term temperature records in relation to abundance of rainbow smelt in Marine and Estuarine waters of New York State AND in New England states.*

Objective 5 : increase abundance of adults and juveniles

Measure: *annual indices of relative abundance for adults and juveniles*

Objective 6 : Restore spawning populations to five major tributaries with historic spawning populations

Measure: *presence of spawning fish*

Recommended Actions

Habitat monitoring:

* Determine the Rainbow smelt spawning habitat availability within the Marine and estuarine waters of New York State. Provide funding to conduct an inventory of existing and potential spawning habitat in coastal streams and within the Hudson River estuary.

Habitat research:

* identify tributaries with spawning populations
  initiate studies of habitat use by life stage

Life history research:

* obtain data on basic biology (max age, maturity, fecundity)
* Determine the current population structure of the Rainbow smelt with the Marine and estuarine waters of New York and determine those life history factors which are restricting the species.

New regulation:

* Develop as appropriate regulations that protect the Rainbow smelt within the Marine and Estuarine waters of New York state consistent with the status and needs of the resource.

Other action:

* Support regulations to reverse climate warming trend documented for New England states based on increased emissions of greenhouse gases

Population monitoring:

* Initiate studies of population abundance and age structure
  develop method to measure annual relative abundance of juveniles and adults
* Based upon preliminary identification of the populations status and spawning site availability, conduct periodic investigations to determine the populations status and trends.

Recommended Actions

Web page:

* Develop a web based survey to assist the department in obtaining information relative to the Rainbow smelt spawning sites and to provide the public with information relative to this species life history and population status within the Marine and estuarine waters of New York.

References

Hudson River Utility/Generators Annual Year Class Reports for the Hudson River Longriver Monitoring Program. 1974-2001.

Fishes of the Gulf of Maine, Third Edition, Bigelow and Schroeder, 2002, edited by Bruce B. Collette and Grace Klein-MacPhee, Smithsonian Institution Press, Washington and London. 748 pgs.

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Taxa Group: Marine fish
Species Group: Shortnose sturgeon

Threats:
Dredging / development projects in over-wintering and/or spawning areas. Unknown contaminant (primarily PCB) effects.

Trends:
Population level appears to be stable; stock largest on Atlantic coast.

SEQR - No Action Alternative:
Continued protection under the Endangered Species Act place limitations on nearly all activities within the Hudson River system. Stock should remain stable at current level.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Shortnose sturgeon (Acipenser brevirostrum)	E		S1	G3	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Shortnose sturgeon (Acipenser brevirostrum)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Stable
	Upper Hudson	Upper Hudson	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Shortnose sturgeon (Acipenser brevirostrum)	Lower New England Piedmont	Lower New England Piedmont	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Shortnose sturgeon (Acipenser brevirostrum)				
	Breeding	Riverine	deep subtidal	rocky
	Nursery/Juvenile	Estuarine	deep subtidal	rocky

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Shortnose sturgeon (Acipenser brevirostrum)				
	Roosting/Congregating	Estuarine	deep subtidal	unknown

Goal and Objectives for Shortnose sturgeon

Goal: Maintain stock at current high levels of abundance

Objective 1 : maintain adult stock at stable or increasing abundance AND at or above 40,000 animals

Measure: *periodic (every 5 years) estimates of adult population size and annual indices of relative abundance*

Recommended Actions

Habitat monitoring:

* Monitor effects of dredge projects where it impacts shortnose

Other action:

* Unknown effect of major Hudson contaminant (PCB's) on this species. Need a better understanding on contaminant levels.

Other management plan:

* explore possibility of delisting species

Population monitoring:

* conduct mark recapture estimates of population size periodically
  develop methodology and implement sampling for indices of relative abundance

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Taxa Group: Marine fish
Species Group: Skates and Rays

Threats:
Overfishing is a key threat to the skate and rays from direct harvest and from bycatch mortality associated with commercial and recreational gears.

Trends:
The results of the latest stock assessment for the skates and rays suggests that the overall stock complex is at a medium level of abundance. The abundance has fluctuated over the past several decades.

SEQR - No Action Alternative:
The no action alternative would not provide for any further management or protection of this species complex and would maintain the existing fluctuating populations levels for the species complex.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Manta (Manta birostris)					U	Migratory
Cownose ray (Rhinoptera bonasus)					U	Migratory
Roughtail stingray (Dasyatis centroura)					U	Migratory
Clearnose skate (Raja eglanteria)					U	Migratory
Smooth skate (Malacoraja senta)					U	Migratory
Winter skate (Leucoraja ocellata)					U	Migratory
Rosette skate (Leucoraja garmani virginica)					U	Migratory
Little skate (Leucoraja erinacea)					U	Migratory
Barndoor skate (Dipturus laevis)					U	Migratory
Thorny skate (Amblyraja radiata)					U	Migratory
Atlantic torpedo (Torpedo nobiliana)					U	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic torpedo (Torpedo nobiliana)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Thorny skate (Amblyraja radiata)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Barndoor skate (Dipturus laevis)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Little skate (Leucoraja erinacea)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing
Rosette skate (Leucoraja garmani virginica)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Winter skate (Leucoraja ocellata)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Smooth skate (Malacoraja senta)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Clearnose skate (Raja eglanteria)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Roughtail stingray (Dasyatis centroura)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Cownose ray (Rhinoptera bonasus)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
Manta (Manta birostris)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Atlantic torpedo (Torpedo nobiliana)	North Atlantic Coast	North Atlantic Coast	Unknown
Thorny skate (Amblyraja radiata)	North Atlantic Coast	North Atlantic Coast	Unknown
Barndoor skate (Dipturus laevis)	North Atlantic Coast	Lower New England Piedmont	Unknown
Little skate (Leucoraja erinacea)	North Atlantic Coast	North Atlantic Coast	Decreasing
Rosette skate (Leucoraja garmani virginica)	North Atlantic Coast	North Atlantic Coast	Unknown
Winter skate (Leucoraja ocellata)	North Atlantic Coast	North Atlantic Coast	Unknown
Smooth skate (Malacoraja senta)	North Atlantic Coast	Lower New England Piedmont	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Clearnose skate (Raja eglanteria)	North Atlantic Coast	North Atlantic Coast	Unknown
Roughtail stingray (Dasyatis centroura)	North Atlantic Coast	North Atlantic Coast	Unknown
Cownose ray (Rhinoptera bonasus)	North Atlantic Coast	North Atlantic Coast	Unknown
Manta (Manta birostris)	North Atlantic Coast	North Atlantic Coast	Stable

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Atlantic torpedo (Torpedo nobiliana)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	sand/gravel
Thorny skate (Amblyraja radiata)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	sand/gravel
Barndoor skate (Dipturus laevis)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	sand/gravel
Little skate (Leucoraja erinacea)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	sand/gravel
Rosette skate (Leucoraja garmani virginica)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	rocky
	all	Marine	deep subtidal	sand/gravel
Winter skate (Leucoraja ocellata)				
	all	Marine	deep subtidal	sand/gravel
Smooth skate (Malacoraja senta)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Smooth skate (Malacoraja senta)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	sand/gravel
Clearnose skate (Raja eglanteria)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	sand/gravel
	all	Marine	shallow subtidal	sand/gravel
Roughtail stingray (Dasyatis centroura)				
	all	Marine	deep subtidal	sand/gravel
	all	Marine	shallow subtidal	sand/gravel
Cownose ray (Rhinoptera bonasus)				
	all	Marine	deep subtidal	mud
	all	Marine	deep subtidal	sand/gravel
	all	Marine	shallow subtidal	sand/gravel
Manta (Manta birostris)				
	all	Marine	deep subtidal	pelagic

Goal and Objectives for Skates and Rays

Goal: Maintain self-sustaining skate and ray stock complex throughout the middle Atlantic Bight.

Objective 1 : Collect and summarize available biological data relative to skates and rays in order to provide an updated biological assessment for the complex for New York State waters by 2015

Measure: *Review available biological data collections for information on the skate and ray complex.*

Objective 2 : Collect maturity and fecundity information from skates and rays from a sub sample of the harvest or bycatch by 2010.

Measure: *In cooperation with other researchers provide samples of skates and rays to researchers conducting maturity and fecundity studies.*

Objective 3 : Collect new biological data from skates and rays captured by New York fisherman by 2010.

Measure: *Add dock side and at sea sampling of skates and rays to existing biological sampling collections made under the Atlantic Coastal Cooperative Statistics Program.*

Objective 4 : Insure that all skate and rays harvested are reported on vessel trip reports and by dealers who handle any skates and rays landed in New York by 2010.

Measure: *Update as necessary rules and regulations covering the reporting of harvest, bycatch and landings for fisherman and dealers. Update instructions to fisherman and dealers regarding the needs for harvest and bycatch information on skates and rays.*

Recommended Actions

Fact sheet:

* Develop fact sheets for all species of skates and rays found in or near to New York's Territorial waters.

Life history research:

* Participate in programs to obtain new biological information relative to this species complex for those species found in harvested or landed in New York.

New regulation:

* Implement new rules and regulations as necessary and appropriate consistent with rules and regulations implemented by National Marine Fisheries Service.

Population monitoring:

* Support existing monitoring and develop as necessary new biological monitoring for this species.

Web page:

* Develop webpage information about the species in this complex.

References

Collette, Bruce B. and G. Klein-MacPhee. 2002. Bigelow and Schroeder's Fishers of the Gulf of Maine. Third Edition. Smithsonian Institution Press, Washington D.C. 748 pgs.

Department of Commerce. 2001. Final United States National Plan of Action for the Conservation and Management of Sharks. Dept. of Commerce, NOAA, NMFS, Silver Spring, MD. 90 pgs.

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Taxa Group: Marine fish
Species Group: Tomcod

Threats:
Susceptible to pollution (sewage) and DO blocks. Past data indicates that DO blocks in NY harbor adversely affected tomcod survival in the summer (when they move to the marine waters.)
Unknown contaminant (PCB's and others) effects.

Possible threat from global climate change warming ocean waters

Trends:
Species is on the southern part of its range for a cold water/marine species. Population has varied greatly without specific trend for the past 30 years. Last ten plus years, annual population estimates have become extremely variable with a repeating low-high sawtooth pattern.

SEQR - No Action Alternative:
Population is not directly managed, however it has persisted with great variation in size over the past 30 years.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Atlantic tomcod (Microgadus tomcod)			S3	G5	U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Atlantic tomcod (Microgadus tomcod)	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown
	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Upper Hudson	Upper Hudson	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Atlantic tomcod (Microgadus tomcod)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Atlantic tomcod (Microgadus tomcod)				
	Breeding	Estuarine	intertidal	shoreline
	Feeding	Estuarine	unknown	unknown
	Feeding	Marine	deep subtidal	unknown
	Nursery/Juvenile	Estuarine	shallow subtidal	unknown
	Nursery/Juvenile	Marine	unknown	unknown
	Roosting/Congregating	Marine	deep subtidal	unknown

Goal and Objectives for Tomcod

Goal: Maintain stock at levels that can support predation by fish and fishing

Objective 1 : Identify factors (environmental or otherwise) that affect population size

Measure: *Examine data from other river systems to identify similarity or differences in population variation*

Objective 2 : Maintain Hudson stock at stable or increasing abundance

Measure: *Estimate of annual population size by year class or index of relative abundance*

Objective 3 : Maintain optimum water quality in spawning, nursery and congregating habitats

Measure: *Implement water quality recommendations of the Hudson River Estuary and (NY) Harbor Estuary Programs.*

Recommended Actions

Population monitoring:

* conduct periodic estimate of adult population size
develop methodology and implement annual sampling of adult relative abundance by age

References

[Grey literature] Hudson River Utility Yearclass Reports and Striped bass/Atlantic tomcod survey. ASAAC (Utility consultants prepare document) 1974-2002.

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Taxa Group: Marine fish
Species Group: Winter flounder

Threats:
Threats include but are not limited to over harvest, habitat destruction, global warming, and increased predation.

Trends:
The winter flounder stocks are bouncing around at a low level of abundance. The trend overtime has been a serious decline from high abundances in the late 1970's.

SEQR - No Action Alternative:
The no action alternative would leave in place the existing management measures which may need to be modified to assist in the rebuilding of this valuable species of fish.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Winter flounder (Pseudopleuronectes americanus)			S3?	G5	P	Migratory

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Winter flounder (Pseudopleuronectes americanus)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Winter flounder (Pseudopleuronectes americanus)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Winter flounder (Pseudopleuronectes americanus)				
	Breeding	Estuarine	deep subtidal	sand/gravel
	Breeding	Estuarine	shallow subtidal	mud

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Winter flounder (Pseudopleuronectes americanus)				
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Feeding	Estuarine	deep subtidal	mud
	Feeding	Estuarine	deep subtidal	sand/gravel
	Feeding	Estuarine	shallow subtidal	sand/gravel
	Feeding	Estuarine	shallow subtidal	submerged aquatic vegetation
	Feeding	Marine	deep subtidal	rocky
	Feeding	Marine	deep subtidal	sand/gravel
	Hibernating/Overwintering	Marine	deep subtidal	rocky
	Hibernating/Overwintering	Marine	deep subtidal	sand/gravel
	Nursery/Juvenile	Estuarine	shallow subtidal	mud
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel
	Nursery/Juvenile	Estuarine	shallow subtidal	submerged aquatic vegetation

Goal and Objectives for Winter flounder

Goal: To rebuild a healthy, self-sustaining inshore population of winter flounder

Objective 1 : Collect current biological data necessary to assess the health and status of winter flounder stocks (inshore and offshore) annually.

Measure: *Support investigations which will collect updated biological data on winter flounder in New York State.*

Objective 2 : Develop information relative to habitat utilization by inshore winter flounder by 2010.

Measure: *Support efforts which provide new or updated information relative to inshore winter flounder significant habitats.*

Objective 3 : Develop information relative to predation on inshore winter flounder 2015.

Measure: *Support efforts which provide new or updated information on the predation on inshore winter flounder.*

Objective 4 : Identify and map winter flounder juvenile habitat by 2015.

Measure: *Identifies critical habitat necessary to the well being of the species and can be used to address impacts.*

Objective 5 : Identify and map winter flounder spawning habitat by 2015.

Measure: *Supports efforts to rebuild winter flounder stocks and to address impact assessments.*

Objective 6 : Monitor commercial and recreational harvest of inshore stocks of winter flounder annually.

Measure: *Implement all aspects of the ACCSP program necessary collect appropriate harvest information on inshore winter flounder. Support increased effort through the MRFSS to understand the recreational harvest of inshore winter flounder.*

Objective 7 : Rebuild winter flounder stocks in sufficient abundance to support stable, productive commercial and recreational fisheries by 2015

Measure: *Implement all aspects of the ASMFC FMP for winter flounder to protect and rebuild the coastal stocks. Implement a management program in New York which protects and rebuilds New York's inshore stock of winter flounder.*

Recommended Actions

Fact sheet:

* Develop appropriate biological fact sheet on inshore winter flounder population and their status.

Habitat research:

* Conduct habitat research that is address at understand or documenting the utilization of specific habitat by winter flounder.

Habitat restoration:

* Where appropriate support habitat restoration which supports inshore winter flounder stocks.

Life history research:

* Support the collection of new and updated data relative to the life history status of this species. A main focus area would be life stage interactions relative to survival between life stages.

Modify regulation:

* Modify regulations as appropriate to protect the inshore stocks of winter flounder consistent with the needs of the species and with the ASMFC Fishery Management Plan for the species.

Population monitoring:

* Support monitoring efforts which focus on the status and well being of this species.

Statewide management plan:

* Support the development of a Marine District Fishery Management Plan for this species.

Recommended Actions

Web page:

* Develop an appropriate webpage document which provides information relative to the status and well being of this species.

References

Collette, Bruce B, and Grace Klein-MacPhee editors, Bigelow and Schroeder's Fishes of the Gulf of Maine, Third Edition. 2002. Smithsonian Institution Press, Washington, D.C. 748 pgs.

Draft Fishery Management Report No. ___ of the Atlantic States Marine Fisheries Commission. Amendment 1 to the Interstate Fishery Management Plan for Winter Flounder. 2004. ASMFC, Washington, D.C. 106 pgs.

Fishery Management Report No. 21 of the Atlantic States Marine Fisheries Commission. Fishery Management Plan for Inshore Stocks of Winter Flounder 1992. ASMFC, Washington D.C. 138 pgs.

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new york state
Comprehensive Wildlife Conservation Strategy

Appendix A8:

Comprehensive Wildlife Conservation Strategy Species Group Reports for Mollusks

Revised DRAFT

Prepared by New York State Department of Environmental Conservation staff in cooperation with Cazenovia College and the Riverhead Foundation for Marine Research in support of the Comprehensive Wildlife Conservation Strategy prepared for New York as required by the United States Fish and Wildlife Service's State Wildlife Grants Program

27-Sep-05

Taxa Group: Mollusk
Species Group: Bay scallop

Threats:
Habitat loss: The lost of eelgrass beds in the 1930's along the Atlantic Coast of the United States (and again in Peconic Bays in the late 1980's) probably had the greatest impact on bay scallop populations. Currently, local bay scallop recruitment can be strongly affected by the presence or absence of the appropriate submerged aquatic vegetation for habitat, especially necessary for juvenile scallops.

Toxic algal blooms: The severe brown tide blooms in the 1980's and early 1990's caused the scallop population to drop precipitously low and it has never recovered from the impact of the blooms.

Predation: Predators such as crabs and starfish are a major threat to bay scallops. Juvenile bay scallops are especially vulnerable to predation by crabs.

Trends:
Bay scallops are short-lived broadcast spawners and most live only long enough to spawn once at age 1. Consequently, bay scallop populations can vary widely from year to year, depending on the success of the spawn from the previous year.

In the 1930's the bay scallop population along the Atlantic coast significantly decreased following the drastic decline of eelgrass beds, their preferred habitat. The scallop population remained low for several years, but eventually recovered. The bay scallop population was stable and self-sustaining in New York when the initial brown tide bloom appeared in 1985. The initial bloom was severe and had a deleterious effect on larval, juvenile, and adult bay scallops and their habitat, eelgrass. The bay scallop population plummeted and remained low in the face of repeated blooms in the late 1980's and early 1990's. In 1994 there was a significant resurgence of bay scallops; however, in 1995 a particularly severe bloom occurred and bay scallops never recovered. The population remains low and recruitment poor.

SEQR - No Action Alternative:
The current status of the bay scallop population in New York is poor. If the No Action Alternative were adopted, it would be unlikely that bay scallop population levels would reach the same levels achieved before the first brown tide bloom in 1985. The drastic reduction in bay scallop population has most likely decreased the spawning success of these animals in Long Island bays. Bay scallops are broadcast spawners, simultaneously releasing their gametes into the water column in response to an environmental trigger. It is possible that the effects of brown tide have so reduced bay scallop densities that once scallops do spawn, their gametes are less likely to encounter other gametes in a timely fashion for fertilization.

In addition, bay scallops are filter feeders, grazing on microscopic plants. When present in greater numbers than currently present in local bays, they may influence the phytoplankton assemblage in local bays, thereby affecting local estuarine faunal assemblages. If no action is taken to restore the bay scallop population to stable levels, the ecology of many eastern Long Island bays will be altered by the absence of this primary consumer in New York's estuarine environment. Bay scallops will not fill the ecological niche they once had before the population was decimated by the effects of the brown tide blooms, but more likely will remain as a remnant population in local areas of the eastern bays of Long Island.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Bay scallop (Argopecten irradians)					P	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Bay scallop (Argopecten irradians)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Bay scallop (Argopecten irradians)	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Bay scallop (Argopecten irradians)				
	all	Estuarine	deep subtidal	submerged aquatic vegetation
	all	Estuarine	shallow subtidal	submerged aquatic vegetation
	Breeding	Estuarine	deep subtidal	sand/gravel
	Breeding	Estuarine	shallow subtidal	sand/gravel
	Nursery/Juvenile	Estuarine	deep subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic

Goal and Objectives for Bay scallop

Goal: Restore the bay scallop population in the Lower Hudson/Long Island Bays to a level that sustains commercial and recreational harvest and maintains ecosystem function.

Objective 1 : 1. Achieve by 2015 an annual fall standing stock of adult bay scallops in excess of 60,000 bushels in the Lower Hudson/Long Island Bays Watershed.

Measure: *Number of bushels of bay scallops recruited to the fishery*

Objective 2 : 2. Inventory eelgrass in major bay systems of the Lower Hudson/Long Island Bays Watershed at least every 5 years.

Measure: *Routine assessments of the condition of the critical habitat of bay scallops*

Objective 3 : 3. Restore by 2015 eelgrass beds in major bays of Lower Hudson/Long Island Bays watershed to pre-1980 acreages as determined by individual estuary management plans.

Measure: *Number of acres restored to a condition that can be effective habitat for bay scallops*

Objective 4 : 4. Develop a restoration plan by 2008 for bay scallops that will consider the effects of habitat loss, predation, and low adult spawning densities on the achievement of a sustainable scallop population in the Lower Hudson/Long Island Bay Watershed.

Measure: *A restoration plan that outlines an effective program to enhance bay scallop productivity.*

Recommended Actions

Captive breeding:

* Bay scallops may be held in spawner sanctuaries (lantern nets or confined in nets to specific areas) to increase their densities and increase spawning success.

Curriculum development:

* The role of the bay scallop in the estuarine bays of Long Island may play a role as one aspect of public education.

Educational signs:

* Kiosk signs identifying bay scallops and scallop habitat can also play a part in public education.

Fact sheet:

* More public education.

Habitat management:

* Management steps may be taken to protect eelgrass and other submerged aquatic vegetation. Boating may be curtailed in shallow areas with eelgrass. Dredging activities may be limited or prohibited in established eelgrass beds.

Habitat monitoring:

* Eelgrass beds have been mapped in eastern Long Island bays. It would prudent to continue to update maps and assess the status of submerged aquatic vegetation as essential habitat for bay scallops.

Recommended Actions

Habitat research:

* The role of eelgrass beds as habitat for bay scallops has been examined by researchers. The roles of other submerged aquatic vegetation should be studied further. Causes of potential habitat degradation should be examined and mitigation procedures should be developed. The characteristics of the key habitats of the bay scallop should be identified.

Habitat restoration:

* Eelgrass bed restoration activities have already been conducted in eastern Long Island bays. These activities should be continued to enhance the habitat of bay scallops and other estuarine organisms.

Invasive species control:

* The European green crab (Carcinus maenus) is an invasive crustacean that first arrived on the east coast about 150 years ago. It consumes large numbers of juvenile bivalves. There is little that may be done to control this species at this time.

Life history research:

* Spat collectors may be used to determine recruitment success and to collect larvae that may not otherwise successfully settle elsewhere. These larvae may be retained and later seeded in areas where bay scallops are likely to survive and grow. Spat collectors also allow a measurement of larval settlement in the bays.

New regulation:

* Adopt regulations that may be determined necessary to manage and protect bay scallop resources in New York.

Other action:

* Toxic algal blooms have wreaked havoc with the bay scallop populations in eastern Long Island bays. Possible causes of the blooms have been studied, but a single causative agent has not been identified. Toxic algal blooms, their causes and impacts on the bay scallops and their habitat must be continued to be studied. The impact of predators (crabs, sea stars, gulls) on bay scallop populations must also be studied and actions that may lessen the impact of predators on scallops should be explored.

Other management plan:

* A management plan for the protection and enhancement of bay scallops in New York state waters must be developed. Such a plan should examine the history of research related to the bay scallop, assess the current status of the population, evaluate threats to bay scallops, assess the condition of bay scallop habitats and develop a strategy for the restoration of the scallop to NY waters.

Population monitoring:

* Bay scallop populations should be monitored to learn the distribution and status of the current population, the level of recruitment success, and the impacts of predators on local populations.

Recommended Actions

Relocation/reintroduction:

* Juvenile bay scallops may be cultured and seeded in areas where bay scallops are likely to survive and grow. Scallops may also be transplanted from areas of high scallop density to areas where scallops are scarce. Bay scallop blown ashore during winter are returned to the water by volunteers.

Web page:

* Another tool for public education concerning the role of the bay scallop in the estuarine waters of eastern Long Island.

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Taxa Group: Mollusk

Species Group: Blue mussel

Threats:

In general, blue mussels are subject to common ecological threats affecting all shellfish species which include an increase in the presence of predators, alterations in food supply (phytoplankton communities and detritus), harmful algal blooms (HAB's), water quality degradation and habitat changes. Various predators are able to target blue mussels at a range of sizes from small juvenile forms to larger adults. Large scale changes in phytoplankton assemblages, including HAB events, can have an effect on the growth and survival of all blue mussel life stages. Recent losses of tidal wetlands may negatively affect the food supply of fine detritus for blue mussels and also limit habitat availability. Anthropogenic involvement contributes to changes in habitat resulting from marine construction and dredging, chemical contamination and nutrient enrichment of embayments. Significant mortalities of blue mussels are often seen following large storms when severe wave action dislodges mussel beds. Abnormally high water temperatures, typically during the summer months, can also result in large mortalities when blue mussels become stressed and release from their beds only to be washed on shore.

Trends:

Very little long term survey data exists to track the population trends of blue mussels. Commercial landings show a peak of 68,233 bushels harvested in 1973 whereas less than 300 bushels were harvested in 2003. This apparent decline is more likely a result of changes in harvesting effort rather than a significant collapse in stocks. However, anecdotal reports do indicate that historic mussel beds were more prolific than today. Most regions in the marine district still report relatively stable and healthy beds of mussels although their size is unknown.

SEQR - No Action Alternative:

Because the size, distribution and health of blue mussel beds is largely unknown surveys should be conducted to track the population trends of this species. Without such information management of blue mussels is not possible. If a no action strategy was adopted this species could easily recess into decline without a record to document it. Large scale mortalities, in particular summer wash-ups, should be diagnosed and monitored for their implications on the species.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Blue mussel (Mytilus edulis)					U	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Blue mussel (Mytilus edulis)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown
	Atlantic Ocean - NY Bight	Atlantic Ocean - NY Bight	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Blue mussel (Mytilus edulis)	Lower New England Piedmont	North Atlantic Coast	Unknown
	North Atlantic Coast	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Blue mussel (Mytilus edulis)				
	all	Marine	deep subtidal	rocky
	all	Marine	intertidal	mudflats
	all	Marine	intertidal	sand/gravel
	Nursery/Juvenile	Marine	deep subtidal	pelagic

Goal and Objectives for Blue mussel

Goal: Survey and monitor the Lower Hudson/Long Island Bays watershed for long term trends in the size, health and distribution of blue mussels while providing protective measures against possible threats.

Objective 1 : Determine the size and distribution of blue mussel populations in the Lower Hudson/Long Island Bays watershed by 2010.

Measure: *Number of population surveys for blue mussel populations, within major embayments, recording distribution and biomass, performed on a bi-yearly basis .*

Objective 2 : Establish a monitoring program testing the general health as well as chemical and PSP contamination of significant blue mussel populations by 2010.

Measure: *Number of sample locations and samples of blue mussels from major embayments tested for chemical and PSP contamination and general pathology taken on a yearly basis.*

Objective 3 : Establish a monitoring program to determine the environmental and biological condition of blue mussels during mass mortality events in the Lower Hudson/Long Island Bays watershed, by 2010.

Measure: *Number of blue mussel mass mortality events that were monitored and characterized each year.*

Recommended Actions

Habitat monitoring:

* Monitor the environmental and biological condition of blue mussels during mass mortality events including water quality parameters and pathology of blue mussels.

Other action:

* As necessary, implement management measures needed to protect, conserve and support sustainable blue mussel populations in the Lower Hudson/Long Island bays watershed.

Population monitoring:

* Conduct monitoring of the contamination and accumulation of chemicals and Paralytic Shellfish Poisoning within blue mussels.

* Conduct populations surveys to track the distribution, biomass and health of blue mussels.

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Taxa Group: Mollusk
Species Group: Eastern oyster

Threats:

The most significant threats which impact the growth, survival and recruitment of oysters in estuarine waters of the marine district are diseases, anthropogenic inputs, sedimentation, heavy metal contamination, nutrient enrichment from runoff, physical disturbance by storms, dredging which removes important habitat, predators, water quality degradation, environmental changes in temperature and salinity and lack of suitable hard substrate (habitat) for settlement and attachment of larvae. The two parasitic oyster diseases, MSX (Haplosporidium nelsoni) and Dermo (Perkinsus marinus), have caused significant mortalities of adult oysters and continue to impact restoration efforts in coastal states. Oysters require a hard, relatively undisturbed substrate for setting and attachment. The larvae are planktonic for about 2-3 weeks after fertilization and eventually settle and attach to hard bottom or shell (cultch) material. Adult oysters are sessile and may be found in low profile beds or reefs as part of the benthic community. The lack of suitable and sufficient habitat is a limiting factor which threatens the recruitment and viability of oyster resources in New York. The abundance of predators such as starfish, whelks, crabs and oyster drills also result in significant mortalities of juvenile and adult oysters. Larvae are subject to mortality from predation, disease and food supply. Oyster beds are also important to the ecosystem as a natural filter for removing suspended sediments and algae (phytoplankton) from the water column and can improve water quality and clarity. The filtering action of oysters can significantly alter the phytoplankton assemblage in an embayment. The loss or removal of oysters from an area will also cause a shift in phytoplankton which may not be favorable to oyster growth and survival. Oyster beds can also provide important habitat and refuge for fish assemblages and invertebrates. Presently, the most significant threats affecting oysters resources in New York would be lack of suitable shell substrate for settlement of spat and oyster parasitic diseases such as MSX, Dermo and JOD (Juvenile oyster disease).

Trends:

The Eastern oyster, Crassostrea virginica, was one of the most commercially abundant shellfish resources in New York State prior to the 1950's. Historically, there were extensive oyster beds and shellfish culture leases located in Great South Bay, Long Island Sound, Raritan Bay, Jamaica Bay, Peconic Bays and the Hudson River which supported a significant oyster fishery in New York dating back to the 1800's. The oyster industry observed a steady decline in production after its peak in 1911 due mainly to lack of adequate supply of seed oysters and irregular sets and pollution from urbanization (water quality degradation) which led to the closure of shellfish lands in Raritan Bay, Jamaica Bay, and areas around New York Harbor. Other factors contributing to the decline in oyster resources were diseases, predation, changing hydrographic patterns, storm events, over-harvesting, etc. In 1950, a total of 1.2 million bushels of oysters valued at $6 million dollars was harvested compared to a dramatic decline in abundance of only 62,133 in 2003, representing a 95 percent decline in shellfish landings. In 2003, farmed raised (cultured) oysters produced in Oyster Bay Harbor accounted for more than 92 percent of the State's oyster landings and very few natural oyster beds exist today. The Eastern oyster supported subsistence fishing by native American and early European colonists along the Atlantic and Gulf coasts of North America for centuries. It supported a major commercial fishery for more than a century from the Canadian Maritime Provinces to Texas. However, the oyster fishery is in decline throughout most of its range and in some areas, like Chesapeake Bay, has collapsed. There are a few locations in New York such as Mecox Bay, Southampton, town waters in East Hampton, Huntington - Northport Bay complex, Mattituck Inlet and areas within the Town of Brookhaven that have stable oyster populations. Several towns such as East Hampton, Brookhaven, Southold, Huntington, Smithtown and Oyster Bay supplement natural populations of oysters located within their jurisdiction with cultured oysters produced in shellfish hatcheries.

SEQR - No Action Alternative:

Oyster populations are currently at very low levels, less than 95 percent, of historical abundance. Natural oyster beds which were once plentiful in the Hudson River, Raritan Bay, Great South Bay and Long Island Sound are non-existent today. Current water quality and food availability in areas such as Great South Bay and Raritan Bay are unlikely to support viable oyster populations. Suitable oyster habitat which consists of hard, unfouled substrate and shell (cultch) are lacking in most areas that historically supported oyster beds. The planting of cultch (shell), hard substrate for spat settlement, has been extensively used in oyster habitat restoration programs to mitigate loss of oyster habitat and increase oyster recovery in the state's of Connecticut, Maryland, Virginia, North and South Carolina, Florida, Louisiana, Alabama and Texas. No significant oyster habitat restoration effort has been conducted in New York with the exception of limited cultch planting activities undertaken by aqua culturists on private leased underwater lands. Restoration and conservation actions are needed in order to rehabilitate oyster resources in New York State. Failure to implement conservation strategies and address the threats affecting oyster abundance, recruitment and lack of suitable habitat will result in the continual decline of remaining natural oyster beds that are already limited in the state.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Oyster (Crassostrea virginica)					P	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Oyster (Crassostrea virginica)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Oyster (Crassostrea virginica)	North Atlantic Coast	North Atlantic Coast	Decreasing
	Lower New England Piedmont	Lower New England Piedmont	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Oyster (Crassostrea virginica)				
	all	Estuarine	deep subtidal	mud
	all	Estuarine	deep subtidal	sand/gravel
	all	Estuarine	deep subtidal	structure
	all	Estuarine	shallow subtidal	mud
	all	Estuarine	shallow subtidal	sand/gravel
	all	Estuarine	shallow subtidal	structure

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Oyster (Crassostrea virginica)				
	Nursery/Juvenile	Estuarine	cultural	structure
	Nursery/Juvenile	Estuarine	deep subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Estuarine	shallow subtidal	rocky
	Nursery/Juvenile	Estuarine	shallow subtidal	sand/gravel

Goal and Objectives for Eastern oyster

Goal: By 2020, restore and protect oyster beds in the Lower Hudson/Long Island bays watershed to levels that are naturally recoverable, self-sustaining and support ecosystem function.

Objective 1 : By 2010, determine population abundance and distribution of oysters in the Lower Hudson/Long Island bays watershed.

Measure: *Number of population surveys conducted and estimate of oyster biomass at each embayment.*

Objective 2 : By 2010, document and identify prevalence and locations of oyster disease in the Lower Hudson/Long Island bays watershed in order to minimize the impact of oyster diseases on restoration efforts.

Measure: *Number of samples of oysters collected and processed for oyster disease testing under an MOU with the Marine Animal Disease Laboratory at Stony Brook University.*

Objective 3 : By 2010, identify locations of historical and current oyster abundance and establish a list of potential oyster habitat restoration sites based on current water quality parameters necessary to support viable oyster populations.

Measure: *Number of locations of historical oyster beds identified and also targeted for oyster habitat restoration.*

Objective 4 : By 2015, establish oyster reefs at a minimum of 3 locations in the Lower Hudson/Long Island bays watershed that are sustainable and support ecosystem function and increased biodiversity.

Measure: *Number of oyster reefs established in the Lower Hudson/Long Island bays watershed.*

Objective 5 : By 2015, increase our understanding and knowledge of the beneficial role oyster reefs may have on biodiversity, water quality and ecosystem function.

Measure: *Number of oyster reefs evaluated for changes in biodiversity, water quality and ecosystem function.*

Objective 6 : Monitor population abundance of oyster beds in the Lower Hudson/Long Island bays watershed and evaluate success of restoration efforts no less than every five years.

Measure: *Number of oyster beds surveyed and total biomass of oysters attained compared to baseline population data.*

Recommended Actions

Habitat research:

* Research and monitoring is needed to determine the scale and size of oyster habitat restoration along with planting of sufficient quantities of juvenile and adult oysters necessary to support viable and sustainable oyster populations.
* Research is needed to evaluate and determine the habitat value of a restored oyster bar or reef for fish and other invertebrates (increase in biodiversity).

Habitat restoration:

* Identify locations of historical oyster abundance and evaluate the potential use of these sites for oyster habitat restoration.

Other action:

* As necessary, implement management measures needed to protect, conserve and support sustainable oyster populations in the Lower Hudson/Long Island bays watershed.
* Develop Policy and Permit Requirements Manual for establishment of oyster reefs/bars in New York. There has been considerable interest in oyster gardening programs and establishment of oyster reefs/bars in locations around New York Harbor and Long Island bays. These projects have received mixed reviews from DEC based on their site location, scale and project design. There are public health concerns associated with establishment of oyster reefs in uncertified areas and habitat tradeoff vs. enhancement issues that must be addressed. Development of Policy that provides specific criteria for applicants and assists staff in the review process is needed.
* Conduct research on disease resistant strains of native oysters.
* Conduct oyster disease monitoring on cultured and natural "wild" oysters in the state to determine presence of oyster diseases, MSX, Dermo, JOD (Juvenile Oyster Disease) which can significantly impact oyster restoration efforts and viability of oyster resources in natural and cultured beds. This information is needed in order to minimize the spread and transmission of disease from relocation of oysters to other areas within the marine district. Develop criteria for importation of oyster seed from out-of-state sources and screening of oysters for in-state transfer to minimize spread of disease and introduction of exotic species.

Other management plan:

* Develop Comprehensive Oyster Restoration Management Plan for the Lower Hudson/Long Island bays watershed.

Recommended Actions

Population monitoring:

* Conduct oyster population surveys in the Lower Hudson/Long Island bays watershed in order to identify and map the locations of natural oyster beds.

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Taxa Group: Mollusk
Species Group: Freshwater bivalves

Threats:
In general, negative impacts to freshwater systems are threats to freshwater mussels: sedimentation, pollution, in-steam gravel mining, algal blooms, alteration of flows, dams interrupting habitat continuity. IN addition some populations are threatened by cold water from dam releases causing them to become non-breeding throughout the year. Other species may be affected by loss of their fish hosts. A very large threat in some water systems, especially the Hudson River and Mohawk Rivers, Lake Champlain, the Great Lakes and other large lakes, is competition and fouling from the introduced zebra and quaga mussels. A lesser threat may come from competition from the introduced Asian clam. Larger, thicker shelled species such as Amblema plicata may be at risk from poaching for the pearl trade.

Trends:
For most species trends are not known because of a lack of baseline data beyond historic documentation in particular watersheds. Little is known of population sizes or changes over time.

SEQR - No Action Alternative:
Without action, populations in severely impacted watersheds will quickly disappear, while other populations may be unaffected or experience long slow declines due to gradual degradation of their habitat.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Green floater (Lasmigona subviridis)		X	S1S2	G3	T	Resident
Round pigtoe (Pleurobema sintoxia)			S1	G4	U	Resident
Clubshell (Pleurobema clava)	E		SH	G2	E	Resident
Sheepnose (Plethobasus cyphus)		X				Resident
Round hickorynut (Obovaria subrotunda)			SH	G4	U	Resident
Hickorynut (Obovaria olivaria)			SH	G4	U	Resident
Eastern pearlshell (Margaritifera margaritifera)			S2	G4	U	Resident
Black sandshell (Ligumia recta)		X	S2S3	G5	U	Resident
Snuffbox (Epioblasma triquetra)		X	SH	G3	U	Resident
Tidewater mucket (Leptodea ochracea)		X	S1	G4	U	Resident
Kidneyshell (Ptychobranchus fasciolaris)			S2	G4G5	U	Resident
White heelsplitter (Lasmigona complanata)			SH	G5	U	Resident
Yellow sandshell (Lampsilis teres)			SH	G5	U	Resident
Pocketbook (Lampsilis ovata)			S2S3	G5	U	Resident

Pink mucket (Lampsilis abrupta)	E		SH	G2	E	Resident
Wavyrayed lampmussel (Lampsilis fasciola)			S1	G4	T	Resident
Yellow lamp mussel (Lampsilis cariosa)		X	S3	G3G4	U	Resident
Wabash pigtoe (Fusconaia flava)			S2	G5	U	Resident
Eastern pondmussel (Ligumia nasuta)		X	S2S3	G4G5	U	Resident
Paper pondshell (Utterbackia imbecillis)			SH	G5	U	Resident
Tubercled blossom (Epioblasma torulosa)	E		SH	G2	U	Resident
Alewife floater (Anodonta implicata)			S1S2	G5	U	Resident
Threeridge (Amblema plicata)			S1	G5	U	Resident
Slippershell mussel (Alasmidonta viridis)			S1S2	G4G5	U	Resident
Elktoe (Alasmidonta marginata)		X	S4	G4	U	Resident
Brook floater (Alasmidonta varicosa)		X	S1	G3	T	Resident
Mucket (Actinonaias ligamentina)			S1S2	G5	U	Resident
Pink heelsplitter (Potamilus alatus)			S2S3	G5	U	Resident
Rainbow (Villosa iris)			S2S3	G5	U	Resident
Fat pocketbook (Potamilus capax)	E		SH	G1	E	Resident
Rayed bean (Villosa fabalis)		X	S1	G1G2	E	Resident
Deertoe (Truncilla truncata)			S1	G5	U	Resident
Fawnsfoot (Truncilla donaciformis)			SH	G5	U	Resident
Lilliput (Toxolasma parvum)			SH	G5	U	Resident
Salamander mussel (Simpsonaias ambigua)		X	SH	G3	U	Resident
Mapleleaf (Quadrula quadrula)			SH	G5	U	Resident
Pimpleback (Quadrula pustulosa)			SH	G5	U	Resident
Northern riffleshell (Epioblasma torulosa rangiana)	E		SNA	G2T2	U	Resident
Dwarf wedgemussel (Alasmidonta heterodon)	E		S1	G1G2	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Snuffbox (Epioblasma triquetra)	Lake Erie	Unknown	Unknown
Wabash pigtoe (Fusconaia flava)	SW Lake Ontario	Lake Erie	Unknown
		SW Lake Ontario	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Yellow lamp mussel (Lampsilis cariosa)	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Unknown
	NE Lake Ontario - St. Lawrence	Susquehanna	Stable
	Upper Hudson	Upper Hudson	Unknown
	Susquehanna		
Wavyrayed lampmussel (Lampsilis fasciola)	SW Lake Ontario	Unknown	Unknown
	Allegheny		
Pink mucket (Lampsilis abrupta)	Unknown	Unknown	Unknown
Pocketbook (Lampsilis ovata)	NE Lake Ontario - St. Lawrence	Lake Champlain	Unknown
	SE Lake Ontario	NE Lake Ontario - St. Lawrence	Unknown
	Upper Hudson	SW Lake Ontario	Unknown
	Lake Erie		
	Allegheny		
	SW Lake Ontario		
Yellow sandshell (Lampsilis teres)	Lake Erie	Unknown	Unknown
White heelsplitter (Lasmigona complanata)	SE Lake Ontario	Unknown	Unknown
Green floater (Lasmigona subviridis)	Susquehanna	Susquehanna	Unknown
	Upper Hudson		
	SE Lake Ontario		
Tidewater mucket (Leptodea ochracea)	Susquehanna	Unknown	Unknown
	Upper Hudson		
	Lower Hudson - Long Island Bays		
	SW Lake Ontario		

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Eastern pondmussel (Ligumia nasuta)	Unknown	Upper Hudson	Unknown
	Lake Erie	Delaware	Unknown
	NE Lake Ontario - St. Lawrence	SW Lake Ontario	Unknown
	SE Lake Ontario		
Black sandshell (Ligumia recta)	Allegheny	Lake Champlain	Unknown
	Lake Erie	SW Lake Ontario	Unknown
	SW Lake Ontario		
	Lower Hudson - Long Island Bays		
Eastern pearlshell (Margaritifera margaritifera)	Lower Hudson - Long Island Bays	Delaware	Unknown
	SE Lake Ontario	Upper Hudson	Unknown
	NE Lake Ontario - St. Lawrence	Lower Hudson - Long Island Bays	Unknown
		NE Lake Ontario - St. Lawrence	Unknown
		SE Lake Ontario	Unknown
Hickorynut (Obovaria olivaria)	NE Lake Ontario - St. Lawrence	Unknown	Unknown
	SE Lake Ontario		
Round hickorynut (Obovaria subrotunda)	Allegheny	Unknown	Unknown
Sheepnose (Plethobasus cyphus)	Unknown	Unknown	Unknown
Clubshell (Pleurobema clava)	Allegheny	Unknown	Unknown
Round pigtoe (Pleurobema sintoxia)	SW Lake Ontario	Unknown	Unknown
Pink heelsplitter (Potamilus alatus)	Allegheny	Lake Champlain	Unknown
	Upper Hudson	SW Lake Ontario	Unknown
Fat pocketbook (Potamilus capax)	SW Lake Ontario	Unknown	Unknown
Kidneyshell (Ptychobranchus fasciolaris)	Lake Erie	Lake Erie	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
		Lake Champlain	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Pimpleback (Quadrula pustulosa)	Lake Erie	Unknown	Unknown
	SW Lake Ontario		
Mapleleaf (Quadrula quadrula)	Lake Erie	Unknown	Unknown
Salamander mussel (Simpsonaias ambigua)	Lake Erie	Unknown	Unknown
Lilliput (Toxolasma parvum)	SE Lake Ontario	Unknown	Unknown
	SW Lake Ontario		
Fawnsfoot (Truncilla donaciformis)	Lake Erie	Unknown	Unknown
Deertoe (Truncilla truncata)	SW Lake Ontario	Unknown	Unknown
Rayed bean (Villosa fabalis)	Allegheny		
Paper pondshell (Utterbackia imbecillis)	SE Lake Ontario	Unknown	Unknown
	SW Lake Ontario		
	Allegheny		
	NE Lake Ontario - St. Lawrence		
	Upper Hudson		
Rainbow (Villosa iris)	SE Lake Ontario	SW Lake Ontario	Unknown
	SW Lake Ontario	SE Lake Ontario	Unknown
	Allegheny		
Dwarf wedgemussel (Alasmidonta heterodon)	Delaware	Delaware	Stable
Mucket (Actinonaias ligamentina)	Allegheny	Allegheny	Unknown
	Lake Erie		
Brook floater (Alasmidonta varicosa)	Delaware	Delaware	Unknown
	Susquehanna	Susquehanna	Unknown

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Elktoe (Alasmidonta marginata)	NE Lake Ontario - St. Lawrence	NE Lake Ontario - St. Lawrence	Unknown
	SE Lake Ontario	SE Lake Ontario	Unknown
	SW Lake Ontario	SW Lake Ontario	Unknown
	Allegheny	Lake Erie	Unknown
	Susquehanna	Upper Hudson	Unknown
	Lake Erie		
	Upper Hudson		
Slippershell mussel (Alasmidonta viridis)	Lake Erie	Lake Erie	Unknown
	SE Lake Ontario		
Threeridge (Amblema plicata)	Allegheny	Lake Erie	Unknown
	Lake Erie	SW Lake Ontario	Unknown
	SW Lake Ontario		
	SE Lake Ontario		
Alewife floater (Anodonta implicata)	Upper Hudson	Upper Hudson	Decreasing
	Delaware	Delaware	Unknown
Tubercled blossom (Epioblasma torulosa)	Unknown	Unknown	Unknown
Northern riffleshell (Epioblasma torulosa rangiana)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Snuffbox (Epioblasma triquetra)	Great Lakes	Unknown	Unknown
Wabash pigtoe (Fusconaia flava)	Great Lakes	Great Lakes	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Yellow lamp mussel (Lampsilis cariosa)	Great Lakes	High Allegheny Plateau	Unknown
	High Allegheny Plateau	Lower New England Piedmont	Unknown
	Lower New England Piedmont	Northern Appalachian/Boreal Forest	Stable
	St. Lawrence-Lake Champlain Valley		
Wavyrayed lampmussel (Lampsilis fasciola)	Great Lakes	High Allegheny Plateau	Unknown
	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
Pink mucket (Lampsilis abrupta)	Unknown	Unknown	Unknown
Pocketbook (Lampsilis ovata)	Great Lakes	Northern Appalachian/Boreal Forest	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	Lower New England Piedmont	Western Allegheny Plateau	Unknown
	Western Allegheny Plateau	Great Lakes	Unknown
Yellow sandshell (Lampsilis teres)	Great Lakes	Unknown	Unknown
White heelsplitter (Lasmigona complanata)	Great Lakes	Unknown	Unknown
Green floater (Lasmigona subviridis)	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont		
	Great Lakes		
Tidewater mucket (Leptodea ochracea)	Lower New England Piedmont	Western Allegheny Plateau	Unknown
	Great Lakes	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	High Allegheny Plateau	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Eastern pondmussel (Ligumia nasuta)	Lower New England Piedmont	High Allegheny Plateau	Unknown
	Great Lakes	Lower New England Piedmont	Unknown
	St. Lawrence-Lake Champlain Valley	Western Allegheny Plateau	Unknown
Black sandshell (Ligumia recta)	High Allegheny Plateau	Lower New England Piedmont	Unknown
	Great Lakes	High Allegheny Plateau	Unknown
	St. Lawrence-Lake Champlain Valley	Great Lakes	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown
Eastern pearlshell (Margaritifera margaritifera)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	Northern Appalachian/Boreal Forest	Unknown
		High Allegheny Plateau	Unknown
Hickorynut (Obovaria olivaria)	St. Lawrence-Lake Champlain Valley	Unknown	Unknown
	Great Lakes		
Round hickorynut (Obovaria subrotunda)	Unknown	St. Lawrence-Lake Champlain Valley	Unknown
Sheepnose (Plethobasus cyphus)	Unknown	Unknown	Unknown
Clubshell (Pleurobema clava)	Western Allegheny Plateau	Unknown	Unknown
Round pigtoe (Pleurobema sintoxia)	Unknown	Unknown	Unknown
Pink heelsplitter (Potamilus alatus)	Lower New England Piedmont	Lower New England Piedmont	Unknown
		St. Lawrence-Lake Champlain Valley	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Fat pocketbook (Potamilus capax)	Great Lakes	Unknown	Unknown
Kidneyshell (Ptychobranchus fasciolaris)	Great Lakes	Great Lakes	Unknown
	Northern Appalachian/Boreal Forest	Western Allegheny Plateau	Unknown
Pimpleback (Quadrula pustulosa)	Great Lakes	Unknown	Unknown
Mapleleaf (Quadrula quadrula)	Great Lakes	Unknown	Unknown
Salamander mussel (Simpsonaias ambigua)	Great Lakes	Unknown	Unknown
Lilliput (Toxolasma parvum)	Great Lakes	Unknown	Unknown
Fawnsfoot (Truncilla donaciformis)	Great Lakes	Unknown	Unknown
Deertoe (Truncilla truncata)	Great Lakes	Unknown	Unknown
Rayed bean (Villosa fabalis)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Paper pondshell (Utterbackia imbecillis)	Great Lakes	Unknown	Unknown
	Northern Appalachian/Boreal Forest		
	Western Allegheny Plateau		
Rainbow (Villosa iris)	Great Lakes	Great Lakes	Unknown
	Western Allegheny Plateau		
Dwarf wedgemussel (Alasmidonta heterodon)	High Allegheny Plateau	High Allegheny Plateau	Stable

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Mucket (Actinonaias ligamentina)	Great Lakes	Western Allegheny Plateau	Unknown
	Western Allegheny Plateau		
Brook floater (Alasmidonta varicosa)	High Allegheny Plateau	High Allegheny Plateau	Unknown
Elktoe (Alasmidonta marginata)	Great Lakes	Great Lakes	Unknown
	St. Lawrence-Lake Champlain Valley	St. Lawrence-Lake Champlain Valley	Unknown
	High Allegheny Plateau	High Allegheny Plateau	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown
Slippershell mussel (Alasmidonta viridis)	Great Lakes	Great Lakes	Unknown
Threeridge (Amblema plicata)	Western Allegheny Plateau	Western Allegheny Plateau	Unknown
	Great Lakes	Great Lakes	Unknown
Alewife floater (Anodonta implicata)	Lower New England Piedmont	Lower New England Piedmont	Decreasing
	High Allegheny Plateau	High Allegheny Plateau	Unknown
Tubercled blossom (Epioblasma torulosa)	Unknown	Unknown	Unknown
Northern riffleshell (Epioblasma torulosa rangiana)	Unknown	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Snuffbox (Epioblasma triquetra)	all	Riverine	coldwater stream	sand/gravel bottom
Wabash pigtoe (Fusconaia flava)	all	Riverine	coldwater stream	mud bottom
Yellow lamp mussel (Lampsilis cariosa)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Yellow lamp mussel (Lampsilis cariosa)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Wavyrayed lampmussel (Lampsilis fasciola)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Pink mucket (Lampsilis abrupta)				
	all	Riverine	deepwater river	rocky bottom
Pocketbook (Lampsilis ovata)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Yellow sandshell (Lampsilis teres)				
	all	Riverine	deepwater river	sand/gravel bottom
White heelsplitter (Lasmigona complanata)				
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	cultural	mud bottom
	all	Lacustrine	warm water shallow	mud bottom
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	warmwater stream	mud bottom
Green floater (Lasmigona subviridis)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Tidewater mucket (Leptodea ochracea)				
	all	Riverine	coastal plain stream	sand/gravel bottom
Eastern pondmussel (Ligumia nasuta)				
	all	Estuarine	unknown	unknown
	all	Riverine	cultural	unknown
	all	Riverine	deepwater river	mud bottom
Black sandshell (Ligumia recta)				
	all	Lacustrine	cold water shallow	sand/gravel bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Eastern pearlshell (Margaritifera margaritifera)				
	all	Riverine	coldwater stream	sand/gravel bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Eastern pearlshell (Margaritifera margaritifera)				
Hickorynut (Obovaria olivaria)				
	all	Riverine	deepwater river	sand/gravel bottom
Round hickorynut (Obovaria subrotunda)				
	all	Lacustrine	unknown	unknown
	all	Riverine	warmwater stream	sand/gravel bottom
Sheepnose (Plethobasus cyphus)				
	all	Riverine	deepwater river	sand/gravel bottom
Clubshell (Pleurobema clava)				
	all	Riverine	warmwater stream	sand/gravel bottom
Round pigtoe (Pleurobema sintoxia)				
	all	Riverine	deepwater river	sand/gravel bottom
Pink heelsplitter (Potamilus alatus)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
	Breeding	Lacustrine	unknown	unknown
Fat pocketbook (Potamilus capax)				
	all	Riverine	deepwater river	mud bottom
	all	Riverine	deepwater river	sand/gravel bottom
Kidneyshell (Ptychobranchus fasciolaris)				
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Pimpleback (Quadrula pustulosa)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
Mapleleaf (Quadrula quadrula)				
	all	Lacustrine	cultural	unknown
	all	Riverine	deepwater river	unknown
Salamander mussel (Simpsonaias ambigua)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	deepwater river	rocky bottom
	all	Riverine	warmwater stream	rocky bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Lilliput (Toxolasma parvum)				
	all	Lacustrine	cold water shallow	unknown
	all	Lacustrine	warm water shallow	unknown
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	warmwater stream	mud bottom
Fawnsfoot (Truncilla donaciformis)				
	all	Lacustrine	unknown	unknown
	all	Riverine	deepwater river	sand/gravel bottom
Deertoe (Truncilla truncata)				
	all	Lacustrine	warm water shallow	mud bottom
	all	Riverine	deepwater river	sand/gravel bottom
Rayed bean (Villosa fabalis)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	SAV
	all	Riverine	warmwater stream	SAV
Paper pondshell (Utterbackia imbecillis)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	deepwater river	mud bottom
	all	Riverine	warmwater stream	mud bottom
Rainbow (Villosa iris)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	sand/gravel bottom
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Dwarf wedgemussel (Alasmidonta heterodon)				
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	coldwater stream	sand/gravel bottom
Mucket (Actinonaias ligamentina)				
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	coldwater stream	rocky bottom
	all	Riverine	deepwater river	mud bottom
	all	Riverine	deepwater river	rocky bottom
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	mud bottom
Brook floater (Alasmidonta varicosa)				
	all	Riverine	coldwater stream	sand/gravel bottom

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Brook floater (Alasmidonta varicosa)				
	all	Riverine	deepwater river	sand/gravel bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Elktoe (Alasmidonta marginata)				
	all	Riverine	coldwater stream	other
	all	Riverine	deepwater river	unknown
	all	Riverine	warmwater stream	unknown
Slippershell mussel (Alasmidonta viridis)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	unknown
	all	Riverine	deepwater river	unknown
	all	Riverine	warmwater stream	unknown
Threeridge (Amblema plicata)				
	all	Lacustrine	unknown	unknown
	all	Riverine	coldwater stream	mud bottom
	all	Riverine	deepwater river	mud bottom
	all	Riverine	warmwater stream	mud bottom
Alewife floater (Anodonta implicata)				
	all	Riverine	deepwater river	rocky bottom
Tubercled blossom (Epioblasma torulosa)				
	all	Riverine	deepwater river	unknown
Northern riffleshell (Epioblasma torulosa rangiana)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown

Goal and Objectives for Freshwater bivalves

Goal: Maintain healthy populations of all native species of freshwater bivalves throughout their historic ranges in New York.

Objective 1 : Develop a management strategy to maintain data sets on mussel populations and to eliminate or mitigate negative impacts on declining populations

Measure: *A strategy for monitoring and management of mussel populations is developed and implemented.*

Objective 2 : Maintain up-to-date knowledge of mussel research, development of new technology or techniques in mussel work, protection and management issues

Measure: *DEC staff working on mussels and water quality issues participate in international and regional mollusk symposia. DEC convenes or participates in regional and local mussel working grps, exchanges data with professionals and mussel conservation societies.*

Objective 3 : Understand the causes of declines in listed mussel populations.

Measure: *Field monitoring of populations indicate threats present including exotic species competition, habitat degradation, fish host availability, fragmentation from impoundments, flow alteration, etc.*

Objective 4 : Understand the current distribution of listed species in New York State.

Measure: *Surveys determine where extant populations of listed mussels are located in the watersheds of New York State*

Objective 5 : Understand the current status of listed mussel populations where they are located in New York.

Measure: *Periodic population estimates of listed mussels give baseline data and trend data for listed mussel species in NY.*

Recommended Actions

Curriculum development:

* Develop an curriculum to educate the public about freshwater mussel life history and protection issues at all DEC environmental education centers and Project Wild programs

Development rights acquisition:

* In key locations acquire development rights to protect water quality for listed mussel populations.

Educational signs:

* Develop and post educational signs, in appropriate languages, for markets dealing in live bivalves, fish and crustacea explaining the dangers of releasing exotic invasive animals into New York.
* Post educational signs at boater access points to reduce introduction of zebra and quagga mussels in water bodies.

Fact sheet:

* Develop fact sheets on each species of listed freshwater mussels.

Recommended Actions

Habitat management:

* Manage areas of important mussel populations by controlling degradation factors (e.g.. Controlling livestock access, point source or non-point source pollution, flow alteration, etc.)
* Develop methods to improve and restore freshwater bivalve habitat.

Habitat research:

* Conduct research to determine habitat parameters necessary for good populations of each species of species-at-risk listed mussels.
* Research flow requirements of freshwater bivalves and model the effects of flow changes both in volume and timing.
* Research all parameters of mussel habitat requirements including temperature, substrate, fish, flow, food, etc.

Habitat restoration:

* Restore degraded habitat areas to allow for recolonization or reintroduction of listed mussels.

Invasive species control:

* Develop a monitoring/control plan that includes measures to detect invasive species problematic to freshwater bivalves in all New York watersheds and actions that will be taken to control them before they become threats.
* Conduct research on control of exotic bivalve species that compete with native mussels and exotic crustaceans or fish which may prey on them.

Life history research:

* Research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, adults
* Research potential interbreeding between Alasmidonta varicosa and Alasmidonta marginata and, if occurring, evaluate the potential threat to A. varicosa population integrity.
* Determine fish hosts for species where this is not known for populations living in New York .
* Research population dynamics of listed mussel species including connectivity of populations or subpopulations and genetic distinctness of populations or subpopulations.
* Determine or confirm breeding phenology and habitat conditions necessary for successful breeding for listed mussels (e.g.. mussel density, pop. level of fish host, temp, flow).

Modify regulation:

* Modify marine mussel regulations to be clearer that freshwater mussels are protected under ECL.

New regulation:

* Ban the importation of fish that feed on freshwater mollusks (e.g.. black carp).
* Require inclusion of all stages of freshwater mussels in testing for approval of new pesticides in New York

Recommended Actions

Other action:

* Develop an outreach program to private landowners through the Landowner Incentive Program to educate the public about freshwater mussel protection and initiate projects to prevent or repair impacts from land use on mussels.
* Increase regional permit control of development and highway projects that may impact native mussels.
* Develop standard monitoring/survey protocols for development projects in all watersheds in New York.
* Evaluate threats to mussels in each New York watershed and prioritize areas for actions to address the threats.
* Research the best survey methods both for detection of rare species and evaluation of population status and trends.
* Begin evaluation of members of the family Sphaeridae (fingernail clams) for inclusion into the species at risk list.

Population monitoring:

* Conduct population estimates of species-at-risk listed mussel species in NY
* Conduct surveys to determine distribution of species-at-risk listed mussel species in NY.

Regional management plan:

* Incorporate freshwater mussel goals and objectives into regional water quality and fish management plans and policies.

Relocation/reintroduction:

* Where appropriate, reintroduce listed mussels into appropriate habitat within their historic range.

Statewide management plan:

* Incorporate freshwater mussel goals and objectives into statewide water quality and fish management plans and policies.

References

Strayer, D.L. and K.J.Jirka. 1997. The pearly mussels of New York state. New York State Museum memoir 26. University of the Sate of New York Education Department. 170 pp.

Originator

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Taxa Group: Mollusk
Species Group: Freshwater gastropods

Threats:
We believe that threats to this group are similar to those faces by many freshwater organisms in New York. These include loss of habitat due to water table drawdown, development, alteration of drainage and surface water flows, and change in aquatic vegetation. Threats also include use of pesticides and other chemicals either directly on habitat areas or from non-point source pollution. Competition from exotic species may also be a problem. There may be specific threats to species which need to be researched.

Trends:
Trends need to be determined with surveys.

SEQR - No Action Alternative:
Without action it is likely the species in this group will decline.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
File rams-horn (Planorbella pilsbryi)			SH	G4G5	U	Resident
Banded physa (Physella vinosa)			S1	GU	U	Resident
Lance aplexa (Aplexa elongata)			S2	G5	U	Resident
Coldwater pondsnail (Stagnicola woodruffi)			S?	G1G3	U	Resident
Spindle lymnaea (Acella haldemani)			S?	G3	U	Resident
Gravel pyrg (Pyrgulopsis letsoni)			SH	G1	U	Resident
Buffalo pebblesnail (Gillia altilis)			S1	G5	U SC	Resident
Watercress snail (Fontigens nickliniana)			S1S3	G5	U	Resident
Campeloma spire snail (Cincinnatia cincinnatiensis			S1	G4G5	U	Resident
Globe siltsnail (Birgella subglobosus)						Resident
Canadian duskysnail (Lyogyrus walkeri)			S?	G2G3	U	Resident
Mossy valvata (Valvata sincera)			S1	G5	U SC	Resident
Purplecap valvata (Valvata perdepressa)			SP	G3	U	Resident
Fringed valvata (Valvata lewisi)			S1	G3?	U SC	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Fringed valvata (Valvata lewisi)	Unknown	Unknown	Unknown
Purplecap valvata (Valvata perdepressa)	NE Lake Ontario - St. Lawrence	Unknown	Unknown
Mossy valvata (Valvata sincera)	SE Lake Ontario	Unknown	Unknown
	Allegheny		
	Lake Champlain		
	NE Lake Ontario - St. Lawrence		
	Upper Hudson		
Canadian duskysnail (Lyogyrus walkeri)	Unknown	Unknown	Unknown
Globe siltsnail (Birgella subglobosus)	Lake Champlain	Unknown	Unknown
	Upper Hudson		
	SE Lake Ontario		
	Lake Erie		
Campeloma spire snail (Cincinnatia cincinnatiensis)	SE Lake Ontario	Unknown	Unknown
	Lake Erie		
	Allegheny		
	NE Lake Ontario - St. Lawrence		
	Upper Hudson		
Watercress snail (Fontigens nickliniana)	Upper Hudson	Unknown	Unknown
	Allegheny		
	Lake Erie		
Buffalo pebblesnail (Gillia altilis)	Upper Hudson	Unknown	Unknown
	SE Lake Ontario		
	SW Lake Ontario		
	Lake Erie		

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Gravel pyrg (Pyrgulopsis letsoni)	Lake Erie	Unknown	Unknown
	Allegheny		
Spindle lymnaea (Acella haldemani)	Lake Champlain	Unknown	Unknown
	Susquehanna		
	SE Lake Ontario		
	Lake Erie		
Coldwater pondsnail (Stagnicola woodruffi)	Unknown	Unknown	Unknown
Lance aplexa (Aplexa elongata)	Lake Champlain	Unknown	Unknown
	Upper Hudson		
	SE Lake Ontario		
	SE Lake Ontario		
	Lake Erie		
	Allegheny		
	Susquehanna		
	NE Lake Ontario - St. Lawrence		
	Lower Hudson - Long Island Bays		
Banded physa (Physella vinosa)	Unknown	Unknown	Unknown
File rams-horn (Planorbella pilsbryi)	Unknown	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Fringed valvata (Valvata lewisi)	Unknown	Unknown	Unknown
Purplecap valvata (Valvata perdepressa)	Great Lakes	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Mossy valvata (Valvata sincera)	St. Lawrence-Lake Champlain Valley Lower New England Piedmont Northern Appalachian/Boreal Forest Great Lakes Western Allegheny Plateau	Unknown	Unknown
Canadian duskysnail (Lyogyrus walkeri)	Unknown	Unknown	Unknown
Globe siltsnail (Birgella subglobosus)	Lower New England Piedmont St. Lawrence-Lake Champlain Valley Great Lakes	Unknown	Unknown
Campeloma spire snail (Cincinnatia cincinnatiensis)	Great Lakes St. Lawrence-Lake Champlain Valley Northern Appalachian/Boreal Forest Western Allegheny Plateau	Unknown	Unknown
Watercress snail (Fontigens nickliniana)	Western Allegheny Plateau Great Lakes	Unknown	Unknown
Buffalo pebblesnail (Gillia altilis)	Great Lakes Lower New England Piedmont	Unknown	Unknown
Gravel pyrg (Pyrgulopsis letsoni)	Western Allegheny Plateau Great Lakes	Unknown	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Spindle lymnaea (Acella haldemani)	Great Lakes	Unknown	Unknown
	St. Lawrence-Lake Champlain Valley		
	High Allegheny Plateau		
Coldwater pondsnail (Stagnicola woodruffi)	Unknown	Unknown	Unknown
Lance aplexa (Aplexa elongata)	All	Unknown	Unknown
Banded physa (Physella vinosa)	Unknown	Unknown	Unknown
File rams-horn (Planorbella pilsbryi)	Unknown	Unknown	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Fringed valvata (Valvata lewisi)				
	all	Lacustrine	unknown	unknown
	all	Lacustrine	warm water shallow	sand/gravel bottom
Purplecap valvata (Valvata perdepressa)				
	all	Lacustrine	cold water shallow	mud bottom
	all	Lacustrine	warm water shallow	mud bottom
Mossy valvata (Valvata sincera)				
		Lacustrine	cold water shallow	SAV
	all	Lacustrine	cold water deep	SAV
	all	Lacustrine	warm water shallow	SAV
	all	Riverine	deepwater river	SAV
Canadian duskysnail (Lyogyrus walkeri)				
	all	Unknown		
Globe siltsnail (Birgella subglobosus)				
	all	Lacustrine	unknown	unknown
	all	Riverine	unknown	unknown
Campeloma spire snail (Cincinnatia cincinnatiensis)				

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Campeloma spire snail (Cincinnatia cincinnatiensis)				
	all	Lacustrine	warm water shallow	mud bottom
	all	Lacustrine	warm water shallow	sand/gravel bottom
	all	Riverine	warmwater stream	mud bottom
	all	Riverine	warmwater stream	sand/gravel bottom
Watercress snail (Fontigens nickliniana)				
	all	Riverine	coldwater stream	SAV
Buffalo pebblesnail (Gillia altilis)				
	all	Lacustrine	warm water shallow	mud bottom
Gravel pyrg (Pyrgulopsis letsoni)				
	all	Unknown		
Spindle lymnaea (Acella haldemani)				
	all	Lacustrine	cold water shallow	SAV
	all	Lacustrine	warm water shallow	SAV
Coldwater pondsnail (Stagnicola woodruffi)				
	all	Unknown		
Lance aplexa (Aplexa elongata)				
	all	Palustrine	mineral soil wetland	emergent marsh
	all	Palustrine	mineral soil wetland	pond/lake shore
Banded physa (Physella vinosa)				
	all	Unknown		
File rams-horn (Planorbella pilsbryi)				
	all	Unknown		

Goal and Objectives for Freshwater gastropods

Goal: Secure the status of the freshwater gastropods on the species at risk list.

Objective 1 : Determine the current status of each species on the list through surveys including population trends.

Measure: *Completion of surveys in appropriate habitat via methods designed to provide population and trend data.*

Objective 2 : Develop specific plans for each listed species or appropriate suite of freshwater gastropod species on the list that details status, threats, actions necessary to reverse declines or maintain stable populations.

Measure: *Development and implementation of the plans completed.*

Objective 3 : Identify habitat requirements of all life stages of listed species.

Measure: *Data collected from research and contact with experts on the taxa sufficient to determine habitat needs.*

Objective 4 : Identify threats to each listed species.

Measure: *Threat data gathered on listed species from contact with experts on the taxi and those conducting pertinent research. Areas where more research is needed are identified.*

Recommended Actions

Fact sheet:

* Develop fact sheets for each listed species for paper distribution and the DEC website.

Habitat research:

* Determine habitat requirements for all life stages, potential threats, to habitat, and habitat management techniques.

Life history research:

* Determine through research live history phylogeny, population dynamics, distribution.

Other management plan:

* Develop specific plans for each listed species or appropriate suite of freshwater gastropod species on the list that details status, threats, actions necessary to reverse declines or maintain stable populations.

References

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Jokinen, Eileen H. 1992. The freshwater snails (Mollusca: Gastropoda) of New York State. New York State Museum Bulletin 482.112pp.

Harmon.W. N. and C. O. Berg. 1971. The freshwater snails of central New York with illustrated keys to the genera and species. Search (1)4 68pp.

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Taxa Group: Mollusk
Species Group: Hard clam

Threats:
Several major factors negatively affect the survival and recovery of hard clam populations including environmental conditions such as an increase in the presence of predators, alterations in food supply (primarily phytoplankton communities), harmful algal bloom (HAB) events, water quality degradation, habitat changes and emergent diseases. Predators significantly reduce the survival of juvenile hard clams and can greatly reduce the effects of restorative seeding projects. Alterations in food quality combined with HAB's and general water quality degradation affect general reproductive success, early life stages and hinder the health and growth of juvenile to mature clams. At the same time habitat loss such as long term sedimentation of estuaries or the loss of suitable submerged aquatic vegetation beds continue to limit existing and future population areas. New disease outbreaks such as Quahog Parasite Unknown (QPX) have been identified in isolated but dense populations of hard clams in Raritan Bay, resulting in mortalities of approximately 30%, and have the threat to impact similar populations elsewhere on Long Island. Also anthropogenic involvement creates a loss of habitat caused by marine construction and dredging, direct population alteration, chemical contamination and nutrient enrichment of embayments.

Trends:
Historically, New York State has maintained some of the most productive hard clam populations in the country based on commercial fishery landings data where Statewide production peaked at over 850,000 bushels in 1947. Most recently, hard clam landings peaked at 750,000 bushels in 1976 with over 700, 000 of those bushels being harvested from Great South Bay. By 2003, total Statewide production had fallen to 106,739 bushels representing a 76% decline while production in Great South Bay had fallen to 12,723 bushels a 98% decline. Elsewhere in the State, hard clam populations could generally be described as having declined from historic highs and are now either stable and low in population density or declining. Notable exceptions are high populations in Raritan Bay, which are now impacted by QPX disease, and Oyster Bay and Huntington Bay regions, the former in part due to long term private aquaculture activities. Populations of hard clams in closed water classification areas are generally unknown, such as in Jamaica Bay and Western Long Island Sound. Currently every major Township in the New York State marine district is involved in the aquaculture or seeding of juvenile hard clams in efforts to increase populations. Mature clam spawner sanctuaries have also been created by many Townships and by private entities notably The Nature Conservancy.

SEQR - No Action Alternative:
Recently, complex statistical modeling has been used to perform population trends for hard clams in Great South Bay. These studies indicate that hard clam populations, in the absence of all negative stresses including commercial harvesting, would take over 10 years under natural conditions to achieve any measurable recovery. By incorporating unfavorable conditions upon the population model, many of which are currently substantial, hard clam populations could easily need more than 20 years to achieve any population increase or be in a state of permanent decline. These predictions have been proven by example where in various hard clam growing areas the density of hard clams has become so low that even in favorable conditions populations have not increased. A no action strategy would likely result in the continued decline of hard clam populations to a point of increasingly unsuccessful reproduction and recruitment resulting in isolated populations with greatly decreased chances for natural recovery.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status

Hard clam (Mercenaria mercenaria) P Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Hard clam (Mercenaria mercenaria)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Hard clam (Mercenaria mercenaria)	Lower New England Piedmont	Lower New England Piedmont	Unknown
	North Atlantic Coast	North Atlantic Coast	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Hard clam (Mercenaria mercenaria)				
	all	Marine	deep subtidal	sand/gravel
	all	Marine	intertidal	mudflats
	all	Marine	shallow subtidal	sand/gravel
	Nursery/Juvenile	Marine	deep subtidal	pelagic

Goal and Objectives for Hard clam

Goal: To restore and protect hard clam populations in the Lower Hudson/Long Island Bays watershed, particularly within Great South Bay and the Picnic's Bay system, to levels that are naturally recoverable and self sustaining by 2020.

Objective 1 : Determine embayments with greatest need and potential for restoration by 2007.

Measure: *Complete population surveys identifying low population areas and determine the environmental conditions that would best support restoration.*

Objective 2 : Determine the distribution and abundance of hard clams in major embayments, by 2010.

Measure: *Completion of hard clam population surveys every 2 years within major embayments.*

Objective 3 : Establish 5 spawner sanctuaries in the major embayments of the Lower Hudson/Long Island Bays watershed, 2 in the Peconic Bay system, 2 in south shore estuaries and 1 along LI Sound - all closed to commercial harvesting, by 2010.

Measure: *Creation of 5 spawner sanctuaries, closed to commercial harvest, by 2010.*

Objective 4 : Establish the distribution and effects of QPX disease upon hard clams populations, by 2010.

Measure: *Completion of studies outlining the distribution of QPX in major embayments and which determine the transmission and effects of QPX upon wild populations of hard clams by 2010.*

Objective 5 : Increase successfully recruiting populations of juvenile hard clams by 2010.

Measure: *Perform juvenile hard clam seeding projects in embayments of greatest need and potential using hatchery reared stock on a yearly basis.*

Objective 6 : Know factors affecting hard clam population dynamics including reproductive success, food availability and water quality parameters.

Measure: *Number of research projects studying hard clam population dynamics and physiology completed by 2010.*

Recommended Actions

Captive breeding:

* Continue to promote shellfish hatchery spawning of hard clams and their use in the seeding of public waters.

Habitat monitoring:

* Record and monitor HAB events and continue further research into their effect on hard clams.

Habitat research:

* Promote and continue ongoing research into the survival and growth of hard clams, focusing on phytoplankton dynamics, predator prey relationships and water quality parameters.

Life history research:

* Promote and continue species research testing the success and effectiveness of spawner sanctuaries and seeding efforts as well as research into the success of wild hard clam reproduction and recruitment.

Other action:

* As necessary, implement management measures needed to protect, conserve and support sustainable hard clam populations in the Lower Hudson/Long Island bays watershed.
* Continue population restoration via juvenile hard clam seeding projects and via mature hard clam spawner sanctuaries.

Recommended Actions

* Promote and continue research into the distribution and effects of QPX disease on hard clams.

Other management plan:

* Develop Comprehensive Hard Clam Management Plan for the marine district.

Population monitoring:

* Conduct shellfish surveys of major embayments, especially where little population data are known. Also compile population data from involved hard clam industry representatives and from areas where surveys are impractical. This combined data will be used in the long term monitoring of hard clam populations.

References

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Rice, M.A. (1992). The Northern Quahog: The Biology of Mercenaria mercenaria. Rhode Island Sea Grant, Rhode Island, 60pp.

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Lewis, D., Kassner, J., Cerrato, R., Finch, R. (1995). An Assessment of Shellfish Resources in the Deep Water Areas of the Peconic Estuary. Marine Sciences Research Center, State University of New York, Stony Brook, NY.

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Taxa Group: Mollusk
Species Group: Ribbed mussel

Threats:
Threats to ribbed mussel populations are mostly unknown.

1.) One local expert commented that the fate of ribbed mussels is tied to that of smooth cord grass (Spartina alterniflora). It is believed by DEC tidal wetland staff that smooth cord grass populations are in decline locally. Any threat to smooth cord grass should be considered a threat to ribbed mussels. Some of the important ecological roles played by ribbed mussels are included:

Ribbed mussels should be considered a species of concern because of their significant ecological role. Since they are not a commercially important species they tend to be the dominant filter feeding invertebrate in shallow quiescent creeks. “They are classified as both autogenic and allogenic bioengineers because they both provide habitat and convert resources from one state to another. Bioengineers are species determined to play a major role in the structure and function of most natural communities” (from Bertness, 1999).

In creeks where populations are significant, ribbed mussels can apply both top down (control of populations and community structure by consumers) and bottom up (control of populations and community structure by control over natural resources) forces on phytoplankton populations as well as provide nutrient support and erosion control to smooth cord grass.

An effect of the top down control of phytoplankton coupled with filtration of suspended solids (with the production of pseudofeces) is reduced turbidity resulting in greater photosynthetically active radiation penetration and improved submerged aquatic vegetation and benthic phytoplankton growth and survival. This is accomplished due primarily to the fact that ribbed mussels increase clearance rates (the rate at which bivalves pass water through their bodies and over their gills) with increases in suspended solids significantly past the point where hard and soft shell clams shut down (from Newell, 2004). Dense communities of ribbed mussels have the ability to filter a great percentage of the water within their water body on a daily basis.

An additional effect of the redistribution of particulate organic nitrogen from the water column to the water sediment interface (pelagic benthic coupling) is the increased potential for Nitrification / Denitrification (the process in which dissolved inorganic nitrogen is converted to elemental nitrogen) and the removal of anthropogenic nitrogen as N2 (from Newell, 2004).

An effect of the bottom up control of nitrogen concentrations is the potential to affect salt marsh zonation, which is in part controlled by nitrogen limitation. Smooth cord grass is a competitive subordinate to marsh hay, but can displace marsh hay when exposed to elevated nitrogen levels (from Bertness, 1999).

2.) A second local expert speculated that the harvest of ribbed mussels for bait may damage smooth cord grass stands (see above). Additionally, he stated that ribbed mussel beds may become habitat refuges for soft shell clams, and individual harvesters may be digging up smooth cord grass and ribbed mussels to get at soft shell clams beneath.

Trends:
Trends in ribbed mussel populations are mostly unknown.

Because smooth cord grass populations are declining locally, we can assume that ribbed mussel populations are declining in those same locations (see Threats section).

Both local experts agreed that trends in population distribution and abundance are unknown except for localized embayments. In Jamaica Bay, even though the bay is suffering from major smooth cord grass loss, populations of ribbed mussels appear to be thriving on the remaining marsh.

SEQR - No Action Alternative:
Too little is known about ribbed mussel population trends and health to determine what the impact would be of a "No Action Alternative".

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Ribbed mussel (Geukensia demissa)						Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Ribbed mussel (Geukensia demissa)	Lower Hudson - Long Island Bays	Lower Hudson - Long Island Bays	Unknown

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Ribbed mussel (Geukensia demissa)	North Atlantic Coast	North Atlantic Coast	Unknown
	Lower New England Piedmont	Lower New England Piedmont	Unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ribbed mussel (Geukensia demissa)				
	Breeding	Estuarine	intertidal	emergent marsh
	Breeding	Estuarine	intertidal	structure
	Breeding	Estuarine	shallow subtidal	structure
	Feeding	Estuarine	intertidal	emergent marsh
	Feeding	Estuarine	intertidal	structure
	Feeding	Estuarine	shallow subtidal	structure
	Nursery/Juvenile	Estuarine	shallow subtidal	pelagic
	Nursery/Juvenile	Marine	shallow subtidal	pelagic

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Ribbed mussel (Geukensia demissa)				

Goal and Objectives for Ribbed mussel

Goal: Develop baseline data on abundance and distribution. Determine the interactions between ecological parameters, population status and trends and anthropogenic and natural impacts

Objective 1 : By 2015 a region specific ribbed mussel baseline database will be completed which includes abundance, distribution, and other parameters in 10 reference and 20 impacted wetlands throughout the NY marine district.

Measure: *The number of reference and impacted wetlands that have complete information.*

Objective 2 : By 2015 know how habitat loss relates to ribbed mussel population trends.

Measure: *Understand the relationship of habitat loss and population trends*

Objective 3 : Have a program for integrated species monitoring in the lower Hudson / Long Island Bays watershed that can be implemented by 2010.

Measure: *Implementation of the monitoring program.*

Objective 4 : Have a protocol for integrated marsh species monitoring that can be implemented by 2008.

Measure: *Completion of the monitoring protocol.*

Recommended Actions

Habitat management:

* If ribbed mussel populations are in decline due to loss of smooth cordgrass habitat, increased protections to tidal wetlands would be required. Salt marsh habitat protection and restoration are crucial elements in any ribbed mussel conservation plan. Aspects of salt marsh protection and restoration will be included in the final watershed recommendations.

Habitat monitoring:

* Because of the link with smooth cordgrass, continued tidal wetland habitat monitoring is necessary to determine if ribbed mussel populations are being impacted.

Recommended Actions

Population monitoring:

* After baseline population data is gathered, further monitoring is necessary to determine trends.

References

Roger I. E. Newell. 2004. Ecosystem influences of natural and cultivated populations of suspension-feeding bivalve mollusks: a review. Journal of Shellfis Research. 23: 51-61.

Many scientific papers exist that describe the ecological role that ribbed mussels play. However, literature on distribution, abundance and trend data is limited. See reference section of Bertness' book (referenced above) for many ecological role papers. Additionally, many papers by David R. Franz or Roge I. E. Newell describe the ecology, physiology, age structure, recruitment and fecundity of ribbed mussels.

Mark D. Bertness. 1999. The Ecology of Atlantic Shorelines. Sinauer Associates Inc., 23 Plumtree Road, Sunderland, MA USA 01375. This book gives a good introduction to the ecology of salt marshes and the interactions between smooth cordgrass and ribbed mussels. This book also contains a decent bibliography for salt marsh ecology.

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Taxa Group: Mollusk
Species Group: Terrestrial gastropods

Threats:
The primary threats to the Chittenango ovate amber snail (COAS) is its small population size and fact that the population at Chittenango Falls State Park is the only known population in the world. There is also an apparent negative interaction with an introduced snail, Succinea sp. B.

Trends:
The population is considerably smaller than when first discovered in 1905. The snail apparently reached lowest numbers about the time that S. sp. B was found in the habitat circa 1980. Since then the snail has maintained itself at low numbers, approximately 250 to 500 individuals as the total worldwide population.

SEQR - No Action Alternative:
Leslie Hubright, a prominent malacologist, noted than when Succinea sp. B invades an area all other Succineid snails disappear. It is expected that without intervention, COAS will disappear from this site and therefore become extinct.

Species in the Group and their Management Status

Species	Federal Listing	NE Concern	State Rank	Global Rank	State Protection	Migratory Status
Chittenango ovate amber snail (Novisuccinea chitte	T		S1	G1	E	Resident

Species Distribution - Watershed Basin

Species	Historical	Current	Stability
Chittenango ovate amber snail (Novisuccinea chittenang	SE Lake Ontario	SE Lake Ontario	Decreasing

Species Distribution - Ecoregion

Species	Historical	Current	Stability
Chittenango ovate amber snail (Novisuccinea chittenango	Great Lakes	Great Lakes	Decreasing

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Chittenango ovate amber snail (Novisuccinea chittenangoensis)				
	all	Terrestrial	unknown	unknown

Critical Habitats for Species in the Group

Species	Life Stage or Use	System	SubSystem	Habitat
Chittenango ovate amber snail (Novisuccinea chittenangoensis)				

Goal and Objectives for Terrestrial gastropods

Goal: To establish long term sustainability of COAS in the wild and ultimately delist the species.

Objective 1 : Coordinate statewide management and protection actions with involved staff of the State Park and the USFWS.

Measure: *Number of protection and management actions coordinated.*

Objective 2 : Determine genetic distinctiveness of COAS and other closely related succineids.

Measure: *Identify genetic markers for determining whether a snail at other locations is COAS or not.*

Objective 3 : Establish additional populations of COAS within Chittenango Falls State Park so that species is not threatened with extinction due to isolated stochastic events.

Measure: *Number of additional populations established.*

Objective 4 : Reduce competition with S. sp. B

Measure: *Assess change in abundance of COAS and S. sp. B over time.*

Objective 5 : Search for additional sites where COAS might occur.

Measure: *Number of sites surveyed that have suitable habitat.*

Objective 6 : Stabilize population at Chittenango Falls

Measure: *Using M-R-R techniques, show that population is stable or increasing for 5 generations (i.e., 10 years)*

Recommended Actions

Captive breeding:

* Use captive breeding to augment existing population if necessary, establish new populations, and conduct laboratory and field experiments to quantify life history parameters and competitive interactions with S. sp. B.

Recommended Actions

Educational signs:

* Revise educational signs at Chittenango Falls State Park and develop educational signs at zoos that participate in captive breeding experiments

Habitat research:

* Conduct habitat research to determine if there are microhabitat differences preferred by COAS and S. sp. B.

Invasive species control:

* Investigate methods of removing S. sp. B from the habitat without harming COAS

Life history research:

* Continue life history research including analysis of DNA

Other action:

* Continue to participate as part of the federal COAS Recovery Team

Population monitoring:

* Continue M-R-R studies as a method of determining population size, seasonal movement and habitat use.

Relocation/reintroduction:

* Identify possible sites for relocation COAS so as to establish 3 additional self sustaining populations.

References

Arrigoni, J.E., Jr. 2002. Mark-release-recapture study of the Chittenango ovate amber snail (Novisuccinea chittenangoensis Pilsbry), July-October 2002. Final Report to New York State Department of Environmental Conservation Endangered Species Unit.

Molloy, A. W. 1995. Studies of the endangered Chittenango ovate amber snail (Novisuccinea chittenangoensis) and related species of the Chittenango Creek watershed. M.S. Thesis. SUNY, College of Environmental Sciences and Forestry. Syracuse, NY. 149 pp.

U. S. Fish and wildlife Service. 2003. Chittenango ovate amber snail (Novisuccinea chittenangoensis) Recovery Plan, Fiorst Revision. Technical Agency Draft. Hadley, MA 57 pp

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Appendix B: **Habitats of New York State critical to SGCN**

The following habitat types of New York State were adapted from:
Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (Eds.). (2002). *Ecological Communities of New York State, Second Edition*. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). Albany, NY: New York Natural Heritage Program, New York State Department of Environmental Conservation.

Estuarine

Subsystem	**Habitat**
Cultural	Shoreline
	Structure
Deep subtidal	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure
Intertidal	Emergent marsh
	Mudflats
	Other
	Rocky
	Sand/ gravel
	Shoreline
	Structure
Shallow subtidal	Mud
	Other
	Pelagic
	Rocky
	Sand/gravel
	SAV
	Stucture
Unknown	Unknown

Lacustrine

Subsystem	**Habitat**
Coastal plain	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure
Cold water deep	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure
Cold water shallow	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure
Cultural	Cement pond
	Treatment pond
Unknown	Unknown
Warm water deep	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure
Warm water shallow	Mud
	Other
	Pelagic
	Rocky
	Sand/ gravel
	SAV
	Structure

Marine

Subsystem	Habitat
Cultural	Shoreline
	Structure
Deep subtidal	Mud
	Pelagic
	Rocky
	Other
	Sand/ gravel
	SAV
	Structure
Intertidal	Emergent marsh
	Mudflats
	Other
	Rocky
	Sand/ gravel
	Shoreline
	Structure
Shallow subtidal	Mud
	Other
	Pelagic
	Rocky
	Sand/gravel
	SAV
	Stucture
Unknown	Unknown

Palustrine

Subsystem	Habitat
Cultural	Impoundment
	Other
Mineral soil wetland	Coniferous forested
	Deciduous forested
	Emergent marsh
	Meadow
	Deciduous/ coniferous
	Other
	Pond/ lake shore
	Shrub swamp
	Vernal pool
Peatlands	Bog/ fen
	Other
Unknown	Unknown

Riverine

Subsystem	Habitat
Coastal plain stream	Marsh
	Other
	Rocky bottom
	Sand/ gravel bottom
	SAV
	Mud bottom
	Structure
Cultural	Culvert/ concrete channel
Cold water stream	Marsh
	Mud bottom
	Rocky bottom
	Other
	Sand/ gravel bottom
	SAV
	Structure
Deep water river	Pelagic
	Mud bottom
	Rocky bottom
	Sand/ gravel bottom
	Structure
Deep water stream	Other
Warm water stream	Marsh
	Other
	Mud bottom
	Rocky bottom
	Sand/gravel bottom
	SAV
	Stucture
Unknown	Unknown

Subterranean

Subsystem	Habitat
Cultural	Mines
	Tunnels
Natural	Aquatic caves
	Terrestrial caves

Terrestrial

Subsystem	Habitat
Alpine/ mountain	Northern coniferous
	Northern deciduous
	Cliffs and open talus
	Other
Barrens/ woodlands	Cultural
	Deciduous/coniferous
	Northern coniferous
	Northern deciduous
	Other
	Shrublands
	Southern coniferous
	Southern deciduous
Coastal	Beach/ shoreline
	Cultural
	Dunes
	Other
	Sand/ gravel bar
Forested	Cultural
	Deciduous/ coniferous
	Northern coniferous
	Northern deciduous
	Other
	Southern coniferous
	Southern deciduous
Maritime	Beach/ shoreline
	Cultural
	Dunes
	Grasslands
	Heathlands
	Other
	Shrublands
Open upland	Beach/ shoreline
	Cliffs & open talus
	Cultural
	Dunes
	Grasslands
	Heathlands
	Other
	Sand/ gravel bar
Unknown	Unknown

Appendix C:

A complete list of all the threats to SGCN listed in the CWCS planning database.

Direct Impacts to Aquatic Individuals, Populations, or Genetic Diversity
1. Human Disturbance - Direct and Indirect: a. vehicle collisions: boats; jetskis b. entanglement, entrainment, impingement; electrocution c. illegal or unregulated harvest; overharvest, including eggs
2. Contaminants, pesticides
3. Disease
4. Interspecific interactions: a. loss of host species b. disturbed predator/prey cycles c. competition for life support (food, spawning sites, cover) from non-native species or species in places or numbers not historically found d. detrimental hybridization e. parasites
5. Susceptibility to stochastic events: a. weather; storm events b. species with isolated distributions c. rare species

Loss of Aquatic Habitat Quantity - Streams & Rivers; Lakes, Ponds; Reservoirs; Wetlands, Vernal Pools; Associated Riparian Areas; Oceans
6. Conversion from natural to cultural: resource extraction (mining); snagging; construction of docks, piers, and boathouses; dredging; filling; aquatic vegetation control. Wetlands/Vernal Pools: filling; draining; mosquito control; fragmentation or loss of connectivity.
7. Climate change: sea level rise; temperature changes
8. Alteration by natural processes: beaver activity; spring flooding
9. Sedimentation/Erosion: stormwater; agriculture; silviculture; road sanding; construction site runoff; cleaning roadside ditches
10. Altered hydrology: barriers (dams, weirs, culverts, bridges); water withdrawal/management; stormwater; floodplain alteration
11. Loss of streamside buffers (loss of resting and shelter area)
12. Competition from exotics: purple loosestrife; phragmites; water chestnut, etc.

Loss of Aquatic Habitat Quality (Degraded health of system)
13. Degradation of water quality: water chemistry; temperature; sediment; toxics; nutrients; algal blooms; on-site septics; acid rain; drainage(wetlands/vernal pools): agricultural, commercial, and residential purposes; mosquito control (wetlands/vernal pools): chemical application
14. Altered hydrology: water level management; stormwater; floodplain alteration; ground water extraction
15. Habitat composition altered by invasives or non-native species
16. Habitat composition altered by overuse: beaver; geese; swans; muskrat

Direct Impacts to Terrestrial Individuals, Populations, or Genetic Diversity
1. Human Disturbance - Direct and Indirect: a. vehicle/structure collisions, including mowing; wind towers, cell towers, power lines b. entanglement, including litter c. illegal or unregulated harvest; overharvest, including eggs
2. Contaminants, pesticides
3. Disease
4. Interspecific interactions: a. loss of host species b. disrupted predator/prey cycles c. competition for life support (food, nest sites, cover) from non-native species or species in places or numbers not historically found d. detrimental hybridization e. parasites
5. Susceptibility to stochastic events: a. weather; storm events b. species with isolated distributions c. rare species

Loss of or Degraded Terrestrial Habitat - Forests, Shrublands, Grasslands, Unique Natural Areas, Early Successional Areas
6. Conversion from natural to cultural: urbanization, agriculture (row cropping), resource extraction (mining)
7. Conversion from one natural covertype to another: succession; forestry; agricultural reversion
8. Climate change: range restriction; changes in distribution; impacts to migration and breeding
9. Erosion: silviculture; agriculture; stormwater
10. Barriers: roads; development
11. Pollution: acid rain; soil contamination
12. Habitat composition altered by invasives or non-native species
13. Habitat composition altered by overuse: deer browse

Loss of or Degraded Terrestrial Habitat Function
14. Fragmentation of habitat types
15. Reduction of patch size, shape, area
16. Human-created abrupt edges resulting in negative edge effects
17. Loss of connectivity necessary to maintain metapopulations: decrease in travel corridors; increase in fragmentation
18. Insensitive/unsustainable agricultural and silvicultural practices
19. Active alteration of natural processes: fire, which would have reverted succession; flood control

Appendix D1:

Species of Greatest Conservation Need and their status, sorted alphabetically by taxonomic group and scientific name.

Taxa Group	Common Name	Scientific Name	Migratory Status	Federal Listing	Northest Concern	Other Ranking	State Rank	State Status	Global Rank
Bird									
	American bittern	Botaurus lentiginosus	Migratory		X	PIF-IIA	S4	P SC	G4
	American black duck	Anas rubripes	Migratory			WL, PIF-IA	S4	G	G5
	American golden-plover	Pluvialis dominica	Migratory					P	
	American oystercatcher	Haematopus palliatus	Migratory			WL, PIF- IA, SP	S3	P	G5
	American woodcock	Scolopax minor	Migratory			WL, PIF-IA, SP	S5	G	G5
	Atlantic brant	Branta bernicla	Migratory			WL, PIF-IA	SNRN	G	G5
	Bald eagle	Haliaeetus leucocephalus	Resident	T			S2S3B,S2N	T	G4
	Barn owl	Tyto alba	Resident				S1S2	P	
	Bay-breasted warbler	Dendroica castanea	Resident			WL, PIF-IA	S2	P	G5
	Bicknell's thrush	Catharus bicknelli	Migratory		X	WL, PIF-IA	S2S3B	P SC	G4
	Black rail	Laterallus jamaicensis	Resident			WL, PIF-IA	S1B	E	G4
	Black scoter	Melanitta nigra	Migratory					G	
	Black skimmer	Rynchops niger	Migratory			PIF-IA	S2	P SC	G5
	Black tern	Chlidonias niger	Migratory		X		S2B	E	G4
	Black-bellied plover	Pluvialis squatarola	Migratory					P	
	Black-billed cuckoo	Coccyzus erythropthalmus	Migratory					P	
	Black-crowned night-heron	Nycticorax nycticorax	Migratory			DEC	S3	P	G5
	Black-throated blue warbler	Dendroica caerulescens	Migratory					P	
	Blue-winged teal	Anas discors	Migratory					P	
	Blue-winged warbler	Vermivora pinus	Migratory			WL, PIF-IA	S5	P	G5
	Bobolink	Dolichonyx oryzivorus	Migratory			DEC, PIF-IIA	S5	P	G5
	Bonaparte's gull	Larus philadelphia	Migratory						
	Brown thrasher	Toxostoma rufum	Migratory					P	
	Buff-breasted sandpiper	Tryngites subruficollis	Migratory			WL, SP	SNRN	P	G4
	Canada warbler	Wilsonia canadensis	Migratory		X			P	
	Cape May warbler	Dendroica tigrina	Migratory				S2	P	
	Caspian tern	Sterna caspia	Migratory				S1	P	G5

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Bird									
	Cattle egret	Bubulcus ibis	Migratory				S2	P	
	Cerulean warbler	Dendroica cerulea	Migratory		X	WL, PIF-IA	S4B	P SC	G4
	Common eider	Somateria mollissima	Migratory					G	
	Common goldeneye	Bucephala clangula	Migratory				S2	G	G5
	Common loon	Gavia immer	Migratory			PIF-IIA	S3	P SC	G5
	Common nighthawk	Chordeiles minor	Migratory				S4	P SC	G5
	Common tern	Sterna hirundo	Migratory		X	PIF-IIA	S3B	T	G5
	Cooper's hawk	Accipiter cooperii	Migratory				S4	P SC	G5
	Cory's shearwater	Calonectris diomedea	Migratory						
	Dickcissel	Spiza americana	Migratory						
	Dunlin	Calidris alpina	Migratory					P	
	Eastern meadowlark	Sturnella magna	Migratory					P	
	Forster's tern	Sterna forsteri	Migratory				S1	P	G5
	Glossy ibis	Plegadis falcinellus	Migratory			PIF-IIB	S2	P	G5
	Golden eagle	Aquila chrysaetos	Migratory		X		SHB,S1N	E	G5
	Golden-winged warbler	Vermivora chrysoptera	Migratory		X	WL, PIF-IA	S4	P SC	G4
	Grasshopper sparrow	Ammodramus savannarum	Migratory			PIF-IIC	S4	P SC	G5
	Great egret	Ardea alba	Migratory				S2	P	G5
	Greater scaup	Aythya marila	Migratory			PIF-IA	SNRN	G	G5
	Greater shearwater	Puffinus gravis	Migratory						
	Greater yellowlegs	Tringa melanoleuca	Migratory					P	
	Gull-billed tern	Sterna nilotica	Migratory				S1	P	G5
	Harlequin duck	Histrionicus histrionicus	Migratory		X			P	
	Henslow's sparrow	Ammodramus henslowii	Migratory		X	W, PIF-IA	S3B,SAN	T	G4
	Horned grebe	Podiceps auritus	Migratory					P	
	Horned lark	Eremophila alpestris	Migratory				S5	P SC	G5
	Hudsonian godwit	Limosa haemastica	Migratory			WL, SP	SNRN	P	G4
	Kentucky warbler	Oporornis formosus	Migratory				S2		
	King rail	Rallus elegans	Migratory			PIF-IB	S1B,SZN	T	G4G5
	Laughing gull	Larus atricilla	Migratory				S1	P	G5
	Least bittern	Ixobrychus exilis	Migratory				S3B,S1N	T	G5

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Bird									
	Least tern	Sterna antillarum	Migratory		X	IA(30)	S3B	T	G4
	Lesser scaup	Aythya affinis	Migratory						
	Little blue heron	Egretta caerulea	Migratory			PIF-IB	S2	P	G5
	Little gull	Larus minutus	Migratory						
	Loggerhead shrike	Lanius ludovicianus	Migratory		X	PIF-IIC	S1B,SZN	E	G4
	Long-eared owl	Asio otus	Unknown		X		S3	P	G5
	Long-tailed duck	Clangula hyemalis	Migratory					G	
	Louisiana waterthrush	Seiurus motacilla	Migratory		X			P	
	Marbled godwit	Limosa fedoa	Migratory			WL, PIF-IIC, SP	SNRN	P	G5
	Northern bobwhite	Colinus virginianus	Resident					G	
	Northern goshawk	Accipiter gentilis	Resident				S4B,S3N	P SC	G5
	Northern harrier	Circus cyaneus	Resident		X	PIF-IIC	S3B,S3N	T	G5
	Northern pintail	Anas acuta	Migratory					U	
	Olive-sided flycatcher	Contopus borealis	Migratory			WL, PIF-IB		P	
	Osprey	Pandion haliaetus	Migratory				S4B	P SC	G5
	Peregrine falcon	Falco peregrinus	Resident				S3B	E	G4
	Pied-billed grebe	Podilymbus podiceps	Migratory		X		S3B,S1N	T	G5
	Piping plover	Charadrius melodus	Migratory	T		WL, PIF-IA, SP	S3B	E	G3
	Prairie warbler	Dendroica discolor	Migratory						
	Prothonotary warbler	Protonotaria citrea	Migratory				S2		
	Purple sandpiper	Calidris maritima	Migratory			WL, PIF-IA	SNRN	P	G5
	Razorbill	Alca torda	Migratory						
	Red knot	Calidris canutus	Migratory		X	WL, PIF- IB, SP	SNRN	P	G5
	Red-headed woodpecker	Melanerpes erythrocephalus	Migratory			WL, PIF-IB	S4	P SC	G5
	Red-necked phalarope	Phalaropus lobatus	Migratory					P	
	Red-shouldered hawk	Buteo lineatus	Migratory				S4B	P SC	G5
	Red-throated loon	Gavia stellata	Migratory					P	
	Roseate tern	Sterna dougallii	Migratory	E		PIF-IB	S1B	E	G4
	Ruddy duck	Oxyura jamaicensis	Migratory				S1	P	
	Ruddy turnstone	Arenaria interpres	Migratory					P	
	Ruffed grouse	Bonasa umbellus	Resident					G	

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Bird									
	Rusty blackbird	Euphagus carolinus	Resident			WL, PIF-IB	S3	P	G5
	Saltmarsh sharp-tailed sparrow	Ammodramus caudacutus	Migratory		X	WL, PIF-IA	S3	P	G4
	Sanderling	Calidris alba	Migratory					P	
	Scarlet tanager	Piranga olivacea	Migratory					P	
	Seaside sparrow	Ammodramus maritimus	Migratory			WL, PIF-IA	S2S3	P SC	G4
	Sedge wren	Cistothorus platensis	Migratory		X			T	GS3B,SAN5
	Semipalmated sandpiper	Calidris pusilla	Migratory					P	
	Sharp-shinned hawk	Accipiter striatus	Migratory				S4	P SC	G5
	Short-billed dowitcher	Limnodromus griseus	Migratory			WL	SNRN	P	G5
	Short-eared owl	Asio flammeus	Resident		X	WL, PIF- IB	S2	E	G5
	Snowy egret	Egretta thula	Migratory				S2S3	P	G5
	Spruce grouse	Falcipennis canadensis	Resident				S2	E	G5
	Surf scoter	Melanitta perspicillata	Migratory					G	
	Tennessee warbler	Vermivora peregrina	Migratory				S2	P	
	Thayer's gull	Larus thayeri	Migratory						
	Three-toed woodpecker	Picoides tridactylus	Resident				S2	P	G5
	Tricolored heron	Egretta tricolor	Migratory				S2	P	G5
	Upland sandpiper	Bartramia longicauda	Migratory		X	PIF-IA, SP	S3B	T	G5
	Vesper sparrow	Pooecetes gramineus	Migratory				S5	P SC	G5
	Whimbrel	Numenius phaeopus	Migratory			WL, SP	SNRN	P	G5
	Whip-poor-will	Caprimulgus vociferus	Migratory		X	PIF-IIA	S4	P SC	G5
	White-winged scoter	Melanitta fusca	Migratory					G	
	Willet	Catoptrophorus semipalmatus	Migratory				S1	P	G5
	Willow flycatcher	Empidonax traillii	Migratory			WL, PIF-IA	S5	P	G5
	Wood thrush	Hylocichla mustelina	Migratory			WL, PIF-IA	S5	P	G5
	Worm-eating warbler	Helmitheros vermivorum	Migratory					P	
	Yellow rail	Coturnicops noveboracensis	Migratory						
	Yellow-breasted chat	Icteria virens	Migratory					SC	
	Yellow-crowned night-heron	Nyctanassa violacea	Migratory				S2	P	G5

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Crustacea/Meristomata									
	American lobster	Homarus americanus	Resident			DEC		P	
	Blue crab	Callinectes sapidus	Migratory			DEC		P	
	Devil crawfish	Cambarus diogenes	Resident				S2	U	G5
	fiddler crab	Uca pugnax	Resident					U	
	Horseshoe crab	Limulus polyphemus	Unknown			X		P	
	Marine zooplankton	Various species of invertebrates	Resident			X	N/A		N/A
	Piedmont groundwater amphipod	Stygobromus tenuis tenuis	Resident				SNR	U	G4G5T2T3Q

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Freshwater fish									
	Atlantic salmon	Salmo salar	Migratory			DEC		P	
	Banded sunfish	Enneacanthus obesus	Resident		X		S1S2	T	G5
	Bigeye chub	Hybopsis amblops	Resident				S2	U	G5
	Black redhorse	Moxostoma duquesnei	Resident				S2	U SC	G5
	Blackchin shiner	Notropis heterodon	Resident				S1	U	G5
	Bloater	Coregonus hoyi	Resident				SX	U	G4
	Bluebreast darter	Etheostoma camurum	Resident		X		S1	E	G4
	Brook trout, Heritage strains	Salvelinus fontinalis	Resident			DEC	S5	P	G5
	Comely shiner	Notropis amoenus	Resident			DEC	S3	U	G5
	Deepwater sculpin	Myoxocephalus thompsoni	Resident		X		S1	E	G5
	Eastern sand darter	Ammocrypta pellucidum	Resident		X		S2	T	G3
	Gilt darter	Percina evides	Resident		X		SH	E	G4
	Gravel chub	Erimystax x-punctatus	Resident		X		S1	T	G4
	Iowa darter	Etheostoma exile	Resident		X		S2	U	G5
	Ironcolor shiner	Notropis chalybaeus	Resident				S1	U SC	G4
	Kiyi	Coregonus kiyi	Migratory			DEC	SX	U	G3
	Lake chubsucker	Erimyzon sucetta	Resident		X		SH	T	G5
	Lake sturgeon	Acipenser fulvescens	Migratory		X		S1S2	T	G3G4
	Longear sunfish	Lepomis megalotis	Resident				S1	T	G5
	Longhead darter	Percina macrocephala	Resident		X		S1	T	G3
	Mooneye	Hiodon tergisus	Resident		X		S1	T	G5
	Mountain brook lamprey	Ichthyomyzon greeleyi	Resident		X		S1	U SC	G3G4
	Mud sunfish	Acantharchus pomotis	Resident		X		SH	T	G5
	N. American ninespine stickleback	Pungitius pungitius occidentalis	Resident					U	
	Ohio lamprey	Ichthyomyzon bdellium	Resident		X		S1	U	G3G4
	Paddlefish	Polyodon spathula	Migratory				SX	EP	G4
	Pugnose shiner	Notropis anogenus	Resident				S1	E	G3
	Redfin shiner	Lythrurus umbratilis	Resident				S2	U SC	G5
	River redhorse	Moxostoma carinatum	Resident		X		S2?	U	G4
	Round whitefish	Prosopium cylindraceum	Resident		X		S1S2	E	G5
	Sauger	Stizostedion canadense	Resident				S1	U	G5

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Freshwater fish									
	Shortjaw cisco	Coregonus zenithicus	Resident				SX	U	G3
	Shortnose cisco	Coregonus reighardi	Resident				SX	U	G1
	Silver chub	Macrhybopsis storeriana	Resident		X		SH	E	G5
	Spoonhead sculpin	Cottus ricei	Resident		X		SH	E	G5
	Spotted darter	Etheostoma maculatum	Resident		X		S1	T	G2
	Streamline chub	Erimystax dissimilis	Resident				S1	U SC	G4
	Swallowtail shiner	Notropis procne	Resident				S2	U	G5
	Swamp darter	Etheostoma fusiforme	Resident				S1S2	T	G5
	Western pirate perch	Aphredoderus sayanus gibbosus	Resident			DEC	N/A		N/A

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Herpetofauna									
	Black ratsnake	Elaphe obsoleta	Resident			DEC	S5	U	G5
	Blanding's turtle	Emydoidea blandingii	Resident		X		S2S3	T	G4
	Blue-spotted salamander	Ambystoma laterale	Resident		X		S3	U SC	G5
	Bog turtle	Clemmys muhlenbergii	Resident	T			S2	E	G3
	Coal skink	Eumeces anthracinus	Resident		X		S2S3	U	G5
	Common five-lined skink	Eumeces fasciatus	Resident			DEC	S3	U	G5
	Common mudpuppy	Necturus maculosus	Resident			DEC	S4	U	G5
	Eastern box turtle	Terrapene carolina	Resident		X		S3	G SC	G5
	Eastern hognose snake	Heterodon platirhinos	Resident		X		S3S4	U SC	G5
	Eastern massasauga	Sistrurus c. catenatus	Resident	C	X		S1	E	G3G4T3T4
	Eastern mud turtle	Kinosternon subrubrum	Resident				S1	E	G5
	Eastern ribbonsnake	Thamnophis sauritus sauritus	Resident		X		S5	U	G5
	Eastern spadefoot	Scaphiopus holbrookii	Resident		X		S3	G	G5
	Fence lizard	Sceloporus undulatus	Resident				S1	T	G5
	Four-toed salamander	Hemidactylium scutatum	Resident			DEC	S5	U	G5
	Fowler’s toad	Bufo fowleri	Resident			DEC	S4	G	G5
	Green turtle	Chelonia mydas	Migratory	T			S1N	T	G3
	Hawksbill	Eretmochelys imbricata	Migratory	E			SNA	E	G3
	Hellbender	Cryptobranchus alleganiensis	Resident		X		S2	U SC	G3G4
	Jefferson salamander	Ambystoma jeffersonianum	Resident		X		S3	U SC	G4
	Kemp's or Atlantic ridley	Lepidochelys kempii	Migratory	E			S1N	E	G1
	Leatherback	Dermochelys coriacea	Migratory	E			SNA	E	G2
	Loggerhead	Caretta caretta	Migratory	T			S1N	T	G3
	Longtail salamander	Eurycea longicauda	Resident		X		S2S3	U SC	G5
	Marbled salamander	Ambystoma opacum	Resident				S3	U SC	G5
	Northern black racer	Coluber constrictor	Resident			DEC	S5	U	G5
	Northern copperhead	Agkistrodon contortrix mokasen	Resident			DEC	S3	U	G5
	Northern cricket frog	Acris crepitans	Resident				S1	E	G5
	Northern diamondback terrapin	Malaclemys terrapin terrapin	Resident		X			P G	
	Northern map turtle	Graptemys geographica	Resident			DEC	S4	U	G5
	Northern red salamander	Pseudotriton ruber	Resident			DEC	S4	U	G5

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Herpetofauna									
	Queen snake	Regina septemvittata	Resident		X		S1	E	G5
	Short-headed gartersnake	Thamnophis brachystoma	Resident			DEC	S3	U	G4
	Smooth greensnake	Opheodrys vernalis	Resident			DEC	S5	U	G5
	Snapping turtle	Chelydra serpentina	Resident			DEC		U	
	Southern leopard frog	Rana sphenocephala	Resident				S2S3	G SC	G5
	Spiny softshell	Trionyx spiniferus	Resident				S2S3	U SC	G5
	Spotted turtle	Clemmys guttata	Resident		X		S3	U SC	G5
	Stinkpot	Sternotherus odoratus	Resident			DEC			
	Tiger salamander	Ambystoma tigrinum	Resident		X		S2S3	E	G5
	Timber rattlesnake	Crotalus horridus	Resident		X		S3	T	G4
	Western chorus frog	Pseudacris triseriata	Resident			DEC	S4	G	G5
	Wood turtle	Clemmys insculpta	Resident		X		S3	G SC	G4
	Worm snake	Carphophis amoenus	Resident				S3S4	U SC	G5

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Insect									
	A borer moth	Papaipema aerata	Unknown				SH		
	A borer moth	Papaipema marginidens	Unknown				SH		
	A geometrid moth	Euchlaena madusaria	Unknown				SH		
	A geometrid moth	Semiothisa denticulata	Unknown				S1		
	A geometrid moth	Semiothisa banksianae	Unknown				S1		
	A geometrid moth	Nemoria bifilata	Unknown				SH		G4
	A hand-maid moth	Datana ranaeceps	Unknown				S1S3		
	A looper moth	Lambdina canitiaria	Unknown				SH		
	A mayfly	Procloeon mendax	Resident				SNR	U	G2
	A mayfly	Epeorus frisoni	Resident				SNR	U	G1Q
	A mayfly	Dannella provonshai	Resident				SNR	U	G2
	A mayfly	Rhithrogena uhari	Resident				SNR	U	G3
	A mayfly	Epeorus suffusus	Resident				SNR	U	G1Q
	A mayfly	Epeorus punctatus	Resident				SNR	U	G3
	A mayfly	Ameletus tarteri	Resident				SNR	U	G1
	A mayfly	Procloeon vicinum	Resident				S?	U	G2
	A mayfly	Siphlonurus barbarus	Resident				SNR	U	G1
	A mayfly	Procloeon simile	Resident				SNR	U	G2
	A mayfly	Rhithrogena anomala	Resident				SNR	U	G2
	A mayfly	Brachycercus maculatus	Resident				SNR	U	G3Q
	A mayfly	Procloeon vicinum	Resident				SNR	U	G2
	A mayfly	Plauditus gloveri	Resident				SNR	U	G2
	A mayfly	Siphlonurus barbaroides	Resident				SNR	U	G3
	A mayfly	Procloeon ozburni	Resident				SNR	U	G2
	A mayfly	Heptagenia julia	Resident				SNR	U	G4
	A mayfly	Baetis rusticans	Resident				SNR	U	G2
	A mayfly	Eurylophella bicoloroides	Resident				SNR	U	G3
	A mayfly	Nixe rusticalis	Resident				SNR	U	G2
	A mayfly	Leucrocuta thetis	Resident				SNR	U	G3
	A mayfly	Heptagenia culacantha	Resident				SNR	U	G3
	A mayfly	Ameletus tertius	Resident				SNR	U	G3

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Insect									
	A moth	Lepipolys perscripta	Resident				SH	U	G4
	A noctuid moth	Euxoa pleuritica	Resident				S2S3	U	G4
	A noctuid moth	Hydraecia stramentosa	Resident				S1S3	U	G4
	A noctuid moth	Schinia bifascia	Resident				SH	U	G4
	A noctuid moth	Chytonix ruperti	Unknown				S1		
	A noctuid moth	Chytonix sensilis	Unknown				S1S3		
	A noctuid moth	Chaetaglaea cerata	Unknown				S1S2		
	A noctuid moth	Lithophane lepida lepida	Unknown				S1	E	T3
	A noctuid moth	Eucoptocnemis fimbriaris	Resident				S1	U	G4
	A noctuid moth	Euxoa lidia thanatologia	Unknown				SH	U	G5T5
	A noctuid moth	Richia acclivis	Resident				S2S3	U	G4G5
	A noctuid moth	Anomogyna rhaetica	Resident						
	A noctuid moth	Fagitana littera	Unknown				S2S3		
	A noctuid moth	Paectes abrostolella	Unknown				S1		G4
	A noctuid moth	Phoberia orthosioides	Unknown				S2S3		
	A noctuid moth	Agrotis obliqua	Resident				S1	U	GNR
	A noctuid moth	Orthodes obscura	Resident				S1?	U	G4
	A noctuid moth	Zale largera	Unknown				S1		G4
	A noctuid moth	Synedoida adumbrata	Unknown				S1S2		
	A noctuid moth	Amphipoea erepta ryensis	Unknown				S1		
	A noctuid moth	Fishia enthea	Unknown				SH		
	A noctuid moth	Apamea inordinata	Unknown				SH		
	A noctuid moth	Apamea mixta	Unknown				SH		
	A noctuid moth	Psaphida thaxteriana	Unknown				SH		
	A noctuid moth	Abagrotis barnesi	Resident				S1	U	G5
	A notodontid moth	Heterocampa varia	Unknown				S1S2		G3
	A slug moth	Monoleuca semifascia	Unknown				S1		G4
	A stonefly	Alloperla voinae	Unknown				SNR	U	G3
	A stonefly	Pteronarcys comstocki	Resident				SNR	U	G3
	A stonefly	Utaperla gaspesiana	Unknown				SNR	U	G3
	A stonefly	Alloperla vostocki	Resident				SNR	U	G3

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Insect									
	A stonefly	Allocapnia illinoensis	Unknown				SNR	U	G3
	A tiger beetle	Cicindela patruela	Resident				SH	U	G3T2T3
	A tiger beetle	Cicindela unipunctata	Resident				SH	U	G4
	A tiger beetle	Cicindela abdominalis	Resident				SH	U	G5
	A tiger beetle	Cicindela ancocisconensis	Resident				S1	U	G3
	A tussock moth	Orgyia detrita	Unknown				SH		G3
	Acadian swordgrass moth	Xylena thoracica	Unknown				S1S2		
	American burying beetle	Nicrophorus americanus	Resident	E			SH	E	G2G3
	American rubyspot	Hetaerina americana	Resident				S2S3	U	G5
	An underwing moth	Catocala sp 3	Unknown				SH		
	Appalachian jewelwing	Calopteryx angustipennis	Unknown				SH	U	G4
	Arogos skipper	Atrytone arogos arogos	Resident				SH	E	G3G4T1T2
	Arrow clubtail	Stylurus spiniceps	Resident				S3	U	G5
	Arrowhead spiketail	Cordulegaster obliqua	Resident				S2S3	U	G4
	Aweme borer moth	Papaipema aweme	Resident				SH		
	Barrens buck moth	Hemileuca maia maia	Resident						
	Barrens dagger moth	Acronicta albarufa	Resident				SH		
	Barrens itame	Itame sp 1	Resident				S1		
	Barrens metarranthis moth	Metarranthis apiciaria	Resident				SH		
	Bay underwing	Catocala badia	Resident				S2S4		
	Bird dropping moth	Cerma cora	Unknown				S1S3		
	Black fungus moth	Metalectra tantillus	Unknown				SH		
	Black meadowhawk	Sympetrum danae	Resident				S2S3	U	G5
	Black-bordered lemon moth	Thioptera nigrofimbria	Unknown				SH		G5
	Blueberry gray	Glena cognataria	Unknown				S1S3		
	Blue-tipped dancer	Argia tibialis	Resident				S1	U	G5
	Bog buckmoth	Hemileuca sp.	Resident						
	Bog elfin	Callophrys lanoraieensis	Resident				S1	U	G3G4
	Boreal snaketail	Ophiogomphus colubrinus	Resident				S1	U	G5
	Brazilian skipper	Calpodes ethlius	Migratory				SH	U	G5
	Broad-lined catopyrrha	Erastria coloraria	Unknown				S2S3		

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Insect									
	Brook snaketail	Ophiogomphus aspersus	Resident				S2	U	G3G4
	Brown-bordered geometer	Eumacaria latiferrugata	Unknown				S2S4		
	Buchholz's gray	Hypomecis buchholzaria	Unknown				SH		
	Chain fern borer moth	Papaipema stenocelis	Unknown				S1?		
	Checkered white	Pontia protodice	Resident				SNA	U SC	G4
	Chestnut clearwing moth	Synanthedon castaneae	Unknown				SH		G4
	Coastal barrens buckmoth	Hemileuca maia ssp 5	Unknown				S2	SC	T2
	Coastal heathland cutworm	Abagrotis nefascia benjamini	Resident				S1S3	U	G4T3
	Cobblestone tiger beetle	Cicindela marginipennis	Resident				S1	U	G2G3
	Cobra clubtail	Gomphus vastus	Resident				SH	U	G5
	Comet darner	Anax longipes	Resident				S2	U	G5
	Common sanddragon	Progomphus obscurus	Resident				S1	U SC	G5
	Culvers root borer	Papaipema sciata	Unknown				SH		
	Dark stoneroot borer moth	Papaipema duplicata	Resident				S?		
	Dimorphic gray	Tornos scolopacinarius	Unknown				SH		G4
	Doll's merolonche	Merolonche dolli	Unknown				SH		G3
	Dot-lined white	Artace cribraria	Unknown				SH		
	Ebony boghaunter	Williamsonia fletcheri	Resident				S1	U	G3G4
	Elusive clubtail	Stylurus notatus	Resident				SH	U	G3
	Extra-striped snaketail	Ophiogomphus anomalus	Resident				S1	U SC	G3
	Forcipate emerald	Somatochlora forcipata	Resident				S1	U	G5
	Frosted elfin	Callophrys irus	Resident				S1S3	T	G3
	Golden aster flower moth	Schinia tuberculum	Resident				S2	U	G4
	Golden borer moth	Papaipema cerina	Unknown				SH		G4
	Gordian sphinx	Sphinx gordius	Unknown				S1S3		G4
	Gorgone checkerspot	Chlosyne gorgone	Resident				S1	U	G5
	Gray petaltail	Tachopteryx thoreyi	Resident				S2	U SC	G4
	Gray woodgrain	Morrisonia mucens	Unknown				S1S3	U	G4G5
	Green-faced clubtail	Gomphus viridifrons	Resident				S1	U	G3
	Hairy artesta	Trichoclea artesta	Resident				S1S3	U	G5
	Henry's elfin	Callophrys henrici	Resident				S2S3	U SC	G5

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Insect									
	Heracleum stem borer moth	Papaipema harrisii	Unknown				SH		G4
	Herodias underwing	Catocala herodias gerhardi	Unknown						
	Hessel's hairstreak	Callophrys hesseli	Resident				S1	E	G3G4
	Imperial moth	Eacles imperialis pini	Unknown				S?		
	Incurvate emerald	Somatochlora incurvata	Resident				S1	U	G4
	Jair underwing	Catocala jair	Unknown						
	Jersey jair underwing	Catocala jair ssp 2	Unknown				S1S2		
	Jutta arctic	Oeneis jutta	Resident				S1	U	G5
	Karner blue	Lycaeides melissa samuelis	Resident	E			S1	E	G5T2
	Lake emerald	Somatochlora cingulata	Resident				S1	U	G5
	Lemmer's noctuid moth	Lithophane lemmeri	Unknown				SR		G3
	Little bluet	Enallagma minusculum	Resident				S1	T	G3G4
	Mantled baskettail	Tetragoneuria semiaquea	Resident				SH	U	G4
	Maritime sunflower borer moth	Papaipema maritima	Unknown				SH		
	Maroonwing	Sideridis maryx	Resident				S2S3	U	G4
	Melsheimer's sack bearer	Cicinnus melsheimeri	Unknown				SH		
	Midland clubtail	Gomphus fraternus	Resident				S1S3	U	G5
	Mocha emerald	Somatochlora linearis	Resident				S2S3	U	G5
	Mottled duskywing	Erynnis martialis	Resident				S1S2	U SC	G3G4
	Needham's skimmer	Libellula needhami	Resident				S2S3	U	G5
	New England bluet	Enallagma laterale	Resident				S2	U	G3
	Northeastern beach tiger beetle	Cicindela dorsalis dorsalis	Resident	T			SX	T	G4T2
	Northern metalmark	Calephelis borealis	Resident				SH	U	G3G4
	Northern oak hairstreak	Fixsenia favonius ontario	Resident				S1S3	U	G4T4
	Ocellated emerald	Somatochlora minor	Resident				S2S3	U	G5
	Olympia marble	Euchloe olympia	Resident				S1	U SC	G4G5
	Ostrich fern borer moth	Papaipema sp 2	Unknown				S1?		
	Pale green pinion moth	Lithophane viridipallens	Unknown				SH		
	Persius duskywing	Erynnis persius persius	Resident				SH	E	G5T2T3
	Phyllira tiger moth	Grammia phyllira	Unknown				SH		
	Pine barrens bluet	Enallagma recurvatum	Resident				S1S2	T	G3

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Insect									
	Pine barrens zanclognatha	Zanclognatha martha	Unknown				S1S2		G4
	Pine devil	Citheronia sepulcralis	Unknown				S1		
	Pink sallow	Psectraglaea carnosa	Resident				S2		
	Precious underwing	Catocala pretiosa pretiosa	Unknown				SH		
	Puritan tiger beetle	Cicindela puritana	Resident	T			SNA	U	G1G2
	Pygmy snaketail	Ophiogomphus howei	Resident				S1	U SC	G3
	Quiet or sweet underwing	Catocala dulciola	Resident				SH		
	Rambur's forktail	Ischnura ramburii	Resident				S2	U	G5
	Rapids clubtail	Gomphus quadricolor	Resident				S1S2	U	G3G4
	Regal fritillary	Speyeria idalia	Resident				SH	E	G3
	Regal moth	Citheronia regalis	Unknown				S1		G4
	Ringed boghaunter	Williamsonia lintneri	Resident				SH	U	G3
	Ringed emerald	Somatochlora albicincta	Resident				SH	U	G5
	Riverine clubtail	Stylurus amnicola	Resident				SH	U	G4
	Russet-tipped clubtail	Stylurus plagiatus	Resident				S1	U	G5
	Sable clubtail	Gomphus rogersi	Resident				S1	U	G4
	Scarlet bluet	Enallagma pictum	Resident				S1	T	G3
	Seaside golden borer moth	Papaipema duovata	Unknown				SH		G4
	Seepage dancer	Argia bipunctulata	Resident				SH	U	G4
	Septima's clubtail	Gomphus septima	Resident				S1	U SC	G2
	Silvery blue	Glaucopsyche lygdamus lygdamus	Resident				SH	U	G5T4
	Skillet clubtail	Gomphus ventricosus	Resident				SH	U	G3
	Southern grizzled skipper	Pyrgus wyandot	Resident				SH	E	G2
	Southern sprite	Nehalennia integricollis	Resident				S1	U SC	G5
	Sparkling jewelwing	Calopteryx dimidiata	Resident				SH	U	G5
	Spatterdock darner	Aeshna mutata	Resident				S2	U	G3G4
	Spine-crowned clubtail	Gomphus abbreviatus	Resident				S2S3	U	G3G4
	Stinging rose caterpillar moth	Parasa indetermina	Unknown				SH		
	Subarctic bluet	Coenagrion interrogatum	Resident				S1S3	U	G5
	Subarctic darner	Aeshna subarctica	Resident				S1?	U	G5
	Sylvan hygrotus diving beetle	Hygrotus sylvanus	Resident				SH	U	G1

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Insect									
	Taper-tailed darner	Gomphaeschna antilope	Resident				S1	U	G4
	Tawny crescent	Phyciodes batesii batesii	Resident				SH	U SC	G4T1
	The consort underwing	Catocala consors sorsconi	Resident				SH		
	The little beggar	Eubaphe meridiana	Unknown				SH		
	Tiger spiketail	Cordulegaster erronea	Resident				S1	U	G4
	Tomah mayfly	Siphlonisca aerodromia	Resident				S1	E	G2
	Toothed apharetra	Apharetra dentata	Unknown				S2S3		
	Trichoclea artesta	Hairy artesta	Unknown				S1S3		G5
	Variable sallow	Sericaglaea signata	Unknown				SH		
	Woolly gray	Lycia ypsilon	Unknown				SH		G4
	Yellow stoneroot borer	Papaipema astuta	Resident				SH		G3
	Yellow-sided skimmer	Libellula flavida	Resident				S1	U	G5

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Mammal									
	Allegheny woodrat	Neotoma magister	Resident		X		S1	E	G3G4
	American marten	Martes americana	Resident				S3	G	G5
	Blue whale	Balaenoptera musculus	Migratory	E			SNA	E	G3G4
	Canada lynx	Lynx canadensis	Resident	T	X		SX	G	G5
	Eastern cougar	Felis concolor cougar	Resident	E			SX	E	G5TH
	Eastern red bat	Lasiurus borealis	Resident		X		S5B	U	G5
	Fin whale	Balaenoptera physalus	Migratory	E			S1	E	G3G4
	Gray wolf	Canis lupus	Resident	E			SX	E	G4
	Harbor porpoise	Phocoena phocoena	Migratory		X		S4	U SC	G4G5
	Hoary bat	Lasiurus cinereus	Resident		X		S4B	U	G5
	Humpback whale	Megaptera novaeangliae	Migratory	E			SNA	E	G3
	Indiana bat	Myotis sodalis	Resident	E			S1	E	G2
	Least shrew	Cryptotis parva	Resident		X		SH	U	G5
	Least weasel	Mustela nivalis	Resident				SH	G	G5
	New England cottontail	Sylvilagus transitionalis	Resident		X		SH	G SC	G4
	Northern right whale	Eubalaena glacialis	Migratory	E			SNA	E	G1
	River otter	Lontra canadensis	Resident				S5	G	G5
	Sei whale	Balaenoptera borealis	Migratory	E			SNA	E	G3
	Silver-haired bat	Lasionycteris noctivagans	Resident		X		S4B	U	G5
	Small-footed bat	Myotis leibii	Resident						
	Sperm whale	Physeter catodon	Migratory	E			SNA	E	G3G4

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Marine fish									
	Alewife	Alosa pseudoharengus	Migratory					U	
	American eel	Anguilla rostrata	Migratory			DEC, ASMFC	S5	U	G5
	American shad	Alosa sapidissima	Migratory			DEC	S4	P	G5
	Atlantic silverside	Menidia menidia	Migratory				S2S3	U	G5
	Atlantic sturgeon	Acipenser oxyrinchus	Migratory	T	X	DEC, NMFS	S1	T	G3
	Atlantic tomcod	Microgadus tomcod	Resident			DEC	S3	U	G5
	Atlantic torpedo	Torpedo nobiliana	Migratory					U	
	Barndoor skate	Dipturus laevis	Migratory					U	
	Basking shark	Cetorhinus maximus	Migratory			NMFS		P	
	Bay anchovy	Anchoa mitchilli	Migratory				S3	U	G5
	Bigeye thresher shark	Alopias superciliosus	Migratory			NMFS		P	
	Blue shark	Prionace glauca	Migratory					P	
	Blueback herring	Alosa aestivalis	Migratory			DEC		P	
	Bonnethead shark	Sphyrna tiburo	Migratory			NMFS		P	
	Clearnose skate	Raja eglanteria	Migratory					U	
	Common pipefish	Syngnathus fuscus	Resident			DEC		U	
	Cownose ray	Rhinoptera bonasus	Migratory					U	
	Cunner	Tautogolabrus adspersus	Migratory			DEC		U	
	Dusky shark	Carcharhinus obscurus	Migratory			NMFS		P	
	Fourspine stickleback	Apeltes quadricus	Migratory			DEC	N/A	U	N/A
	Inland silverside	Menidia beryllina	Resident				S2S3	U	G5
	Lined seahorse	Hippocampus erectus	Resident			DEC		U	
	Little skate	Leucoraja erinacea	Migratory					U	
	Longfin mako shark	Isurus paucus	Migratory			NMFS		P	
	Manta	Manta birostris	Migratory					U	
	Menhaden	Brevoortia tyrannus	Migratory				SNRN	U	G5
	Mummichog	Fundulus heteroclitus	Resident			DEC		U	
	N. American ninespine stickleback	Pungitius pungitius occidentalis	Migratory			DEC		U	
	Northern puffer	Sphoeroides maculatus	Migratory			DEC	SNRN	U	G5
	Oyster toadfish	Opsanus tau	Resident			DEC		U	
	Porbeagle shark	Lamna nasus	Migratory			NMFS		P	

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Marine fish									
	Rainbow smelt	Osmerus mordax	Migratory			DEC	S5	U	G5
	Rosette skate	Leucoraja garmani virginica	Migratory					U	
	Roughtail stingray	Dasyatis centroura	Migratory					U	
	Sand tiger shark	Carcharias taurus	Migratory			NMFS		P	
	Sandbar shark	Carcharhinus plumbeus	Migratory			NMFS		P	
	Scalloped hammerhead shark	Sphyrna lewini	Migratory			NMFS		P	
	Shortfin mako shark	Isurus oxyrhinchus	Migratory			NMFS		P	
	Shortnose sturgeon	Acipenser brevirostrum	Resident	E			S1	E	G3
	Smooth hammerhead shark	Sphyrna zygaena	Migratory			NMFS		P	
	Smooth skate	Malacoraja senta	Migratory					U	
	Spotfin killifish	Fundulus luciae	Resident				S1	U	G4
	Striped killifish	Fundulus majalis	Resident			DEC		U	
	Tautog	Tautoga onitis	Migratory			DEC	SNRN	P	GNR
	Thorny skate	Amblyraja radiata	Migratory					U	
	Threespine stickleback	Gasterosteus aculeatus	Resident			DEC	N/A	U	N/A
	Thresher shark	Alopias vulpinus	Migratory			NMFS		P	
	Tiger shark	Galeocerdo cuvier	Migratory			NMFS		P	
	White shark	Carcharodon carcharias	Migratory			NMFS		P	
	Winter flounder	Pseudopleuronectes americanus	Migratory			DEC	S3?	P	G5
	Winter skate	Leucoraja ocellata	Migratory					U	

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Mollusk									
	Alewife floater	Anodonta implicata	Resident				S1S2	U	G5
	Banded physa	Physella vinosa	Resident				S1	U	GU
	Bay scallop	Argopecten irradians	Resident			DEC		P	
	Black sandshell	Ligumia recta	Resident		X		S2S3	U	G5
	Blue mussel	Mytilus edulis	Resident					U	
	Brook floater	Alasmidonta varicosa	Resident		X		S1	T	G3
	Buffalo pebblesnail	Gillia altilis	Resident				S1	U SC	G5
	Campeloma spire snail	Cincinnatia cincinnatiensis	Resident				S1	U	G4G5
	Canadian duskysnail	Lyogyrus walkeri	Resident				S?	U	G2G3
	Chittenango ovate amber snail	Novisuccinea chittenangoensis	Resident	T			S1	E	G1
	Clubshell	Pleurobema clava	Resident	E			SH	E	G2
	Coldwater pondsnail	Stagnicola woodruffi	Resident				S?	U	G1G3
	Deertoe	Truncilla truncata	Resident				S1	U	G5
	Dwarf wedgemussel	Alasmidonta heterodon	Resident	E			S1	E	G1G2
	Eastern pearlshell	Margaritifera margaritifera	Resident				S2	U	G4
	Eastern pondmussel	Ligumia nasuta	Resident		X		S2S3	U	G4G5
	Elktoe	Alasmidonta marginata	Resident		X		S4	U	G4
	Fat pocketbook	Potamilus capax	Resident	E			SH	E	G1
	Fawnsfoot	Truncilla donaciformis	Resident				SH	U	G5
	File rams-horn	Planorbella pilsbryi	Resident				SH	U	G4G5
	Fringed valvata	Valvata lewisi	Resident				S1	U SC	G3?
	Globe siltsnail	Birgella subglobosus	Resident						
	Gravel pyrg	Pyrgulopsis letsoni	Resident				SH	U	G1
	Green floater	Lasmigona subviridis	Resident		X		S1S2	T	G3
	Hard clam	Mercenaria mercenaria	Resident			X		P	
	Hickorynut	Obovaria olivaria	Resident				SH	U	G4
	Kidneyshell	Ptychobranchus fasciolaris	Resident				S2	U	G4G5
	Lance aplexa	Aplexa elongata	Resident				S2	U	G5
	Lilliput	Toxolasma parvum	Resident				SH	U	G5
	Mapleleaf	Quadrula quadrula	Resident				SH	U	G5
	Mossy valvata	Valvata sincera	Resident				S1	U SC	G5

Federal Listing: E = Endangered; T = Threatened
State Protection Status: E = Endangered; T = Threatened; G = Game species; SC = Special Concern; P = Protected U = Unprotected
Other Ranking: Listed in other regional or federal resource plans such as "Partners in Flight" or by DEC staff as of particular concern
For State and Global Rank explanations see www.natureserve.com

Taxa Group	Common Name	Scientific Name	Migratory Status	Federal Listing	Northeast Concern	Other Ranking	State Rank	State Status	Global Rank
Mollusk									
	Mucket	Actinonaias ligamentina	Resident				S1S2	U	G5
	Northern riffleshell	Epioblasma torulosa rangiana	Resident	E			SNA	U	G2T2
	Oyster	Crassostrea virginica	Resident			X		P	
	Paper pondshell	Utterbackia imbecillis	Resident				SH	U	G5
	Pimpleback	Quadrula pustulosa	Resident				SH	U	G5
	Pink heelsplitter	Potamilus alatus	Resident				S2S3	U	G5
	Pink mucket	Lampsilis abrupta	Resident	E			SH	E	G2
	Pocketbook	Lampsilis ovata	Resident				S2S3	U	G5
	Purplecap valvata	Valvata perdepressa	Resident				SP	U	G3
	Rainbow	Villosa iris	Resident				S2S3	U	G5
	Rayed bean	Villosa fabalis	Resident		X		S1	E	G1G2
	Ribbed mussel	Geukensia demissa	Resident						
	Round hickorynut	Obovaria subrotunda	Resident				SH	U	G4
	Round pigtoe	Pleurobema sintoxia	Resident				S1	U	G4
	Salamander mussel	Simpsonaias ambigua	Resident		X		SH	U	G3
	Sheepnose	Plethobasus cyphus	Resident		X				
	Slippershell mussel	Alasmidonta viridis	Resident				S1S2	U	G4G5
	Snuffbox	Epioblasma triquetra	Resident		X		SH	U	G3
	Spindle lymnaea	Acella haldemani	Resident				S?	U	G3
	Threeridge	Amblema plicata	Resident				S1	U	G5
	Tidewater mucket	Leptodea ochracea	Resident		X		S1	U	G4
	Tubercled blossom	Epioblasma torulosa	Resident	E			SH	U	G2
	Wabash pigtoe	Fusconaia flava	Resident				S2	U	G5
	Watercress snail	Fontigens nickliniana	Resident				S1S3	U	G5
	Wavyrayed lampmussel	Lampsilis fasciola	Resident				S1	T	G4
	White heelsplitter	Lasmigona complanata	Resident				SH	U	G5
	Yellow lamp mussel	Lampsilis cariosa	Resident		X		S3	U	G3G4
	Yellow sandshell	Lampsilis teres	Resident				SH	U	G5

Federal Listing: E = Endangered; T = Threatened
State Protection Status: E = Endangered; T = Threatened; G = Game species; SC = Special Concern; P = Protected U = Unprotected
Other Ranking: Listed in other regional or federal resource plans such as "Partners in Flight" or by DEC staff as of particular concern
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Appendix D2:

Species of Greatest Conservation Need and their assigned species groups, sorted alphabetically by taxonomic group and species common name.

Bird

Species Name:	Scientific Name:	Species Group:
American bittern	*Botaurus lentiginosus*	Freshwater marsh nesting birds
American black duck	*Anas rubripes*	Breeding waterfowl
American golden-plover	*Pluvialis dominica*	Transient shorebirds
American oystercatcher	*Haematopus palliatus*	Beach and Island ground-nesting birds
American woodcock	*Scolopax minor*	Early successional forest/shrubland birds
Atlantic brant	*Branta bernicla*	Wintering waterbirds
Bald eagle	*Haliaeetus leucocephalus*	Bald Eagle
Barn owl	*Tyto alba*	Barn owl
Bay-breasted warbler	*Dendroica castanea*	Boreal forest birds
Bicknell's thrush	*Catharus bicknelli*	High Altitude Conifer Forest Birds
Black rail	*Laterallus jamaicensis*	Salt marsh breeding birds
Black scoter	*Melanitta nigra*	Wintering waterbirds
Black skimmer	*Rynchops niger*	Beach and Island ground-nesting birds
Black tern	*Chlidonias niger*	Freshwater marsh nesting birds
Black-bellied plover	*Pluvialis squatarola*	Transient shorebirds
Black-billed cuckoo	*Coccyzus erythropthalmus*	Early successional forest/shrubland birds
Black-crowned night-heron	*Nycticorax nycticorax*	Colonial-nesting herons
Black-throated blue warbler	*Dendroica caerulescens*	Deciduous/mixed forest breeding birds
Blue-winged teal	*Anas discors*	Breeding waterfowl
Blue-winged warbler	*Vermivora pinus*	Early successional forest/shrubland birds
Bobolink	*Dolichonyx oryzivorus*	Grassland birds
Bonaparte's gull	*Larus philadelphia*	Wintering waterbirds
Brown thrasher	*Toxostoma rufum*	Early successional forest/shrubland birds
Buff-breasted sandpiper	*Tryngites subruficollis*	Transient shorebirds
Canada warbler	*Wilsonia canadensis*	Early successional forest/shrubland birds
Cape May warbler	*Dendroica tigrina*	Boreal forest birds
Caspian tern	*Sterna caspia*	Beach and Island ground-nesting birds
Cattle egret	*Bubulcus ibis*	Colonial-nesting herons
Cerulean warbler	*Dendroica cerulea*	Deciduous/mixed forest breeding birds
Common eider	*Somateria mollissima*	Wintering waterbirds
Common goldeneye	*Bucephala clangula*	Breeding waterfowl

Bird

Species Name:	Scientific Name:	Species Group:
Common loon	*Gavia immer*	Common loon
Common nighthawk	*Chordeiles minor*	Common nighthawk
Common tern	*Sterna hirundo*	Beach and Island ground-nesting birds
Cooper's hawk	*Accipiter cooperii*	Forest breeding raptors
Cory's shearwater	*Calonectris diomedea*	Wintering waterbirds
Dickcissel	*Spiza americana*	Grassland birds
Dunlin	*Calidris alpina*	Transient shorebirds
Eastern meadowlark	*Sturnella magna*	Grassland birds
Forster's tern	*Sterna forsteri*	Salt marsh breeding birds
Glossy ibis	*Plegadis falcinellus*	Colonial-nesting herons
Golden eagle	*Aquila chrysaetos*	Forest breeding raptors
Golden-winged warbler	*Vermivora chrysoptera*	Early successional forest/shrubland birds
Grasshopper sparrow	*Ammodramus savannarum*	Grassland birds
Great egret	*Ardea alba*	Colonial-nesting herons
Greater scaup	*Aythya marila*	Wintering waterbirds
Greater shearwater	*Puffinus gravis*	Wintering waterbirds
Greater yellowlegs	*Tringa melanoleuca*	Transient shorebirds
Gull-billed tern	*Sterna nilotica*	Salt marsh breeding birds
Harlequin duck	*Histrionicus histrionicus*	Wintering waterbirds
Henslow's sparrow	*Ammodramus henslowii*	Grassland birds
Horned grebe	*Podiceps auritus*	Wintering waterbirds
Horned lark	*Eremophila alpestris*	Grassland birds
Hudsonian godwit	*Limosa haemastica*	Transient shorebirds
Kentucky warbler	*Oporornis formosus*	Deciduous/mixed forest breeding birds
King rail	*Rallus elegans*	Freshwater marsh nesting birds
Laughing gull	*Larus atricilla*	Salt marsh breeding birds
Least bittern	*Ixobrychus exilis*	Freshwater marsh nesting birds
Least tern	*Sterna antillarum*	Beach and Island ground-nesting birds
Lesser scaup	*Aythya affinis*	Wintering waterbirds
Little blue heron	*Egretta caerulea*	Colonial-nesting herons
Little gull	*Larus minutus*	Wintering waterbirds
Loggerhead shrike	*Lanius ludovicianus*	Loggerhead Shrike
Long-eared owl	*Asio otus*	Forest breeding raptors
Long-tailed duck	*Clangula hyemalis*	Wintering waterbirds
Louisiana waterthrush	*Seiurus motacilla*	Deciduous/mixed forest breeding birds
Marbled godwit	*Limosa fedoa*	Transient shorebirds
Northern bobwhite	*Colinus virginianus*	Early successional forest/shrubland birds
Northern goshawk	*Accipiter gentilis*	Forest breeding raptors
Northern harrier	*Circus cyaneus*	Grassland birds

Bird

Species Name:	Scientific Name:	Species Group:
Northern pintail	*Anas acuta*	Wintering waterbirds
Olive-sided flycatcher	*Contopus borealis*	Boreal forest birds
Osprey	*Pandion haliaetus*	Osprey
Peregrine falcon	*Falco peregrinus*	Peregrine Falcon
Pied-billed grebe	*Podilymbus podiceps*	Freshwater marsh nesting birds
Piping plover	*Charadrius melodus*	Beach and Island ground-nesting birds
Prairie warbler	*Dendroica discolor*	Early successional forest/shrubland birds
Prothonotary warbler	*Protonotaria citrea*	Deciduous/mixed forest breeding birds
Purple sandpiper	*Calidris maritima*	Transient shorebirds
Razorbill	*Alca torda*	Wintering waterbirds
Red knot	*Calidris canutus*	Transient shorebirds
Red-headed woodpecker	*Melanerpes erythrocephalus*	Deciduous/mixed forest breeding birds
Red-necked phalarope	*Phalaropus lobatus*	Wintering waterbirds
Red-shouldered hawk	*Buteo lineatus*	Forest breeding raptors
Red-throated loon	*Gavia stellata*	Wintering waterbirds
Roseate tern	*Sterna dougallii*	Beach and Island ground-nesting birds
Ruddy duck	*Oxyura jamaicensis*	Breeding waterfowl
Ruddy turnstone	*Arenaria interpres*	Transient shorebirds
Ruffed grouse	*Bonasa umbellus*	Early successional forest/shrubland birds
Rusty blackbird	*Euphagus carolinus*	Boreal forest birds
Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*	Salt marsh breeding birds
Sanderling	*Calidris alba*	Transient shorebirds
Scarlet tanager	*Piranga olivacea*	Deciduous/mixed forest breeding birds
Seaside sparrow	*Ammodramus maritimus*	Salt marsh breeding birds
Sedge wren	*Cistothorus platensis*	Grassland birds
Semipalmated sandpiper	*Calidris pusilla*	Transient shorebirds
Sharp-shinned hawk	*Accipiter striatus*	Forest breeding raptors
Short-billed dowitcher	*Limnodromus griseus*	Transient shorebirds
Short-eared owl	*Asio flammeus*	Grassland birds
Snowy egret	*Egretta thula*	Colonial-nesting herons
Spruce grouse	*Falcipennis canadensis*	Boreal forest birds
Surf scoter	*Melanitta perspicillata*	Wintering waterbirds
Tennessee warbler	*Vermivora peregrina*	Boreal forest birds
Thayer's gull	*Larus thayeri*	Wintering waterbirds
Three-toed woodpecker	*Picoides tridactylus*	Boreal forest birds
Tricolored heron	*Egretta tricolor*	Colonial-nesting herons
Upland sandpiper	*Bartramia longicauda*	Grassland birds

Bird

Species Name:	Scientific Name:	Species Group:
Vesper sparrow	*Pooecetes gramineus*	Grassland birds
Whimbrel	*Numenius phaeopus*	Transient shorebirds
Whip-poor-will	*Caprimulgus vociferus*	Early successional forest/shrubland birds
White-winged scoter	*Melanitta fusca*	Wintering waterbirds
Willet	*Catoptrophorus semipalmatus*	Salt marsh breeding birds
Willow flycatcher	*Empidonax traillii*	Early successional forest/shrubland birds
Wood thrush	*Hylocichla mustelina*	Deciduous/mixed forest breeding birds
Worm-eating warbler	*Helmitheros vermivorum*	Deciduous/mixed forest breeding birds
Yellow rail	*Coturnicops noveboracensis*	Freshwater marsh nesting birds
Yellow-breasted chat	*Icteria virens*	Early successional forest/shrubland birds
Yellow-crowned night-heron	*Nyctanassa violacea*	Colonial-nesting herons

Crustacea/Meristomata

Species Name:	Scientific Name:	Species Group:
American lobster	*Homarus americanus*	American lobster
Blue crab	*Callinectes sapidus*	Blue crab
Devil crawfish	*Cambarus diogenes*	Freshwater crustacea
fiddler crab	*Uca pugnax*	Fiddler crab
Horseshoe crab	*Limulus polyphemus*	Horseshoe crab
Marine zooplankton	*Various species of invertebrates*	Zooplankton
Piedmont groundwater amphipod	*Stygobromus tenuis tenuis*	Freshwater crustacea

Freshwater fish

Species Name:	Scientific Name:	Species Group:
Atlantic salmon	*Salmo salar*	Extirpated Fishes
Banded sunfish	*Enneacanthus obesus*	Banded sunfish
Bigeye chub	*Hybopsis amblops*	Bigeye chub
Black redhorse	*Moxostoma duquesnei*	Black redhorse
Blackchin shiner	*Notropis heterodon*	Blackchin shiner
Bloater	*Coregonus hoyi*	Extirpated Fishes
Bluebreast darter	*Etheostoma camurum*	Bluebreast darter
Brook trout, Heritage strains	*Salvelinus fontinalis*	Brook trout, Heritage strains
Comely shiner	*Notropis amoenus*	Comely shiner
Deepwater sculpin	*Myoxocephalus thompsoni*	Deepwater sculpin
Eastern sand darter	*Ammocrypta pellucidum*	Eastern sand darter
Gilt darter	*Percina evides*	Extirpated Fishes
Gravel chub	*Erimystax x-punctatus*	Gravel chub
Iowa darter	*Etheostoma exile*	Iowa darter
Ironcolor shiner	*Notropis chalybaeus*	Ironcolor shiner
Kiyi	*Coregonus kiyi*	Extirpated Fishes
Lake chubsucker	*Erimyzon sucetta*	Extirpated Fishes
Lake sturgeon	*Acipenser fulvescens*	Lake Sturgeon
Longear sunfish	*Lepomis megalotis*	Longear sunfish
Longhead darter	*Percina macrocephala*	Longhead darter
Mooneye	*Hiodon tergisus*	Mooneye
Mountain brook lamprey	*Ichthyomyzon greeleyi*	Mountain brook lamprey
Mud sunfish	*Acantharchus pomotis*	Extirpated Fishes
N. American ninespine stickleback	*Pungitius pungitius occidentalis*	Ninespine stickleback - inland
Ohio lamprey	*Ichthyomyzon bdellium*	Ohio lamprey
Paddlefish	*Polyodon spathula*	Extirpated Fishes
Pugnose shiner	*Notropis anogenus*	Pugnose shiner
Redfin shiner	*Lythrurus umbratilis*	Redfin shiner
River redhorse	*Moxostoma carinatum*	River redhorse
Round whitefish	*Prosopium cylindraceum*	Round whitefish
Sauger	*Stizostedion canadense*	Sauger
Shortjaw cisco	*Coregonus zenithicus*	Extirpated Fishes
Shortnose cisco	*Coregonus reighardi*	Extirpated Fishes
Silver chub	*Macrhybopsis storeriana*	Extirpated Fishes
Spoonhead sculpin	*Cottus ricei*	Extirpated Fishes
Spotted darter	*Etheostoma maculatum*	Spotted darter
Streamline chub	*Erimystax dissimilis*	Streamline chub
Swallowtail shiner	*Notropis procne*	Swallowtail shiner
Swamp darter	*Etheostoma fusiforme*	Swamp darter
Western pirate perch	*Aphredoderus sayanus gibbosus*	Western pirate perch

Herpetofauna

Species Name:	Scientific Name:	Species Group:
Black ratsnake	*Elaphe obsoleta*	Woodland/grassland snakes
Blanding's turtle	*Emydoidea blandingii*	Uncommon turtles of wetlands
Blue-spotted salamander	*Ambystoma laterale*	Vernal pool salamanders
Bog turtle	*Clemmys muhlenbergii*	Uncommon turtles of wetlands
Coal skink	*Eumeces anthracinus*	Lizards
Common five-lined skink	*Eumeces fasciatus*	Lizards
Common mudpuppy	*Necturus maculosus*	Mudpuppy
Eastern box turtle	*Terrapene carolina*	Box Turtle
Eastern hognose snake	*Heterodon platirhinos*	Woodland/grassland snakes
Eastern massasauga	*Sistrurus c. catenatus*	Massasauga
Eastern mud turtle	*Kinosternon subrubrum*	Uncommon turtles of wetlands
Eastern ribbonsnake	*Thamnophis sauritus sauritus*	Lake/river reptiles
Eastern spadefoot	*Scaphiopus holbrookii*	Eastern Spadefoot Toad
Fence lizard	*Sceloporus undulatus*	Lizards
Four-toed salamander	*Hemidactylium scutatum*	Freshwater wetland amphibians
Fowler's toad	*Bufo fowleri*	Freshwater wetland amphibians
Green turtle	*Chelonia mydas*	Sea turtles
Hawksbill	*Eretmochelys imbricata*	Sea turtles
Hellbender	*Cryptobranchus alleganiensis*	Hellbender
Jefferson salamander	*Ambystoma jeffersonianum*	Vernal pool salamanders
Kemp's or Atlantic ridley	*Lepidochelys kempii*	Sea turtles
Leatherback	*Dermochelys coriacea*	Sea turtles
Loggerhead	*Caretta caretta*	Sea turtles
Longtail salamander	*Eurycea longicauda*	Stream salamanders
Marbled salamander	*Ambystoma opacum*	Vernal pool salamanders
Northern black racer	*Coluber constrictor*	Woodland/grassland snakes
Northern copperhead	*Agkistrodon contortrix mokasen*	Woodland/grassland snakes
Northern cricket frog	*Acris crepitans*	Freshwater wetland amphibians
Northern diamondback terrapin	*Malaclemys terrapin terrapin*	Diamond-backed Terrapin
Northern map turtle	*Graptemys geographica*	Lake/river reptiles
Northern red salamander	*Pseudotriton ruber*	Stream salamanders
Queen snake	*Regina septemvittata*	Lake/river reptiles
Short-headed gartersnake	*Thamnophis brachystoma*	Woodland/grassland snakes
Smooth greensnake	*Opheodrys vernalis*	Woodland/grassland snakes
Snapping turtle	*Chelydra serpentina*	Snapping Turtle
Southern leopard frog	*Rana sphenocephala*	Freshwater wetland amphibians
Spiny softshell	*Trionyx spiniferus*	Lake/river reptiles
Spotted turtle	*Clemmys guttata*	Uncommon turtles of wetlands
Stinkpot	*Sternotherus odoratus*	Uncommon turtles of wetlands
Tiger salamander	*Ambystoma tigrinum*	Vernal pool salamanders
Timber rattlesnake	*Crotalus horridus*	Woodland/grassland snakes
Western chorus frog	*Pseudacris triseriata*	Freshwater wetland amphibians
Wood turtle	*Clemmys insculpta*	Lake/river reptiles

Herpetofauna

Species Name:	Scientific Name:	Species Group:
Worm snake	*Carphophis amoenus*	Woodland/grassland snakes

Insect

Species Name:	Scientific Name:	Species Group:
A borer moth	*Papaipema aerata*	Other moths
A borer moth	*Papaipema marginidens*	Other moths
A geometrid moth	*Euchlaena madusaria*	Other moths
A geometrid moth	*Semiothisa denticulata*	Other moths
A geometrid moth	*Semiothisa banksianae*	Other moths
A geometrid moth	*Nemoria bifilata*	Other moths
A hand-maid moth	*Datana ranaeceps*	Other moths
A looper moth	*Lambdina canitiaria*	Other moths
A mayfly	*Procloeon mendax*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus frisoni*	Stoneflies/Mayflies of lotic waters
A mayfly	*Dannella provonshai*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Rhithrogena uhari*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus suffusus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus punctatus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Ameletus tarteri*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon vicinum*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Siphlonurus barbarus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon simile*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Rhithrogena anomala*	Stoneflies/Mayflies of lotic waters
A mayfly	*Brachycercus maculatus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon vicinum*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Plauditus gloveri*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Siphlonurus barbaroides*	Stoneflies/Mayflies of lentic waters
A mayfly	*Procloeon ozburni*	Stoneflies/Mayflies of lotic waters
A mayfly	*Heptagenia julia*	Stoneflies/Mayflies of lotic waters
A mayfly	*Baetis rusticans*	Stoneflies/Mayflies of lotic waters
A mayfly	*Eurylophella bicoloroides*	Stoneflies/Mayflies of lotic waters
A mayfly	*Nixe rusticalis*	Stoneflies/Mayflies of lotic waters
A mayfly	*Leucrocuta thetis*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Heptagenia culacantha*	Stoneflies/Mayflies of lotic waters
A mayfly	*Ameletus tertius*	Stoneflies/Mayflies of lotic waters
A moth	*Lepipolys perscripta*	Other moths
A noctuid moth	*Euxoa pleuritica*	Other moths
A noctuid moth	*Hydraecia stramentosa*	Other moths
A noctuid moth	*Schinia bifascia*	Other moths
A noctuid moth	*Chytonix ruperti*	Other moths
A noctuid moth	*Chytonix sensilis*	Other moths
A noctuid moth	*Chaetaglaea cerata*	Other moths
A noctuid moth	*Lithophane lepida lepida*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
A noctuid moth	*Eucoptocnemis fimbriaris*	Other moths
A noctuid moth	*Euxoa lidia thanatologia*	Other moths
A noctuid moth	*Richia acclivis*	Other moths
A noctuid moth	*Anomogyna rhaetica*	Other moths
A noctuid moth	*Fagitana littera*	Other moths
A noctuid moth	*Paectes abrostolella*	Other moths
A noctuid moth	*Phoberia orthosioides*	Other moths
A noctuid moth	*Agrotis obliqua*	Other moths
A noctuid moth	*Orthodes obscura*	Other moths
A noctuid moth	*Zale largera*	Other moths
A noctuid moth	*Synedoida adumbrata*	Other moths
A noctuid moth	*Amphipoea erepta ryensis*	Other moths
A noctuid moth	*Fishia enthea*	Other moths
A noctuid moth	*Apamea inordinata*	Other moths
A noctuid moth	*Apamea mixta*	Other moths
A noctuid moth	*Psaphida thaxteriana*	Other moths
A noctuid moth	*Abagrotis barnesi*	Other moths
A notodontid moth	*Heterocampa varia*	Other moths
A slug moth	*Monoleuca semifascia*	Other moths
A stonefly	*Alloperla voinae*	Stoneflies/Mayflies of uncertain habitat
A stonefly	*Pteronarcys comstocki*	Stoneflies/Mayflies of lotic waters
A stonefly	*Utaperla gaspesiana*	Stoneflies/Mayflies of lotic waters
A stonefly	*Alloperla vostocki*	Stoneflies/Mayflies of lotic waters
A stonefly	*Allocapnia illinoensis*	Stoneflies/Mayflies of lotic waters
A tiger beetle	*Cicindela patruela*	Pine barrens tiger beetles
A tiger beetle	*Cicindela unipunctata*	Pine barrens tiger beetles
A tiger beetle	*Cicindela abdominalis*	Pine barrens tiger beetles
A tiger beetle	*Cicindela ancocisconensis*	Riparian tiger beetles
A tussock moth	*Orgyia detrita*	Other moths
Acadian swordgrass moth	*Xylena thoracica*	Other moths
American burying beetle	*Nicrophorus americanus*	American burying beetle
American rubyspot	*Hetaerina americana*	Odonates of rivers/streams
An underwing moth	*Catocala sp 3*	Other moths
Appalachian jewelwing	*Calopteryx angustipennis*	Odonates of rivers/streams
Arogos skipper	*Atrytone arogos arogos*	Other butterflies
Arrow clubtail	*Stylurus spiniceps*	Odonates of rivers/streams
Arrowhead spiketail	*Cordulegaster obliqua*	Odonates of seeps/rivulets
Aweme borer moth	*Papaipema aweme*	Other moths
Barrens buck moth	*Hemileuca maia maia*	Barrens buck moth
Barrens dagger moth	*Acronicta albarufa*	Other moths
Barrens itame	*Itame sp 1*	Other moths
Barrens metarranthis moth	*Metarranthis apiciaria*	Other moths
Bay underwing	*Catocala badia*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Bird dropping moth	*Cerma cora*	Other moths
Black fungus moth	*Metalectra tantillus*	Other moths
Black meadowhawk	*Sympetrum danae*	Odonates of bogs/fens/ponds
Black-bordered lemon moth	*Thioptera nigrofimbria*	Other moths
Blueberry gray	*Glena cognataria*	Other moths
Blue-tipped dancer	*Argia tibialis*	Odonates of rivers/streams
Bog buckmoth	*Hemileuca sp.*	Bog buck moth
Bog elfin	*Callophrys lanoraieensis*	Other butterflies
Boreal snaketail	*Ophiogomphus colubrinus*	Odonates of rivers/streams
Brazilian skipper	*Calpodes ethlius*	Other butterflies
Broad-lined catopyrrha	*Erastria coloraria*	Other moths
Brook snaketail	*Ophiogomphus aspersus*	Odonates of rivers/streams
Brown-bordered geometer	*Eumacaria latiferrugata*	Other moths
Buchholz's gray	*Hypomecis buchholzaria*	Other moths
Chain fern borer moth	*Papaipema stenocelis*	Other moths
Checkered white	*Pontia protodice*	Other butterflies
Chestnut clearwing moth	*Synanthedon castaneae*	Other moths
Coastal barrens buckmoth	*Hemileuca maia ssp 5*	Other moths
Coastal heathland cutworm	*Abagrotis nefascia benjamini*	Other moths
Cobblestone tiger beetle	*Cicindela marginipennis*	Riparian tiger beetles
Cobra clubtail	*Gomphus vastus*	Odonates of rivers/streams
Comet darner	*Anax longipes*	Odonates of lakes/ponds
Common sanddragon	*Progomphus obscurus*	Odonates of rivers/streams
Culvers root borer	*Papaipema sciata*	Other moths
Dark stoneroot borer moth	*Papaipema duplicata*	Other moths
Dimorphic gray	*Tornos scolopacinarius*	Other moths
Doll's merolonche	*Merolonche dolli*	Other moths
Dot-lined white	*Artace cribraria*	Other moths
Ebony boghaunter	*Williamsonia fletcheri*	Odonates of bogs/fens/ponds
Elusive clubtail	*Stylurus notatus*	Odonates of rivers/streams
Extra-striped snaketail	*Ophiogomphus anomalus*	Odonates of rivers/streams
Forcipate emerald	*Somatochlora forcipata*	Odonates of bogs/fens/ponds
Frosted elfin	*Callophrys irus*	Other butterflies
Golden aster flower moth	*Schinia tuberculum*	Other moths
Golden borer moth	*Papaipema cerina*	Other moths
Gordian sphinx	*Sphinx gordius*	Other moths
Gorgone checkerspot	*Chlosyne gorgone*	Other butterflies
Gray petaltail	*Tachopteryx thoreyi*	Odonates of seeps/rivulets
Gray woodgrain	*Morrisonia mucens*	Other moths
Green-faced clubtail	*Gomphus viridifrons*	Odonates of rivers/streams
Hairy artesta	*Trichoclea artesta*	Other moths
Henry's elfin	*Callophrys henrici*	Other butterflies
Heracleum stem borer moth	*Papaipema harrisii*	Other moths
Herodias underwing	*Catocala herodias gerhardi*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Hessel's hairstreak	*Callophrys hesseli*	Other butterflies
Imperial moth	*Eacles imperialis pini*	Other moths
Incurvate emerald	*Somatochlora incurvata*	Odonates of bogs/fens/ponds
Jair underwing	*Catocala jair*	Other moths
Jersey jair underwing	*Catocala jair ssp 2*	Other moths
Jutta arctic	*Oeneis jutta*	Other butterflies
Karner blue	*Lycaeides melissa samuelis*	Karner blue butterfly
Lake emerald	*Somatochlora cingulata*	Odonates of lakes/ponds
Lemmer's noctuid moth	*Lithophane lemmeri*	Other moths
Little bluet	*Enallagma minusculum*	Odonates of coastal plain lakes/ponds
Mantled baskettail	*Tetragoneuria semiaquea*	Odonates of lakes/ponds
Maritime sunflower borer moth	*Papaipema maritima*	Other moths
Maroonwing	*Sideridis maryx*	Other moths
Melsheimer's sack bearer	*Cicinnus melsheimeri*	Other moths
Midland clubtail	*Gomphus fraternus*	Odonates of rivers/streams
Mocha emerald	*Somatochlora linearis*	Odonates of small forest streams
Mottled duskywing	*Erynnis martialis*	Other butterflies
Needham's skimmer	*Libellula needhami*	Odonates of brackish marshes/lakes/ponds
New England bluet	*Enallagma laterale*	Odonates of lakes/ponds
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	Beach tiger beetles
Northern metalmark	*Calephelis borealis*	Other butterflies
Northern oak hairstreak	*Fixsenia favonius ontario*	Other butterflies
Ocellated emerald	*Somatochlora minor*	Odonates of small forest streams
Olympia marble	*Euchloe olympia*	Other butterflies
Ostrich fern borer moth	*Papaipema sp 2*	Other moths
Pale green pinion moth	*Lithophane viridipallens*	Other moths
Persius duskywing	*Erynnis persius persius*	Other butterflies
Phyllira tiger moth	*Grammia phyllira*	Other moths
Pine barrens bluet	*Enallagma recurvatum*	Odonates of coastal plain lakes/ponds
Pine barrens zanclognatha	*Zanclognatha martha*	Other moths
Pine devil	*Citheronia sepulcralis*	Other moths
Pink sallow	*Psectraglaea carnosa*	Other moths
Precious underwing	*Catocala pretiosa pretiosa*	Other moths
Puritan tiger beetle	*Cicindela puritana*	Beach tiger beetles
Pygmy snaketail	*Ophiogomphus howei*	Odonates of rivers/streams
Quiet or sweet underwing	*Catocala dulciola*	Other moths
Rambur's forktail	*Ischnura ramburii*	Odonates of brackish marshes/lakes/ponds
Rapids clubtail	*Gomphus quadricolor*	Odonates of rivers/streams
Regal fritillary	*Speyeria idalia*	Other butterflies
Regal moth	*Citheronia regalis*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Ringed boghaunter	*Williamsonia lintneri*	Odonates of bogs/fens/ponds
Ringed emerald	*Somatochlora albicincta*	Odonates of high elevation lakes
Riverine clubtail	*Stylurus amnicola*	Odonates of rivers/streams
Russet-tipped clubtail	*Stylurus plagiatus*	Odonates of rivers/streams
Sable clubtail	*Gomphus rogersi*	Odonates of small forest streams
Scarlet bluet	*Enallagma pictum*	Odonates of coastal plain lakes/ponds
Seaside golden borer moth	*Papaipema duovata*	Other moths
Seepage dancer	*Argia bipunctulata*	Odonates of seeps/rivulets
Septima's clubtail	*Gomphus septima*	Odonates of rivers/streams
Silvery blue	*Glaucopsyche lygdamus lygdamus*	Other butterflies
Skillet clubtail	*Gomphus ventricosus*	Odonates of rivers/streams
Southern grizzled skipper	*Pyrgus wyandot*	Other butterflies
Southern sprite	*Nehalennia integricollis*	Odonates of bogs/fens/ponds
Sparkling jewelwing	*Calopteryx dimidiata*	Odonates of rivers/streams
Spatterdock darner	*Aeshna mutata*	Odonates of lakes/ponds
Spine-crowned clubtail	*Gomphus abbreviatus*	Odonates of rivers/streams
Stinging rose caterpillar moth	*Parasa indetermina*	Other moths
Subarctic bluet	*Coenagrion interrogatum*	Odonates of bogs/fens/ponds
Subarctic darner	*Aeshna subarctica*	Odonates of bogs/fens/ponds
Sylvan hygrotus diving beetle	*Hygrotus sylvanus*	Sylvan hygrotus diving beetle
Taper-tailed darner	*Gomphaeschna antilope*	Odonates of bogs/fens/ponds
Tawny crescent	*Phyciodes batesii batesii*	Other butterflies
The consort underwing	*Catocala consors sorsconi*	Other moths
The little beggar	*Eubaphe meridiana*	Other moths
Tiger spiketail	*Cordulegaster erronea*	Odonates of seeps/rivulets
Tomah mayfly	*Siphlonisca aerodromia*	Tomah mayfly
Toothed apharetra	*Apharetra dentata*	Other moths
Trichoclea artesta	*Hairy artesta*	Other moths
Variable sallow	*Sericaglaea signata*	Other moths
Woolly gray	*Lycia ypsilon*	Other moths
Yellow stoneroot borer	*Papaipema astuta*	Other moths
Yellow-sided skimmer	*Libellula flavida*	Odonates of bogs/fens/ponds

Mammal

Species Name:	Scientific Name:	Species Group:
Allegheny woodrat	*Neotoma magister*	Allegheny Woodrat
American marten	*Martes americana*	Furbearers
Blue whale	*Balaenoptera musculus*	Marine mammals
Canada lynx	*Lynx canadensis*	Extirpated large mammals
Eastern cougar	*Felis concolor cougar*	Extirpated large mammals
Eastern red bat	*Lasiurus borealis*	Tree bats
Fin whale	*Balaenoptera physalus*	Marine mammals
Gray wolf	*Canis lupus*	Extirpated large mammals
Harbor porpoise	*Phocoena phocoena*	Marine mammals
Hoary bat	*Lasiurus cinereus*	Tree bats
Humpback whale	*Megaptera novaeangliae*	Marine mammals
Indiana bat	*Myotis sodalis*	Indiana Bat
Least shrew	*Cryptotis parva*	Small mammals of uncertain/questionable residency
Least weasel	*Mustela nivalis*	Small mammals of uncertain/questionable residency
New England cottontail	*Sylvilagus transitionalis*	Game species of concern
Northern right whale	*Eubalaena glacialis*	Marine mammals
River otter	*Lontra canadensis*	Furbearers
Sei whale	*Balaenoptera borealis*	Marine mammals
Silver-haired bat	*Lasionycteris noctivagans*	Tree bats
Small-footed bat	*Myotis leibii*	Small-Footed Bat
Sperm whale	*Physeter catodon*	Marine mammals

Marine fish

Species Name:	Scientific Name:	Species Group:
Alewife	*Alosa pseudoharengus*	Alewife - marine district population
American eel	*Anguilla rostrata*	American eel
American shad	*Alosa sapidissima*	American shad
Atlantic silverside	*Menidia menidia*	Estuarine forage species
Atlantic sturgeon	*Acipenser oxyrinchus*	Atlantic sturgeon
Atlantic tomcod	*Microgadus tomcod*	Tomcod
Atlantic torpedo	*Torpedo nobiliana*	Skates and Rays
Barndoor skate	*Dipturus laevis*	Skates and Rays
Basking shark	*Cetorhinus maximus*	Pelagic sharks
Bay anchovy	*Anchoa mitchilli*	Estuarine migratory pelagic
Bigeye thresher shark	*Alopias superciliosus*	Pelagic sharks
Blue shark	*Prionace glauca*	Pelagic sharks
Blueback herring	*Alosa aestivalis*	Blueback herring
Bonnethead shark	*Sphyrna tiburo*	Pelagic sharks
Clearnose skate	*Raja eglanteria*	Skates and Rays
Common pipefish	*Syngnathus fuscus*	Estuarine associates of SAV
Cownose ray	*Rhinoptera bonasus*	Skates and Rays
Cunner	*Tautogolabrus adspersus*	Labrids
Dusky shark	*Carcharhinus obscurus*	Demersal sharks
Fourspine stickleback	*Apeltes quadricus*	Estuarine associates of SAV
Inland silverside	*Menidia beryllina*	Estuarine forage species
Lined seahorse	*Hippocampus erectus*	Estuarine associates of SAV
Little skate	*Leucoraja erinacea*	Skates and Rays
Longfin mako shark	*Isurus paucus*	Pelagic sharks
Manta	*Manta birostris*	Skates and Rays
Menhaden	*Brevoortia tyrannus*	Estuarine migratory pelagic
Mummichog	*Fundulus heteroclitus*	Estuarine forage species
N. American ninespine stickleback	*Pungitius pungitius occidentalis*	Estuarine associates of SAV
Northern puffer	*Sphoeroides maculatus*	Northern puffer
Oyster toadfish	*Opsanus tau*	Oyster toadfish
Porbeagle shark	*Lamna nasus*	Pelagic sharks
Rainbow smelt	*Osmerus mordax*	Rainbow smelt
Rosette skate	*Leucoraja garmani virginica*	Skates and Rays
Roughtail stingray	*Dasyatis centroura*	Skates and Rays
Sand tiger shark	*Carcharias taurus*	Demersal sharks
Sandbar shark	*Carcharhinus plumbeus*	Demersal sharks
Scalloped hammerhead shark	*Sphyrna lewini*	Pelagic sharks
Shortfin mako shark	*Isurus oxyrhinchus*	Pelagic sharks
Shortnose sturgeon	*Acipenser brevirostrum*	Shortnose sturgeon
Smooth hammerhead shark	*Sphyrna zygaena*	Pelagic sharks
Smooth skate	*Malacoraja senta*	Skates and Rays
Spotfin killifish	*Fundulus luciae*	Estuarine forage species
Striped killifish	*Fundulus majalis*	Estuarine forage species

Marine fish

Species Name:	Scientific Name:	Species Group:
Tautog	*Tautoga onitis*	Labrids
Thorny skate	*Amblyraja radiata*	Skates and Rays
Threespine stickleback	*Gasterosteus aculeatus*	Estuarine associates of SAV
Thresher shark	*Alopias vulpinus*	Pelagic sharks
Tiger shark	*Galeocerdo cuvier*	Demersal sharks
White shark	*Carcharodon carcharias*	Pelagic sharks
Winter flounder	*Pseudopleuronectes americanus*	Winter flounder
Winter skate	*Leucoraja ocellata*	Skates and Rays

Mollusk

Species Name:	Scientific Name:	Species Group:
Alewife floater	*Anodonta implicata*	Freshwater bivalves
Banded physa	*Physella vinosa*	Freshwater gastropods
Bay scallop	*Argopecten irradians*	Bay scallop
Black sandshell	*Ligumia recta*	Freshwater bivalves
Blue mussel	*Mytilus edulis*	Blue mussel
Brook floater	*Alasmidonta varicosa*	Freshwater bivalves
Buffalo pebblesnail	*Gillia altilis*	Freshwater gastropods
Campeloma spire snail	*Cincinnatia cincinnatiensis*	Freshwater gastropods
Canadian duskysnail	*Lyogyrus walkeri*	Freshwater gastropods
Chittenango ovate amber snail	*Novisuccinea chittenangoensis*	Terrestrial gastropods
Clubshell	*Pleurobema clava*	Freshwater bivalves
Coldwater pondsnail	*Stagnicola woodruffi*	Freshwater gastropods
Deertoe	*Truncilla truncata*	Freshwater bivalves
Dwarf wedgemussel	*Alasmidonta heterodon*	Freshwater bivalves
Eastern pearlshell	*Margaritifera margaritifera*	Freshwater bivalves
Eastern pondmussel	*Ligumia nasuta*	Freshwater bivalves
Elktoe	*Alasmidonta marginata*	Freshwater bivalves
Fat pocketbook	*Potamilus capax*	Freshwater bivalves
Fawnsfoot	*Truncilla donaciformis*	Freshwater bivalves
File rams-horn	*Planorbella pilsbryi*	Freshwater gastropods
Fringed valvata	*Valvata lewisi*	Freshwater gastropods
Globe siltsnail	*Birgella subglobosus*	Freshwater gastropods
Gravel pyrg	*Pyrgulopsis letsoni*	Freshwater gastropods
Green floater	*Lasmigona subviridis*	Freshwater bivalves
Hard clam	*Mercenaria mercenaria*	Hard clam
Hickorynut	*Obovaria olivaria*	Freshwater bivalves
Kidneyshell	*Ptychobranchus fasciolaris*	Freshwater bivalves
Lance aplexa	*Aplexa elongata*	Freshwater gastropods
Lilliput	*Toxolasma parvum*	Freshwater bivalves
Mapleleaf	*Quadrula quadrula*	Freshwater bivalves
Mossy valvata	*Valvata sincera*	Freshwater gastropods
Mucket	*Actinonaias ligamentina*	Freshwater bivalves
Northern riffleshell	*Epioblasma torulosa rangiana*	Freshwater bivalves
Oyster	*Crassostrea virginica*	Eastern oyster
Paper pondshell	*Utterbackia imbecillis*	Freshwater bivalves
Pimpleback	*Quadrula pustulosa*	Freshwater bivalves
Pink heelsplitter	*Potamilus alatus*	Freshwater bivalves
Pink mucket	*Lampsilis abrupta*	Freshwater bivalves
Pocketbook	*Lampsilis ovata*	Freshwater bivalves
Purplecap valvata	*Valvata perdepressa*	Freshwater gastropods
Rainbow	*Villosa iris*	Freshwater bivalves
Rayed bean	*Villosa fabalis*	Freshwater bivalves
Ribbed mussel	*Geukensia demissa*	Ribbed mussel

Mollusk

Species Name:	Scientific Name:	Species Group:
Round hickorynut	*Obovaria subrotunda*	Freshwater bivalves
Round pigtoe	*Pleurobema sintoxia*	Freshwater bivalves
Salamander mussel	*Simpsonaias ambigua*	Freshwater bivalves
Sheepnose	*Plethobasus cyphus*	Freshwater bivalves
Slippershell mussel	*Alasmidonta viridis*	Freshwater bivalves
Snuffbox	*Epioblasma triquetra*	Freshwater bivalves
Spindle lymnaea	*Acella haldemani*	Freshwater gastropods
Threeridge	*Amblema plicata*	Freshwater bivalves
Tidewater mucket	*Leptodea ochracea*	Freshwater bivalves
Tubercled blossom	*Epioblasma torulosa*	Freshwater bivalves
Wabash pigtoe	*Fusconaia flava*	Freshwater bivalves
Watercress snail	*Fontigens nickliniana*	Freshwater gastropods
Wavyrayed lampmussel	*Lampsilis fasciola*	Freshwater bivalves
White heelsplitter	*Lasmigona complanata*	Freshwater bivalves
Yellow lamp mussel	*Lampsilis cariosa*	Freshwater bivalves
Yellow sandshell	*Lampsilis teres*	Freshwater bivalves

Appendix D2:

Species of Greatest Conservation Need and their assigned species groups, sorted alphabetically by taxonomic group and species common name.

Bird

Species Name:	Scientific Name:	Species Group:
American bittern	*Botaurus lentiginosus*	Freshwater marsh nesting birds
American black duck	*Anas rubripes*	Breeding waterfowl
American golden-plover	*Pluvialis dominica*	Transient shorebirds
American oystercatcher	*Haematopus palliatus*	Beach and Island ground-nesting birds
American woodcock	*Scolopax minor*	Early successional forest/shrubland birds
Atlantic brant	*Branta bernicla*	Wintering waterbirds
Bald eagle	*Haliaeetus leucocephalus*	Bald Eagle
Barn owl	*Tyto alba*	Barn owl
Bay-breasted warbler	*Dendroica castanea*	Boreal forest birds
Bicknell's thrush	*Catharus bicknelli*	High Altitude Conifer Forest Birds
Black rail	*Laterallus jamaicensis*	Salt marsh breeding birds
Black scoter	*Melanitta nigra*	Wintering waterbirds
Black skimmer	*Rynchops niger*	Beach and Island ground-nesting birds
Black tern	*Chlidonias niger*	Freshwater marsh nesting birds
Black-bellied plover	*Pluvialis squatarola*	Transient shorebirds
Black-billed cuckoo	*Coccyzus erythropthalmus*	Early successional forest/shrubland birds
Black-crowned night-heron	*Nycticorax nycticorax*	Colonial-nesting herons
Black-throated blue warbler	*Dendroica caerulescens*	Deciduous/mixed forest breeding birds
Blue-winged teal	*Anas discors*	Breeding waterfowl
Blue-winged warbler	*Vermivora pinus*	Early successional forest/shrubland birds
Bobolink	*Dolichonyx oryzivorus*	Grassland birds
Bonaparte's gull	*Larus philadelphia*	Wintering waterbirds
Brown thrasher	*Toxostoma rufum*	Early successional forest/shrubland birds
Buff-breasted sandpiper	*Tryngites subruficollis*	Transient shorebirds
Canada warbler	*Wilsonia canadensis*	Early successional forest/shrubland birds
Cape May warbler	*Dendroica tigrina*	Boreal forest birds
Caspian tern	*Sterna caspia*	Beach and Island ground-nesting birds
Cattle egret	*Bubulcus ibis*	Colonial-nesting herons
Cerulean warbler	*Dendroica cerulea*	Deciduous/mixed forest breeding birds
Common eider	*Somateria mollissima*	Wintering waterbirds
Common goldeneye	*Bucephala clangula*	Breeding waterfowl

Bird

Species Name:	Scientific Name:	Species Group:
Common loon	*Gavia immer*	Common loon
Common nighthawk	*Chordeiles minor*	Common nighthawk
Common tern	*Sterna hirundo*	Beach and Island ground-nesting birds
Cooper's hawk	*Accipiter cooperii*	Forest breeding raptors
Cory's shearwater	*Calonectris diomedea*	Wintering waterbirds
Dickcissel	*Spiza americana*	Grassland birds
Dunlin	*Calidris alpina*	Transient shorebirds
Eastern meadowlark	*Sturnella magna*	Grassland birds
Forster's tern	*Sterna forsteri*	Salt marsh breeding birds
Glossy ibis	*Plegadis falcinellus*	Colonial-nesting herons
Golden eagle	*Aquila chrysaetos*	Forest breeding raptors
Golden-winged warbler	*Vermivora chrysoptera*	Early successional forest/shrubland birds
Grasshopper sparrow	*Ammodramus savannarum*	Grassland birds
Great egret	*Ardea alba*	Colonial-nesting herons
Greater scaup	*Aythya marila*	Wintering waterbirds
Greater shearwater	*Puffinus gravis*	Wintering waterbirds
Greater yellowlegs	*Tringa melanoleuca*	Transient shorebirds
Gull-billed tern	*Sterna nilotica*	Salt marsh breeding birds
Harlequin duck	*Histrionicus histrionicus*	Wintering waterbirds
Henslow's sparrow	*Ammodramus henslowii*	Grassland birds
Horned grebe	*Podiceps auritus*	Wintering waterbirds
Horned lark	*Eremophila alpestris*	Grassland birds
Hudsonian godwit	*Limosa haemastica*	Transient shorebirds
Kentucky warbler	*Oporornis formosus*	Deciduous/mixed forest breeding birds
King rail	*Rallus elegans*	Freshwater marsh nesting birds
Laughing gull	*Larus atricilla*	Salt marsh breeding birds
Least bittern	*Ixobrychus exilis*	Freshwater marsh nesting birds
Least tern	*Sterna antillarum*	Beach and Island ground-nesting birds
Lesser scaup	*Aythya affinis*	Wintering waterbirds
Little blue heron	*Egretta caerulea*	Colonial-nesting herons
Little gull	*Larus minutus*	Wintering waterbirds
Loggerhead shrike	*Lanius ludovicianus*	Loggerhead Shrike
Long-eared owl	*Asio otus*	Forest breeding raptors
Long-tailed duck	*Clangula hyemalis*	Wintering waterbirds
Louisiana waterthrush	*Seiurus motacilla*	Deciduous/mixed forest breeding birds
Marbled godwit	*Limosa fedoa*	Transient shorebirds
Northern bobwhite	*Colinus virginianus*	Early successional forest/shrubland birds
Northern goshawk	*Accipiter gentilis*	Forest breeding raptors
Northern harrier	*Circus cyaneus*	Grassland birds

Bird

Species Name:	Scientific Name:	Species Group:
Northern pintail	*Anas acuta*	Wintering waterbirds
Olive-sided flycatcher	*Contopus borealis*	Boreal forest birds
Osprey	*Pandion haliaetus*	Osprey
Peregrine falcon	*Falco peregrinus*	Peregrine Falcon
Pied-billed grebe	*Podilymbus podiceps*	Freshwater marsh nesting birds
Piping plover	*Charadrius melodus*	Beach and Island ground-nesting birds
Prairie warbler	*Dendroica discolor*	Early successional forest/shrubland birds
Prothonotary warbler	*Protonotaria citrea*	Deciduous/mixed forest breeding birds
Purple sandpiper	*Calidris maritima*	Transient shorebirds
Razorbill	*Alca torda*	Wintering waterbirds
Red knot	*Calidris canutus*	Transient shorebirds
Red-headed woodpecker	*Melanerpes erythrocephalus*	Deciduous/mixed forest breeding birds
Red-necked phalarope	*Phalaropus lobatus*	Wintering waterbirds
Red-shouldered hawk	*Buteo lineatus*	Forest breeding raptors
Red-throated loon	*Gavia stellata*	Wintering waterbirds
Roseate tern	*Sterna dougallii*	Beach and Island ground-nesting birds
Ruddy duck	*Oxyura jamaicensis*	Breeding waterfowl
Ruddy turnstone	*Arenaria interpres*	Transient shorebirds
Ruffed grouse	*Bonasa umbellus*	Early successional forest/shrubland birds
Rusty blackbird	*Euphagus carolinus*	Boreal forest birds
Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*	Salt marsh breeding birds
Sanderling	*Calidris alba*	Transient shorebirds
Scarlet tanager	*Piranga olivacea*	Deciduous/mixed forest breeding birds
Seaside sparrow	*Ammodramus maritimus*	Salt marsh breeding birds
Sedge wren	*Cistothorus platensis*	Grassland birds
Semipalmated sandpiper	*Calidris pusilla*	Transient shorebirds
Sharp-shinned hawk	*Accipiter striatus*	Forest breeding raptors
Short-billed dowitcher	*Limnodromus griseus*	Transient shorebirds
Short-eared owl	*Asio flammeus*	Grassland birds
Snowy egret	*Egretta thula*	Colonial-nesting herons
Spruce grouse	*Falcipennis canadensis*	Boreal forest birds
Surf scoter	*Melanitta perspicillata*	Wintering waterbirds
Tennessee warbler	*Vermivora peregrina*	Boreal forest birds
Thayer's gull	*Larus thayeri*	Wintering waterbirds
Three-toed woodpecker	*Picoides tridactylus*	Boreal forest birds
Tricolored heron	*Egretta tricolor*	Colonial-nesting herons
Upland sandpiper	*Bartramia longicauda*	Grassland birds

Bird

Species Name:	Scientific Name:	Species Group:
Vesper sparrow	*Pooecetes gramineus*	Grassland birds
Whimbrel	*Numenius phaeopus*	Transient shorebirds
Whip-poor-will	*Caprimulgus vociferus*	Early successional forest/shrubland birds
White-winged scoter	*Melanitta fusca*	Wintering waterbirds
Willet	*Catoptrophorus semipalmatus*	Salt marsh breeding birds
Willow flycatcher	*Empidonax traillii*	Early successional forest/shrubland birds
Wood thrush	*Hylocichla mustelina*	Deciduous/mixed forest breeding birds
Worm-eating warbler	*Helmitheros vermivorum*	Deciduous/mixed forest breeding birds
Yellow rail	*Coturnicops noveboracensis*	Freshwater marsh nesting birds
Yellow-breasted chat	*Icteria virens*	Early successional forest/shrubland birds
Yellow-crowned night-heron	*Nyctanassa violacea*	Colonial-nesting herons

Crustacea/Meristomata

Species Name:	Scientific Name:	Species Group:
American lobster	*Homarus americanus*	American lobster
Blue crab	*Callinectes sapidus*	Blue crab
Devil crawfish	*Cambarus diogenes*	Freshwater crustacea
fiddler crab	*Uca pugnax*	Fiddler crab
Horseshoe crab	*Limulus polyphemus*	Horseshoe crab
Marine zooplankton	*Various species of invertebrates*	Zooplankton
Piedmont groundwater amphipod	*Stygobromus tenuis tenuis*	Freshwater crustacea

Freshwater fish

Species Name:	Scientific Name:	Species Group:
Atlantic salmon	*Salmo salar*	Extirpated Fishes
Banded sunfish	*Enneacanthus obesus*	Banded sunfish
Bigeye chub	*Hybopsis amblops*	Bigeye chub
Black redhorse	*Moxostoma duquesnei*	Black redhorse
Blackchin shiner	*Notropis heterodon*	Blackchin shiner
Bloater	*Coregonus hoyi*	Extirpated Fishes
Bluebreast darter	*Etheostoma camurum*	Bluebreast darter
Brook trout, Heritage strains	*Salvelinus fontinalis*	Brook trout, Heritage strains
Comely shiner	*Notropis amoenus*	Comely shiner
Deepwater sculpin	*Myoxocephalus thompsoni*	Deepwater sculpin
Eastern sand darter	*Ammocrypta pellucidum*	Eastern sand darter
Gilt darter	*Percina evides*	Extirpated Fishes
Gravel chub	*Erimystax x-punctatus*	Gravel chub
Iowa darter	*Etheostoma exile*	Iowa darter
Ironcolor shiner	*Notropis chalybaeus*	Ironcolor shiner
Kiyi	*Coregonus kiyi*	Extirpated Fishes
Lake chubsucker	*Erimyzon sucetta*	Extirpated Fishes
Lake sturgeon	*Acipenser fulvescens*	Lake Sturgeon
Longear sunfish	*Lepomis megalotis*	Longear sunfish
Longhead darter	*Percina macrocephala*	Longhead darter
Mooneye	*Hiodon tergisus*	Mooneye
Mountain brook lamprey	*Ichthyomyzon greeleyi*	Mountain brook lamprey
Mud sunfish	*Acantharchus pomotis*	Extirpated Fishes
N. American ninespine stickleback	*Pungitius pungitius occidentalis*	Ninespine stickleback - inland
Ohio lamprey	*Ichthyomyzon bdellium*	Ohio lamprey
Paddlefish	*Polyodon spathula*	Extirpated Fishes
Pugnose shiner	*Notropis anogenus*	Pugnose shiner
Redfin shiner	*Lythrurus umbratilis*	Redfin shiner
River redhorse	*Moxostoma carinatum*	River redhorse
Round whitefish	*Prosopium cylindraceum*	Round whitefish
Sauger	*Stizostedion canadense*	Sauger
Shortjaw cisco	*Coregonus zenithicus*	Extirpated Fishes
Shortnose cisco	*Coregonus reighardi*	Extirpated Fishes
Silver chub	*Macrhybopsis storeriana*	Extirpated Fishes
Spoonhead sculpin	*Cottus ricei*	Extirpated Fishes
Spotted darter	*Etheostoma maculatum*	Spotted darter
Streamline chub	*Erimystax dissimilis*	Streamline chub
Swallowtail shiner	*Notropis procne*	Swallowtail shiner
Swamp darter	*Etheostoma fusiforme*	Swamp darter
Western pirate perch	*Aphredoderus sayanus gibbosus*	Western pirate perch

Herpetofauna

Species Name:	Scientific Name:	Species Group:
Black ratsnake	*Elaphe obsoleta*	Woodland/grassland snakes
Blanding's turtle	*Emydoidea blandingii*	Uncommon turtles of wetlands
Blue-spotted salamander	*Ambystoma laterale*	Vernal pool salamanders
Bog turtle	*Clemmys muhlenbergii*	Uncommon turtles of wetlands
Coal skink	*Eumeces anthracinus*	Lizards
Common five-lined skink	*Eumeces fasciatus*	Lizards
Common mudpuppy	*Necturus maculosus*	Mudpuppy
Eastern box turtle	*Terrapene carolina*	Box Turtle
Eastern hognose snake	*Heterodon platirhinos*	Woodland/grassland snakes
Eastern massasauga	*Sistrurus c. catenatus*	Massasauga
Eastern mud turtle	*Kinosternon subrubrum*	Uncommon turtles of wetlands
Eastern ribbonsnake	*Thamnophis sauritus sauritus*	Lake/river reptiles
Eastern spadefoot	*Scaphiopus holbrookii*	Eastern Spadefoot Toad
Fence lizard	*Sceloporus undulatus*	Lizards
Four-toed salamander	*Hemidactylium scutatum*	Freshwater wetland amphibians
Fowler’s toad	*Bufo fowleri*	Freshwater wetland amphibians
Green turtle	*Chelonia mydas*	Sea turtles
Hawksbill	*Eretmochelys imbricata*	Sea turtles
Hellbender	*Cryptobranchus alleganiensis*	Hellbender
Jefferson salamander	*Ambystoma jeffersonianum*	Vernal pool salamanders
Kemp's or Atlantic ridley	*Lepidochelys kempii*	Sea turtles
Leatherback	*Dermochelys coriacea*	Sea turtles
Loggerhead	*Caretta caretta*	Sea turtles
Longtail salamander	*Eurycea longicauda*	Stream salamanders
Marbled salamander	*Ambystoma opacum*	Vernal pool salamanders
Northern black racer	*Coluber constrictor*	Woodland/grassland snakes
Northern copperhead	*Agkistrodon contortrix mokasen*	Woodland/grassland snakes
Northern cricket frog	*Acris crepitans*	Freshwater wetland amphibians
Northern diamondback terrapin	*Malaclemys terrapin terrapin*	Diamond-backed Terrapin
Northern map turtle	*Graptemys geographica*	Lake/river reptiles
Northern red salamander	*Pseudotriton ruber*	Stream salamanders
Queen snake	*Regina septemvittata*	Lake/river reptiles
Short-headed gartersnake	*Thamnophis brachystoma*	Woodland/grassland snakes
Smooth greensnake	*Opheodrys vernalis*	Woodland/grassland snakes
Snapping turtle	*Chelydra serpentina*	Snapping Turtle
Southern leopard frog	*Rana sphenocephala*	Freshwater wetland amphibians
Spiny softshell	*Trionyx spiniferus*	Lake/river reptiles
Spotted turtle	*Clemmys guttata*	Uncommon turtles of wetlands
Stinkpot	*Sternotherus odoratus*	Uncommon turtles of wetlands
Tiger salamander	*Ambystoma tigrinum*	Vernal pool salamanders
Timber rattlesnake	*Crotalus horridus*	Woodland/grassland snakes
Western chorus frog	*Pseudacris triseriata*	Freshwater wetland amphibians
Wood turtle	*Clemmys insculpta*	Lake/river reptiles

Herpetofauna

Species Name:	Scientific Name:	Species Group:
Worm snake	*Carphophis amoenus*	Woodland/grassland snakes

Insect

Species Name:	Scientific Name:	Species Group:
A borer moth	*Papaipema aerata*	Other moths
A borer moth	*Papaipema marginidens*	Other moths
A geometrid moth	*Euchlaena madusaria*	Other moths
A geometrid moth	*Semiothisa denticulata*	Other moths
A geometrid moth	*Semiothisa banksianae*	Other moths
A geometrid moth	*Nemoria bifilata*	Other moths
A hand-maid moth	*Datana ranaeceps*	Other moths
A looper moth	*Lambdina canitiaria*	Other moths
A mayfly	*Procloeon mendax*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus frisoni*	Stoneflies/Mayflies of lotic waters
A mayfly	*Dannella provonshai*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Rhithrogena uhari*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus suffusus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Epeorus punctatus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Ameletus tarteri*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon vicinum*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Siphlonurus barbarus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon simile*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Rhithrogena anomala*	Stoneflies/Mayflies of lotic waters
A mayfly	*Brachycercus maculatus*	Stoneflies/Mayflies of lotic waters
A mayfly	*Procloeon vicinum*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Plauditus gloveri*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Siphlonurus barbaroides*	Stoneflies/Mayflies of lentic waters
A mayfly	*Procloeon ozburni*	Stoneflies/Mayflies of lotic waters
A mayfly	*Heptagenia julia*	Stoneflies/Mayflies of lotic waters
A mayfly	*Baetis rusticans*	Stoneflies/Mayflies of lotic waters
A mayfly	*Eurylophella bicoloroides*	Stoneflies/Mayflies of lotic waters
A mayfly	*Nixe rusticalis*	Stoneflies/Mayflies of lotic waters
A mayfly	*Leucrocuta thetis*	Stoneflies/Mayflies of uncertain habitat
A mayfly	*Heptagenia culacantha*	Stoneflies/Mayflies of lotic waters
A mayfly	*Ameletus tertius*	Stoneflies/Mayflies of lotic waters
A moth	*Lepipolys perscripta*	Other moths
A noctuid moth	*Euxoa pleuritica*	Other moths
A noctuid moth	*Hydraecia stramentosa*	Other moths
A noctuid moth	*Schinia bifascia*	Other moths
A noctuid moth	*Chytonix ruperti*	Other moths
A noctuid moth	*Chytonix sensilis*	Other moths
A noctuid moth	*Chaetaglaea cerata*	Other moths
A noctuid moth	*Lithophane lepida lepida*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
A noctuid moth	*Eucoptocnemis fimbriaris*	Other moths
A noctuid moth	*Euxoa lidia thanatologia*	Other moths
A noctuid moth	*Richia acclivis*	Other moths
A noctuid moth	*Anomogyna rhaetica*	Other moths
A noctuid moth	*Fagitana littera*	Other moths
A noctuid moth	*Paectes abrostolella*	Other moths
A noctuid moth	*Phoberia orthosioides*	Other moths
A noctuid moth	*Agrotis obliqua*	Other moths
A noctuid moth	*Orthodes obscura*	Other moths
A noctuid moth	*Zale largera*	Other moths
A noctuid moth	*Synedoida adumbrata*	Other moths
A noctuid moth	*Amphipoea erepta ryensis*	Other moths
A noctuid moth	*Fishia enthea*	Other moths
A noctuid moth	*Apamea inordinata*	Other moths
A noctuid moth	*Apamea mixta*	Other moths
A noctuid moth	*Psaphida thaxteriana*	Other moths
A noctuid moth	*Abagrotis barnesi*	Other moths
A notodontid moth	*Heterocampa varia*	Other moths
A slug moth	*Monoleuca semifascia*	Other moths
A stonefly	*Alloperla voinae*	Stoneflies/Mayflies of uncertain habitat
A stonefly	*Pteronarcys comstocki*	Stoneflies/Mayflies of lotic waters
A stonefly	*Utaperla gaspesiana*	Stoneflies/Mayflies of lotic waters
A stonefly	*Alloperla vostocki*	Stoneflies/Mayflies of lotic waters
A stonefly	*Allocapnia illinoensis*	Stoneflies/Mayflies of lotic waters
A tiger beetle	*Cicindela patruela*	Pine barrens tiger beetles
A tiger beetle	*Cicindela unipunctata*	Pine barrens tiger beetles
A tiger beetle	*Cicindela abdominalis*	Pine barrens tiger beetles
A tiger beetle	*Cicindela ancocisconensis*	Riparian tiger beetles
A tussock moth	*Orgyia detrita*	Other moths
Acadian swordgrass moth	*Xylena thoracica*	Other moths
American burying beetle	*Nicrophorus americanus*	American burying beetle
American rubyspot	*Hetaerina americana*	Odonates of rivers/streams
An underwing moth	*Catocala sp 3*	Other moths
Appalachian jewelwing	*Calopteryx angustipennis*	Odonates of rivers/streams
Arogos skipper	*Atrytone arogos arogos*	Other butterflies
Arrow clubtail	*Stylurus spiniceps*	Odonates of rivers/streams
Arrowhead spiketail	*Cordulegaster obliqua*	Odonates of seeps/rivulets
Aweme borer moth	*Papaipema aweme*	Other moths
Barrens buck moth	*Hemileuca maia maia*	Barrens buck moth
Barrens dagger moth	*Acronicta albarufa*	Other moths
Barrens itame	*Itame sp 1*	Other moths
Barrens metarranthis moth	*Metarranthis apiciaria*	Other moths
Bay underwing	*Catocala badia*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Bird dropping moth	*Cerma cora*	Other moths
Black fungus moth	*Metalectra tantillus*	Other moths
Black meadowhawk	*Sympetrum danae*	Odonates of bogs/fens/ponds
Black-bordered lemon moth	*Thioptera nigrofimbria*	Other moths
Blueberry gray	*Glena cognataria*	Other moths
Blue-tipped dancer	*Argia tibialis*	Odonates of rivers/streams
Bog buckmoth	*Hemileuca sp.*	Bog buck moth
Bog elfin	*Callophrys lanoraieensis*	Other butterflies
Boreal snaketail	*Ophiogomphus colubrinus*	Odonates of rivers/streams
Brazilian skipper	*Calpodes ethlius*	Other butterflies
Broad-lined catopyrrha	*Erastria coloraria*	Other moths
Brook snaketail	*Ophiogomphus aspersus*	Odonates of rivers/streams
Brown-bordered geometer	*Eumacaria latiferrugata*	Other moths
Buchholz's gray	*Hypomecis buchholzaria*	Other moths
Chain fern borer moth	*Papaipema stenocelis*	Other moths
Checkered white	*Pontia protodice*	Other butterflies
Chestnut clearwing moth	*Synanthedon castaneae*	Other moths
Coastal barrens buckmoth	*Hemileuca maia ssp 5*	Other moths
Coastal heathland cutworm	*Abagrotis nefascia benjamini*	Other moths
Cobblestone tiger beetle	*Cicindela marginipennis*	Riparian tiger beetles
Cobra clubtail	*Gomphus vastus*	Odonates of rivers/streams
Comet darner	*Anax longipes*	Odonates of lakes/ponds
Common sanddragon	*Progomphus obscurus*	Odonates of rivers/streams
Culvers root borer	*Papaipema sciata*	Other moths
Dark stoneroot borer moth	*Papaipema duplicata*	Other moths
Dimorphic gray	*Tornos scolopacinarius*	Other moths
Doll's merolonche	*Merolonche dolli*	Other moths
Dot-lined white	*Artace cribraria*	Other moths
Ebony boghaunter	*Williamsonia fletcheri*	Odonates of bogs/fens/ponds
Elusive clubtail	*Stylurus notatus*	Odonates of rivers/streams
Extra-striped snaketail	*Ophiogomphus anomalus*	Odonates of rivers/streams
Forcipate emerald	*Somatochlora forcipata*	Odonates of bogs/fens/ponds
Frosted elfin	*Callophrys irus*	Other butterflies
Golden aster flower moth	*Schinia tuberculum*	Other moths
Golden borer moth	*Papaipema cerina*	Other moths
Gordian sphinx	*Sphinx gordius*	Other moths
Gorgone checkerspot	*Chlosyne gorgone*	Other butterflies
Gray petaltail	*Tachopteryx thoreyi*	Odonates of seeps/rivulets
Gray woodgrain	*Morrisonia mucens*	Other moths
Green-faced clubtail	*Gomphus viridifrons*	Odonates of rivers/streams
Hairy artesta	*Trichoclea artesta*	Other moths
Henry's elfin	*Callophrys henrici*	Other butterflies
Heracleum stem borer moth	*Papaipema harrisii*	Other moths
Herodias underwing	*Catocala herodias gerhardi*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Hessel's hairstreak	*Callophrys hesseli*	Other butterflies
Imperial moth	*Eacles imperialis pini*	Other moths
Incurvate emerald	*Somatochlora incurvata*	Odonates of bogs/fens/ponds
Jair underwing	*Catocala jair*	Other moths
Jersey jair underwing	*Catocala jair ssp 2*	Other moths
Jutta arctic	*Oeneis jutta*	Other butterflies
Karner blue	*Lycaeides melissa samuelis*	Karner blue butterfly
Lake emerald	*Somatochlora cingulata*	Odonates of lakes/ponds
Lemmer's noctuid moth	*Lithophane lemmeri*	Other moths
Little bluet	*Enallagma minusculum*	Odonates of coastal plain lakes/ponds
Mantled baskettail	*Tetragoneuria semiaquea*	Odonates of lakes/ponds
Maritime sunflower borer moth	*Papaipema maritima*	Other moths
Maroonwing	*Sideridis maryx*	Other moths
Melsheimer's sack bearer	*Cicinnus melsheimeri*	Other moths
Midland clubtail	*Gomphus fraternus*	Odonates of rivers/streams
Mocha emerald	*Somatochlora linearis*	Odonates of small forest streams
Mottled duskywing	*Erynnis martialis*	Other butterflies
Needham's skimmer	*Libellula needhami*	Odonates of brackish marshes/lakes/ponds
New England bluet	*Enallagma laterale*	Odonates of lakes/ponds
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	Beach tiger beetles
Northern metalmark	*Calephelis borealis*	Other butterflies
Northern oak hairstreak	*Fixsenia favonius ontario*	Other butterflies
Ocellated emerald	*Somatochlora minor*	Odonates of small forest streams
Olympia marble	*Euchloe olympia*	Other butterflies
Ostrich fern borer moth	*Papaipema sp 2*	Other moths
Pale green pinion moth	*Lithophane viridipallens*	Other moths
Persius duskywing	*Erynnis persius persius*	Other butterflies
Phyllira tiger moth	*Grammia phyllira*	Other moths
Pine barrens bluet	*Enallagma recurvatum*	Odonates of coastal plain lakes/ponds
Pine barrens zanclognatha	*Zanclognatha martha*	Other moths
Pine devil	*Citheronia sepulcralis*	Other moths
Pink sallow	*Psectraglaea carnosa*	Other moths
Precious underwing	*Catocala pretiosa pretiosa*	Other moths
Puritan tiger beetle	*Cicindela puritana*	Beach tiger beetles
Pygmy snaketail	*Ophiogomphus howei*	Odonates of rivers/streams
Quiet or sweet underwing	*Catocala dulciola*	Other moths
Rambur's forktail	*Ischnura ramburii*	Odonates of brackish marshes/lakes/ponds
Rapids clubtail	*Gomphus quadricolor*	Odonates of rivers/streams
Regal fritillary	*Speyeria idalia*	Other butterflies
Regal moth	*Citheronia regalis*	Other moths

Insect

Species Name:	Scientific Name:	Species Group:
Ringed boghaunter	*Williamsonia lintneri*	Odonates of bogs/fens/ponds
Ringed emerald	*Somatochlora albicincta*	Odonates of high elevation lakes
Riverine clubtail	*Stylurus amnicola*	Odonates of rivers/streams
Russet-tipped clubtail	*Stylurus plagiatus*	Odonates of rivers/streams
Sable clubtail	*Gomphus rogersi*	Odonates of small forest streams
Scarlet bluet	*Enallagma pictum*	Odonates of coastal plain lakes/ponds
Seaside golden borer moth	*Papaipema duovata*	Other moths
Seepage dancer	*Argia bipunctulata*	Odonates of seeps/rivulets
Septima's clubtail	*Gomphus septima*	Odonates of rivers/streams
Silvery blue	*Glaucopsyche lygdamus lygdamus*	Other butterflies
Skillet clubtail	*Gomphus ventricosus*	Odonates of rivers/streams
Southern grizzled skipper	*Pyrgus wyandot*	Other butterflies
Southern sprite	*Nehalennia integricollis*	Odonates of bogs/fens/ponds
Sparkling jewelwing	*Calopteryx dimidiata*	Odonates of rivers/streams
Spatterdock darner	*Aeshna mutata*	Odonates of lakes/ponds
Spine-crowned clubtail	*Gomphus abbreviatus*	Odonates of rivers/streams
Stinging rose caterpillar moth	*Parasa indetermina*	Other moths
Subarctic bluet	*Coenagrion interrogatum*	Odonates of bogs/fens/ponds
Subarctic darner	*Aeshna subarctica*	Odonates of bogs/fens/ponds
Sylvan hygrotus diving beetle	*Hygrotus sylvanus*	Sylvan hygrotus diving beetle
Taper-tailed darner	*Gomphaeschna antilope*	Odonates of bogs/fens/ponds
Tawny crescent	*Phyciodes batesii batesii*	Other butterflies
The consort underwing	*Catocala consors sorsconi*	Other moths
The little beggar	*Eubaphe meridiana*	Other moths
Tiger spiketail	*Cordulegaster erronea*	Odonates of seeps/rivulets
Tomah mayfly	*Siphlonisca aerodromia*	Tomah mayfly
Toothed apharetra	*Apharetra dentata*	Other moths
Trichoclea artesta	*Hairy artesta*	Other moths
Variable sallow	*Sericaglaea signata*	Other moths
Woolly gray	*Lycia ypsilon*	Other moths
Yellow stoneroot borer	*Papaipema astuta*	Other moths
Yellow-sided skimmer	*Libellula flavida*	Odonates of bogs/fens/ponds

Mammal

Species Name:	Scientific Name:	Species Group:
Allegheny woodrat	*Neotoma magister*	Allegheny Woodrat
American marten	*Martes americana*	Furbearers
Blue whale	*Balaenoptera musculus*	Marine mammals
Canada lynx	*Lynx canadensis*	Extirpated large mammals
Eastern cougar	*Felis concolor cougar*	Extirpated large mammals
Eastern red bat	*Lasiurus borealis*	Tree bats
Fin whale	*Balaenoptera physalus*	Marine mammals
Gray wolf	*Canis lupus*	Extirpated large mammals
Harbor porpoise	*Phocoena phocoena*	Marine mammals
Hoary bat	*Lasiurus cinereus*	Tree bats
Humpback whale	*Megaptera novaeangliae*	Marine mammals
Indiana bat	*Myotis sodalis*	Indiana Bat
Least shrew	*Cryptotis parva*	Small mammals of uncertain/questionable residency
Least weasel	*Mustela nivalis*	Small mammals of uncertain/questionable residency
New England cottontail	*Sylvilagus transitionalis*	Game species of concern
Northern right whale	*Eubalaena glacialis*	Marine mammals
River otter	*Lontra canadensis*	Furbearers
Sei whale	*Balaenoptera borealis*	Marine mammals
Silver-haired bat	*Lasionycteris noctivagans*	Tree bats
Small-footed bat	*Myotis leibii*	Small-Footed Bat
Sperm whale	*Physeter catodon*	Marine mammals

Marine fish

Species Name:	Scientific Name:	Species Group:
Alewife	*Alosa pseudoharengus*	Alewife - marine district population
American eel	*Anguilla rostrata*	American eel
American shad	*Alosa sapidissima*	American shad
Atlantic silverside	*Menidia menidia*	Estuarine forage species
Atlantic sturgeon	*Acipenser oxyrinchus*	Atlantic sturgeon
Atlantic tomcod	*Microgadus tomcod*	Tomcod
Atlantic torpedo	*Torpedo nobiliana*	Skates and Rays
Barndoor skate	*Dipturus laevis*	Skates and Rays
Basking shark	*Cetorhinus maximus*	Pelagic sharks
Bay anchovy	*Anchoa mitchilli*	Estuarine migratory pelagic
Bigeye thresher shark	*Alopias superciliosus*	Pelagic sharks
Blue shark	*Prionace glauca*	Pelagic sharks
Blueback herring	*Alosa aestivalis*	Blueback herring
Bonnethead shark	*Sphyrna tiburo*	Pelagic sharks
Clearnose skate	*Raja eglanteria*	Skates and Rays
Common pipefish	*Syngnathus fuscus*	Estuarine associates of SAV
Cownose ray	*Rhinoptera bonasus*	Skates and Rays
Cunner	*Tautogolabrus adspersus*	Labrids
Dusky shark	*Carcharhinus obscurus*	Demersal sharks
Fourspine stickleback	*Apeltes quadricus*	Estuarine associates of SAV
Inland silverside	*Menidia beryllina*	Estuarine forage species
Lined seahorse	*Hippocampus erectus*	Estuarine associates of SAV
Little skate	*Leucoraja erinacea*	Skates and Rays
Longfin mako shark	*Isurus paucus*	Pelagic sharks
Manta	*Manta birostris*	Skates and Rays
Menhaden	*Brevoortia tyrannus*	Estuarine migratory pelagic
Mummichog	*Fundulus heteroclitus*	Estuarine forage species
N. American ninespine stickleback	*Pungitius pungitius occidentalis*	Estuarine associates of SAV
Northern puffer	*Sphoeroides maculatus*	Northern puffer
Oyster toadfish	*Opsanus tau*	Oyster toadfish
Porbeagle shark	*Lamna nasus*	Pelagic sharks
Rainbow smelt	*Osmerus mordax*	Rainbow smelt
Rosette skate	*Leucoraja garmani virginica*	Skates and Rays
Roughtail stingray	*Dasyatis centroura*	Skates and Rays
Sand tiger shark	*Carcharias taurus*	Demersal sharks
Sandbar shark	*Carcharhinus plumbeus*	Demersal sharks
Scalloped hammerhead shark	*Sphyrna lewini*	Pelagic sharks
Shortfin mako shark	*Isurus oxyrhinchus*	Pelagic sharks
Shortnose sturgeon	*Acipenser brevirostrum*	Shortnose sturgeon
Smooth hammerhead shark	*Sphyrna zygaena*	Pelagic sharks
Smooth skate	*Malacoraja senta*	Skates and Rays
Spotfin killifish	*Fundulus luciae*	Estuarine forage species
Striped killifish	*Fundulus majalis*	Estuarine forage species

Marine fish

Species Name:	Scientific Name:	Species Group:
Tautog	*Tautoga onitis*	Labrids
Thorny skate	*Amblyraja radiata*	Skates and Rays
Threespine stickleback	*Gasterosteus aculeatus*	Estuarine associates of SAV
Thresher shark	*Alopias vulpinus*	Pelagic sharks
Tiger shark	*Galeocerdo cuvier*	Demersal sharks
White shark	*Carcharodon carcharias*	Pelagic sharks
Winter flounder	*Pseudopleuronectes americanus*	Winter flounder
Winter skate	*Leucoraja ocellata*	Skates and Rays

Mollusk

Species Name:	Scientific Name:	Species Group:
Alewife floater	*Anodonta implicata*	Freshwater bivalves
Banded physa	*Physella vinosa*	Freshwater gastropods
Bay scallop	*Argopecten irradians*	Bay scallop
Black sandshell	*Ligumia recta*	Freshwater bivalves
Blue mussel	*Mytilus edulis*	Blue mussel
Brook floater	*Alasmidonta varicosa*	Freshwater bivalves
Buffalo pebblesnail	*Gillia altilis*	Freshwater gastropods
Campeloma spire snail	*Cincinnatia cincinnatiensis*	Freshwater gastropods
Canadian duskysnail	*Lyogyrus walkeri*	Freshwater gastropods
Chittenango ovate amber snail	*Novisuccinea chittenangoensis*	Terrestrial gastropods
Clubshell	*Pleurobema clava*	Freshwater bivalves
Coldwater pondsnail	*Stagnicola woodruffi*	Freshwater gastropods
Deertoe	*Truncilla truncata*	Freshwater bivalves
Dwarf wedgemussel	*Alasmidonta heterodon*	Freshwater bivalves
Eastern pearlshell	*Margaritifera margaritifera*	Freshwater bivalves
Eastern pondmussel	*Ligumia nasuta*	Freshwater bivalves
Elktoe	*Alasmidonta marginata*	Freshwater bivalves
Fat pocketbook	*Potamilus capax*	Freshwater bivalves
Fawnsfoot	*Truncilla donaciformis*	Freshwater bivalves
File rams-horn	*Planorbella pilsbryi*	Freshwater gastropods
Fringed valvata	*Valvata lewisi*	Freshwater gastropods
Globe siltsnail	*Birgella subglobosus*	Freshwater gastropods
Gravel pyrg	*Pyrgulopsis letsoni*	Freshwater gastropods
Green floater	*Lasmigona subviridis*	Freshwater bivalves
Hard clam	*Mercenaria mercenaria*	Hard clam
Hickorynut	*Obovaria olivaria*	Freshwater bivalves
Kidneyshell	*Ptychobranchus fasciolaris*	Freshwater bivalves
Lance aplexa	*Aplexa elongata*	Freshwater gastropods
Lilliput	*Toxolasma parvum*	Freshwater bivalves
Mapleleaf	*Quadrula quadrula*	Freshwater bivalves
Mossy valvata	*Valvata sincera*	Freshwater gastropods
Mucket	*Actinonaias ligamentina*	Freshwater bivalves
Northern riffleshell	*Epioblasma torulosa rangiana*	Freshwater bivalves
Oyster	*Crassostrea virginica*	Eastern oyster
Paper pondshell	*Utterbackia imbecillis*	Freshwater bivalves
Pimpleback	*Quadrula pustulosa*	Freshwater bivalves
Pink heelsplitter	*Potamilus alatus*	Freshwater bivalves
Pink mucket	*Lampsilis abrupta*	Freshwater bivalves
Pocketbook	*Lampsilis ovata*	Freshwater bivalves
Purplecap valvata	*Valvata perdepressa*	Freshwater gastropods
Rainbow	*Villosa iris*	Freshwater bivalves
Rayed bean	*Villosa fabalis*	Freshwater bivalves
Ribbed mussel	*Geukensia demissa*	Ribbed mussel

Mollusk

Species Name:	Scientific Name:	Species Group:
Round hickorynut	*Obovaria subrotunda*	Freshwater bivalves
Round pigtoe	*Pleurobema sintoxia*	Freshwater bivalves
Salamander mussel	*Simpsonaias ambigua*	Freshwater bivalves
Sheepnose	*Plethobasus cyphus*	Freshwater bivalves
Slippershell mussel	*Alasmidonta viridis*	Freshwater bivalves
Snuffbox	*Epioblasma triquetra*	Freshwater bivalves
Spindle lymnaea	*Acella haldemani*	Freshwater gastropods
Threeridge	*Amblema plicata*	Freshwater bivalves
Tidewater mucket	*Leptodea ochracea*	Freshwater bivalves
Tubercled blossom	*Epioblasma torulosa*	Freshwater bivalves
Wabash pigtoe	*Fusconaia flava*	Freshwater bivalves
Watercress snail	*Fontigens nickliniana*	Freshwater gastropods
Wavyrayed lampmussel	*Lampsilis fasciola*	Freshwater bivalves
White heelsplitter	*Lasmigona complanata*	Freshwater bivalves
Yellow lamp mussel	*Lampsilis cariosa*	Freshwater bivalves
Yellow sandshell	*Lampsilis teres*	Freshwater bivalves

Appendix E: List of DEC Unit Management Plans for DEC lands in each basin. Year of plan completion is indicated in parentheses.

Allegheny River Basin

- Boutwell Hill State Forest (1998)
- Chautauqua County State Forests (Draft)
- Nine Mile Swamp State Forest (2000)

Delaware River Basin

- Halcott Mountain Wild Forest (2001)
- Neversink River Unique Area (1997)
- Sundown Wild Forest / Vernooy Kill State Forest (Draft)
- Treaty Line (Draft)

Lake Champlain Basin

- Chazy Highland Unit (Draft)
- Debar Mountain Wild Forest (Draft)
- Dix Mountain Wilderness (Draft)
- Giant Mountain Wilderness (Draft)
- High Peaks Wilderness (1999)
- Lake George Wild Forest (Draft)
- Pharoah Lake Wilderness (1992)
- Saranac Lakes Wild Forest (Draft)
- Sentinel Range Wilderness (Draft)
- Split Rock Wild Forest (Draft)
- St. Regis State Forest (Draft)
- Wilmington Wild Forest (Draft)

Lake Erie Basin

- Boutwell Hill State Forest (1998)
- Chautauqua County State Forests (Draft)

Northeast Lake Ontario - St. Lawrence River Basin

- Aldrich Pond Wild Forest (1995)
- Blue Mountain Wild Forest (1995)
- Blue Ridge Wilderness (Draft)
- Bog River Complex (2003)
- Brasher Falls State Forest (Draft)
- Colton State Forest (Draft)
- Debar Mountain Wild Forest (Draft)
- Five Ponds Wilderness (1994)
- Grass River Wild Forest (Draft)
- High Peaks Wilderness (1999)
- Independence River Wild Forest (1986)
- Moose River Plains Wild Forest (Draft)
- Raquette Boreal Wild Forest (Draft)
- Saranac Lakes Wild Forest (Draft)
- St. Regis Canoe Area (Draft)
- White Hill Wild Forest (Draft)
- William C. Whitney Wilderness (1998)

Southeast Lake Ontario Basin

- Camillus Forest Unique Area (Draft)
- Nelson Swamp Unique Area (1999)
- Rome Sand Plains Unique Area (Draft)
- Salmon River Falls Unique Area (Draft)
- Six Nations State Forest (1997)

Susquehanna River Basin

- Broome (Draft)
- Leatherstocking Area State Forests (2000)
- Lebanon Hills State Forest (1994)
- Mcdonough Area State Forests (1999)
- Northern Chenango Highlands Area State Forest (2000)
- Six Nations Area State Forest (1997)
- Tioga (Draft)
- Treaty Line (Draft)

Upper Hudson River Basin

- Blue Mountain Wild Forest (1995)
- Blue Ridge Wilderness (Draft)
- Dix Mountain Wilderness (Draft)
- Eminence State Forest (1995)
- Ferris Lake Wild Forest (Draft)
- Giant Mountain Wilderness (Draft)
- Halcott Mountain Wild Forest (2001)
- Helderberg Area (2001)
- High Peaks Wilderness (1999)
- Hoffman Notch Wilderness (Draft)
- Jessup River Wild Forest (Draft)
- Kaaterskill/West Mountain Wild Forest (Draft)
- Lake George Wild Forest (Draft)
- Moose River Plains Wild Forest (Draft)
- Saratoga-Warren State Forests (Draft)
- Shaker Mountain Wild Forest (Draft)
- Shandaken Wild Forest (Draft)
- Siamese Ponds Wilderness (Draft)
- Silver Lake Wilderness (Draft)
- Sundown Wild Forest/Vernooykill State Forest (Draft)
- Vanderwhacker Mountain Wild Forest (Draft)
- Westkill Mountain Wilderness (Draft)
- Wilcox Lake Wild Forest (Draft)
- William C. Whitney Wilderness (1998)
- Windham High Peak Wild Forest (1994)

Unit Management Plans in Southwest Lake Ontario and Lower Hudson River/Long Island Sound basins are in preparation and are not yet available for public review.

For more information visit http://www.dec.state.ny.us/website/dlf/publands/ump/index.html

Appendix F: Rosters of participants on the Watershed review teams during the drafting of the CWCS documentand their affiliations.

Allegheny Basin	Name	Affiliation
Watershed Lead	Ken Roblee	DEC
Watershed Co-Lead	Pat Riexinger	DEC
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Team Member	Darran Crabtree	Nature Conservancy
Team Member	Paul E. McKeown	DEC
Team Member	Chris Pennuto	Buffalo State College
Team Member	John Jablonski	Chautauqua W'shed Conservancy
Team Member	Al Breisch	DEC, Endangered Species Unit
Team Member	Terry Moore	DEC, Retired Wildlife Manger
Team Member	Tom Jurczak	DEC, Retired Wildlife Biologist
Team Member	Chris Pennuto	Buffalo State College, Biology Dept.
Team Member	Stephen Eaton	Cattaraugus Co. Bird Club
Team Member	James Berry	Roger Tory Peterson Institute
eam Member	Jeff Tome	Jamestown Audubon
Team Member	Brian Davis	Cattaraugus Co. SWCD
Team Member	Patricia Riexinger	DEC, Bureau of Habitat
Team Member	Brad Whitcomb	NYSOPRHP, Allegany State Park
Team Member	Rick White	Ecological Consultant
Team Member	Angela Martin	Ecological Consultant
Team Member	Gayla Gray	Seneca Nation of Indians, Env. Prot. Dept.
Team Member	Will Printup	Seneca Nation of Indians, Forestry Dept.
Team Member	Timothy Baird	Cattaraugus Bird Club
eam Member	Patti Nelson	DEC, CPS (Facilitator)
Team Member	Tracey Tomajer	DEC, Watershed Consv. Coordinator

Atlantic Ocean Basin	Name	Affiliation
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Watershed Co-Lead	None	
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Team Member	Kerri Pogue	The Nature Consevancy
Team Member	Craig Kessler	Ducks Unlimited
Team Member	Robert Nyman	NY/NJ Harbor Estuary Program
Team Member	Roselle Henn	US ACOE
Team Member	Tom Halavik	US FWS
Team Member	John Turner	Audubon
Team Member	Robert DiGiovanni	The Riverhead Foundation
Team Member	Chris Rodgers, PhD	NOAA, Highly Migratory Species

Delaware Basin	Name	Affiliation
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Watershed Co-Lead	Wayne Elliot	DEC
Team Member	Norm McBride	DEC
Team Member	George Schuler	Nature Conservancy
Team Member	Kenneth Markussen	DEC
Team Member	Alan White	Nature Conservancy
Team Member	Rocci Aguirre	Trout Unlimited
Team Member	Ira Stern	NYCDEP
Team Member	Chris Olney	Catskill Center
Team Member	Karen Rauter	Watershed Ag. Council

Lake Champlain Basin	Name	Affiliation
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Team Member	Tim Mihuc	Lake Champlain Sea Grant
Team Member	Paul Marangelo	Adirondack Conservancy and Trust
Team Member	Madeline Lyttle	Lake Champlain Fish & Wildlife Resources Office
Team Member	Craig Martin	Lake Champlain Fish & Wildlife Resources Office
Team Member	Ken Adams	SUNY Plattsburgh
Team Member	Bill Wellman	Trout Unlimited
Team Member	Judy Heintz	
Team Member	Brian Houseal	Adirondack Council
Team Member	Richard Redman	USDA-NRCS
Team Member	Michale Glennon	Wildlife Conservation Society
Team Member	Chris Maron	Adirondack Conservancy and Trust

Lake Erie Basin	Name	Affiliation
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Watershed Co-Lead	Joe Galati	DEC habitat, region 9
Team Member	Paul Mckeown	DEC fisheries, region 9
Team Member	Bill Culligan	DEC fisheries, region 9
Team Member	Mike Wilkinson	DEC fisheries, region 9
Team Member	Mark Kandel	DEC wildlife, region 9
Team Member	Mike Morgan	Audubon
Team Member	Patrick McGlew	TNC
Team Member	Sheila Hess	DU
Team Member	John Whitney	NRCS, Erie County
Team Member	Chuck Rosenburg	Stantec Consulting Firm
Team Member	Brian Davis	Soil and Water
Team Member	Tony Friona	Army Corps of Engineers
Team Member	Julie O'Neill	Friends of Buffalo and Niagara River
Team Member	Doug Carlson	DEC fisheries, region 6
Team Member	Gayla Gray	Seneca Nation

Lower Hudson - Long Island Bays Basin	Name	Affiliation
Watershed Lead	Kim McKown	NYSDEC - Marine Resources
Watershed Co-Lead	Dan Rosenblatt	NYSDEC - Region 1, Habitat
Team Member	Joe Pane	NYSDEC - Region 2,
Team Member	Gregg Kenney	NYSDEC - Region 3, Marine Resources
Team Member	Mike Corey	Dept. of State
Team Member	Kerri Pogue	Nature Conservancy
Team Member	Dr. Bob Cerrato	SUNY Stony Brook - MSRC
Team Member	Don Riepe	American Littoral Society
Team Member	Mark Tedesco	LIS Estuary Program
Team Member	Dennis Suzkowski	NY/NJ Harbor Estuary Program, HRMAC, HRF
Team Member	Yigal Gleb	Audubon New York City
Team Member	Tom Halavik	United States Fish and Wildlife Service
Team Member	Jeremey Feinberg	United States Fish and Wildlife Service
Team Member	John Turner	Audubon, Town of Brookhaven

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Watershed Lead	Chris Van Maaren	DEC
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Team Member	Dirk Bryant	Nature Conservancy
Team Member	Katie Malinowski	Tug Hill Commission
Team Member	Mark Craig	DEC
Team Member	Ann Rice	DEC
Team Member	Stephanie Weiss	STR
Team Member	Chris Reidy	USDA NRCD
Team Member	Chris Dobony	US Army
Team Member	Ken Kogut	DEC
Team Member	Bill Schoch	DEC
Team Member	Les Benedict	St Regis Mohawks
Team Member	Dawn Howard	St Lawrence Co Soil and Water

SE Lake Ontario Basin	Name	Affiliation
Watershed Lead	Bryan Swift	DEC
Watershed Co-Lead	Lance Clark	DEC
Team Member	Amy Filipowicz	DOS
Team Member	Doug Thompson	Nature Conservancy
Team Member	Tim Post	DEC Central Office
Team Member	Al Breisch	DEC Central Office
Team Member	Dave Smith	DEC R6 Lands & Forests
Team Member	Dan Bishop	DEC R7 Fisheries
Team Member	Fran Verdoliva	DEC R7 Fisheries
Team Member	Dave Forness	DEC R7 Lands & Forests
Team Member	Sandy Lislovs	DEC R7 Water
Team Member	Jim Eckler	DEC R8 Wildlife
Team Member	Brad Hammers	DEC R8 Fisheries
Team Member	Janet Zuckerman	OPRHP
Team Member	Rob Hiltbrand	OPRHP
Team Member	Mike Corey	DOS Coastal Mgt Program
Team Member	Dave Stilwell	USFWS Cortland
Team Member	Tom Jasikoff *	USFWS Montezuma NWR
Team Member	John DeHollander	USDA NRCS, Oswego Co
Team Member	Rob Hoelscher	USFS - Finger Lakes NF
Team Member	Seth Ausubel	USEPA
Team Member	Tim Noga	NYSCC
Team Member	Craig Tryon	CFAB
Team Member	Karen Edelstein	Finger Lakes Land Trust
Team Member	Katie Malinowski	Tug Hill Commission
Team Member	Brian Slack	Genesee/Finger Lakes RPC
Team Member	Anne Saltman	CNY Reg Plang & Dvlpmt Bd
Team Member	Molly Thompson	Sea Grant
Team Member	John VanNiel	Friends of Montezuma
Team Member	Gerry Smith	Onondaga Audubon Society
Team Member	Kurt Snyder	Oneida Lake Association
Team Member	Kevin Olvany	Canandaigua L W'shed Council
Team Member	Sheila Hess	Ducks Unlimited
Team Member	Mike Burger	Audubon NY
Team Member	Guy Baldassarre	SUNY ESF
Team Member	Jim Gibbs	SUNY ESF
Team Member	Peter Rosenbaum	SUNY Oswego
Team Member	Paul Shipman	RIT
Team Member	Mike Richmond *	Cornell Coop Research Unit
Team Member	Charles Smith	Cornell Univ
Team Member	Sandra Bonanno	Consulting Ecologist
Team Member	Bob Chambers	Consulting Ecologist

SW Lake Ontario Basin	Name	Affiliation
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Watershed Co-Lead	Michael Wilkinson	DEC
Team Member	David Klein	Nature Conservancy
Team Member	Ken Roblee	DEC
Team Member	Mike Morgan	Audubon
Team Member	Paul Hess	FWS
Team Member	Sheila Hess	DU
Team Member	Robert Remillard	NRCS
Team Member	Shanna Shaw	NRCS
Team Member	Dave Woodruff	DEC Region 8 Wildlife
Team Member	Fred Luckey	EPA
Team Member	Brad Hammers	DEC Region 8 Fisheries
	Brian Slack	Genesee/Finger Lakes Regional Planning Council
	George Devolos	OPRHP

Susquehanna Basin	Name	Affiliation
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Watershed Co-Lead	Dave Lemon	DEC, R-7 Fisheries
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Team Member	Al Breisch	DEC, Endangered Species Unit
Team Member	Michele Brown	The Nature Conservancy
Team Member	Dave Bryson	U.S. Fish and Wildlife Service
Team Member	Doug Carlson	DEC, R-6 Fisheries
Team Member	Jim Curatolo	Upper Susq. Coalition
Team Member	Jennifer Green Fais	Southern Tier Central Regional Planning and Development Com.
Team Member	Bill Harmon	SUNY Oneonta Field Station
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Team Member	Dale Madison	SUNY Binghamton Center for Watershed Studies
Team Member	Chip McElwee	Broome Co. SWCD
Team Member	Al Peterson	NYS Electric and Gas
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Team Member	Kirstin Seleen	The Nature Conservancy
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Watershed Lead	Leslie Zucker	Cornell /DEC
Watershed Co-Lead	Nancy Heaslip	DEC Region 4 Wildlife
Team Member	Dan Zielinski	DEC Region 4 Fisheries
Team Member	Ted Kerpez	DEC Region 3 Wildlife
Team Member	Mike Flaherty	DEC Region 3 Fisheries
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Appendix F. (Cont'd)

Species experts consulted in compilation of list of species of greatest conservation need.

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