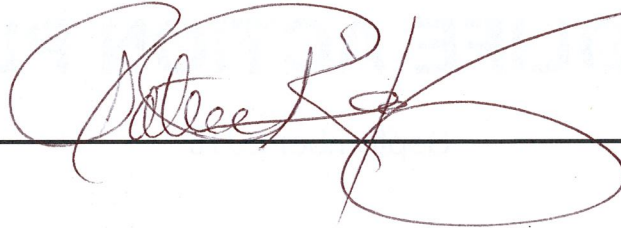NEW YORK
STATE OF
OPPORTUNITY.

Department of
Environmental
Conservation

NEW YORK STATE
WILDLIFE ACTION PLAN

September 2015

Reviewed and Approved by:

Patricia Riexinger, Director

Division of Fish and Wildlife
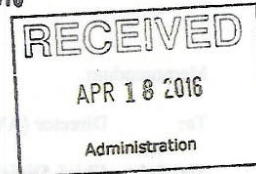
United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

In Reply Refer To:
FWS/R5/WSFR/062591

APR 13 2016

Patricia Riexinger
New York Department of Environmental Conservation
Division of Fish, Wildlife and Marine Resources
625 Broadway
Albany, New York 12233-4750

Dear Ms. Riexinger:

Congratulations! The U.S. Fish and Wildlife Service (Service) has approved the 2015 New York State Wildlife Action Plan (Plan), which is an update of the original Plan submitted in 2005. It will serve as New York's comprehensive wildlife conservation strategy for the next 10 years, unless you choose to revise it sooner.

Congress directed States to commit to reviewing and, if necessary, revising their Plans within 10 years of initial Plan submission. To carry out this directive, the Service and the Association of Fish and Wildlife Agencies (AFWA) jointly issued guidance on July 12, 2007 on how to complete these updates, including comprehensive Plan review and interim revision.

Each Region has a Regional Review Team (Team) consisting of at least one State director and the Service's Assistant Regional Director for Migratory Birds and State Programs or similar designee. Consistent with the 2007 guidance, a State director may not evaluate the plan from his or her agency.

Your Plan was reviewed by David Whitehurst, Director, Bureau of Wildlife Resources, Virginia Department of Game and Inland Fisheries (VADGIF), and Colleen Sculley, Chief, Region 5 Wildlife and Sport Fish Restoration Program, USFWS, with assistance from State and Service staff. The Team reviewed the eight elements of New York's Plan and recommended Service approval. The Team's analysis is enclosed.

Ms. Wendi Weber, the Service's Northeast Regional Director, Mr. Thomas Busiahn, Chief of Policy and Programs for Wildlife and Sport Fish Restoration (WSFR), and Mr. Hannibal Bolton, WSFR Assistant Director have recommended that we approve the Plan. I concur with their recommendation.

We are confident that the Plan will yield great benefits for the conservation of New York's fish and wildlife resources. We look forward to working with you as you implement it.

Sincerely,

Deputy   DIRECTOR

Table of Contents

Executive Summary

New York is proud to be a leading state working to conserve natural resources and to maintain a healthy environment for people and wildlife. In compiling New York's State Wildlife Action Plan (SWAP), the New York State Department of Environmental Conservation (DEC) worked with many conservation partners. While the SWAP is not a state agency work plan, it guides all partners' efforts to protect Species of Greatest Conservation Need (SGCN) in the state.

The SWAP assessed 597 species, identifying important habitats, population trends, and the scope and severity of threats for each. The species assessments resulted in designating 366 species as SGCN, 166 of which are designated High Priority SGCN. There was insufficient data to establish population trends for 113 species which are thus designated as Species of Potential Conservation Need (SPCN).

Boreas River, Adirondacks
(Photo: Catherine Rusch, NYSDEC Five Rivers)

Threats are categorized using the International Union for the Conservation of Nature (IUCN) threat classification system. Threats that are most pervasive and of highest concern to SGCN include: pollution, invasive species, climate change, and loss of habitat to development.

Conservation actions to mitigate the threats, stabilize the population, and gather needed data are compiled into the following goals:

- Protect adequate and viable habitats for SGCN.

- Manage and restore habitats to benefit SGCN.

- Protect SGCN populations to reverse declines in abundance or loss of range.

- Manage SGCN to restore self-sustaining populations.

- Develop and maintain current monitoring data on SGCN populations and habitats.

- Foster research to improve our knowledge regarding SGCN populations and habitats.

- Effectively communicate with all audiences regarding conservation of SGCN to inform the public and engage the conservation community.

- Continue to integrate conservation of SGCN into the many forms of natural resource conservation planning.

Actions were evaluated to prioritize those that benefit the most SGCN, benefit high priority SGCN, and address the threats to species and habitats. Priority actions were characterized as either state-wide or geographically focused. Geographic focus is based upon ecoregion for terrestrial species, watershed for freshwater aquatic species, and habitat type for marine species.

A SWAP Advisory Committee was convened to guide development of the SWAP, and it is expected that the Advisory Committee will continue to meet to coordinate activities during implementation. Outreach efforts to inform, consult, and engage with the public, conservation partners, local governments, and Indian Nations were conducted throughout the development of the SWAP, including presentations, website, press releases, and solicitation of public comments.

Chapter 1: Introduction

In 2001, the Wildlife Conservation and Restoration Act was passed by the U.S. Congress and signed into law, initiating the State Wildlife Grant (SWG) program. The primary goal of the federal SWG program is to prevent additional species from being federally listed as threatened or endangered by implementing conservation actions before the species becomes critically imperiled. The SWG program is administered by the U.S. Fish and Wildlife Service (USFWS), which disburses annual Congressional funding allocations by formula to states and territories. In order to receive SWG funding, states were required to complete a Comprehensive Wildlife Conservation Strategy (CWCS). The CWCS developed a list of Species of Greatest Conservation Need (SGCN), assessed threats to SGCN and their habitats, and described conservation strategies, monitoring plans, and public outreach efforts. The New York CWCS was approved on April 21, 2006.

The American woodcock population is declining due to natural succession in forested habitats.
(Photo: John Shea NYSDEC)

To remain eligible for SWG funding, states are required to update their conservation plans at least every 10 years in a SWAP. The SWAP is a conservation plan for rare, declining, or at-risk species, with the goals to identify important actions that will conserve wildlife diversity, improve coordination of state agencies and partners in conservation, and inform and engage the public in biodiversity conservation. Although required by Federal law to remain eligible for SWG funding, this plan is designed to help New York conserve its rich and valuable biodiversity.

Conservation Planning in New York

Conservation plans have been developed for numerous species and geographic areas in New York. The USFWS, DEC, and partners have developed conservation plans for more than 20 species, and work continues to plan and implement conservation at various levels. Conservation and management plans have also been developed for many geographic areas of New York. Watershed-based plans have been developed for all major watersheds in the state, often including an interstate and international steering committee to coordinate conservation with neighboring jurisdictions. The watershed plans identify important natural resources, conservation threats, and recommended actions within the watershed, and most have a sub-section specific to biodiversity conservation. Collectively, these species and watershed plans provide a solid foundation for comprehensive conservation planning at the landscape level.

In 2012, the USFWS completed a strategic plan for the New York and Long Island field offices. This plan identifies 41 priority representative plant and animal species, 30 of which are SGCN, and eight geographic focal areas. The representative species approach provides benefit to numerous New York SGCN from implementation of the conservation actions identified for the representative species. The USFWS Strategic Habitat Conservation Methodology used four phases—biological planning, conservation design, conservation implementation, and monitoring—to describe conservation actions for the representative species in each focal area. The strategic plan takes an adaptive management approach to implementation, using monitoring data to determine priority actions for annual USFWS work plans.

Northeast Regional Conservation

Since the 1970s, the Northeast Association of Fish and Wildlife Agencies (NEAFWA) has coordinated biodiversity conservation efforts in the 13 northeastern states (Virginia to Maine) through a committee of biologists now known as the Northeast Fish and Wildlife Diversity Technical Committee. In 2007, NEAFWA and the USFWS established a collaboration for integrating a regional context into SWG-funded projects, called the Northeast Regional Conservation Needs (RCN) Program. The RCN Program formalizes a cooperative approach to address SGCN needs across multiple states. The purpose of the RCN program is to develop, coordinate, and implement conservation actions that are regional/sub-regional in scope, and build upon the many regional initiatives that already exist. Since 2007, 37 different projects have been funded; the resulting reports and products can be found at RCNgrants.org.

The New York SWAP is designed to roll up to a regional level, with standardized terminology for conservation threats and actions, and compatible habitat classifications. This enables the SWAP to describe the aspects of conservation which are unique to New York, while facilitating conservation at a broader regional level.

National and International Context

The SWAP is written as a document for biodiversity conservation within New York State but recognizes that many SGCN cross interstate and international boundaries, either as part of their natural migration or as victims of illegal trafficking in wildlife. So while the recommended conservation actions describe work within New York only, there will continue to be a need for inter-jurisdictional coordination of conservation. The foundation set by the Migratory Bird Treaty Act, and built upon by the Neotropical Migratory Bird Conservation Act, provides a model for international cooperation in conservation, and the SWAP recognizes that this type of large-scale cooperation is essential to the conservation of some SGCN.

About this Document

The CWCS was developed as a comprehensive document which included every possible conservation action proposed by DEC staff and partners, and is available at www.dec.ny.gov/animals/30483.html. It was drafted to include the full range of potential conservation actions for SGCN and described priorities at the statewide and watershed levels. The SWAP is intended to be a more concise planning document, focusing on the species for which immediate conservation action is needed, and recommending those actions which are feasible and achievable in a ten-year timeframe. The purpose of the SWAP is to identify Species of Greatest Conservation Need, their habitats, population threats, and recommended actions for their conservation. It will guide DEC and conservation partners in coordinating biodiversity conservation work in New York for the next ten years.

The SWAP is not a DEC work plan, but rather a broad conservation plan for New York State, partners, and stakeholders. It will be used by DEC and partners to guide work planning, support organizational decision-making, help educate stakeholders, and foster collaboration. A diverse group of conservation partners has guided development of the document through the SWAP Advisory Committee, and it is expected that this committee will continue to meet to guide implementation of recommended actions. DEC will lead and coordinate implementation, but the actions described in the SWAP will require active engagement of the broader conservation community in New York.

There are eight required elements of the SWAP:

1. **The distribution and abundance of species of wildlife the state wildlife agency deems indicative of the diversity and health of the state's wildlife.** The process to select SGCN is described in Chapter 3, and the technical information is in the species assessments, which are available at: http://www.dec.ny.gov/animals/7179.html.

2. **The location and relative condition of key habitats and community types.** This information is summarized in Chapter 4 and presented in its entirety in the habitat report, available at: http://www.dec.ny.gov/animals/7179.html.

3. **The threats that may adversely affect SGCN or their habitats.** The scope, severity, and irreversibility of threats were identified by committees of taxonomic experts. An analysis of this information is contained in Chapter 5.

4. **The actions necessary to conserve SGCN and their habitats, and priorities for implementing these conservation actions.** The conservation actions are listed in Chapter 6, and prioritization of the actions is in Chapter 8.

5. **Proposed plans for monitoring SGCN and their habitats.** Plans for monitoring SGCN and habitats are in Chapter 7, and existing monitoring programs are in Appendix 2.

6. **Description of procedures to review the SWAP at intervals not to exceed ten years.** The plans for updating the SWAP are in Chapter 9.

7. **Plans for coordinating the development, implementation, review, and revision of the SWAP with federal, state, and local agencies and Indian nations.** A description of the inter-jurisdictional coordination of the SWAP is in Chapter 8.

8. **Public participation in developing and implementing the SWAP.** The public outreach effort for the SWAP is summarized in Chapter 2.

Blanding's turtle that was radio-tagged and tracked in Wilton Wildlife Preserve in Saratoga County. In New York, the largest population of this species is located in the northern part of the state along the St. Lawrence River, and the second largest is in Dutchess County.

(Photo: Ryan von Linden, NYSDEC)

Chapter 2. Development of the SWAP

Development of the SWAP started with a compilation of current abundance, distribution, and threat information for species assessments, which provide the technical foundation for categorizing SGCN. In addition to the numerous data sources noted in the bibliographies of the species assessments and the SWAP, 106 DEC staff, 16 staff from other New York State agencies, 17 State University of New York faculty, 11 staff from federal agencies, and 113 taxonomic experts from conservation partners participated in drafting and reviewing the species assessments. The habitat classification was developed by The Nature Conservancy in coordination with the other states in the USFWS northeast region, and the habitat condition assessment was completed by the New York Natural Heritage Program. In addition to completing this technical review of species and conservation actions, an outreach plan was developed to guide communications with partners, stakeholders, and the public. The SWAP Outreach Plan describes three levels of communication:

- Inform as many people as possible about the SWAP in order to maintain transparency so that any reasonable person could understand the underlying authority, methodology, and goals of the SWAP.

- Consult with people and organizations that have a particular interest in the outcome of the SWAP, either because they share a goal of fostering wildlife conservation or because they may have concerns about potential impacts the SWAP may have to their property, business, or lifestyle.

- Engage partners and stakeholders in an ongoing discussion related to the SWAP. Outreach efforts at this level were targeted towards natural resource conservation professionals, scientists, conservation partners, and policy-makers, with a goal of incorporating their particular expertise into development and implementation of the SWAP.

During development of the SWAP, presentations were made to several groups, including the New York State Association of Environmental Management Councils, the Haudenosaunee Environmental Task Force, DEC Watershed Coordinators Forum, and staff meetings of DEC and other state agencies. More than a dozen inquiries from media reporters were addressed, resulting in newspaper and radio publication of SWAP-related articles.

The draft SGCN list was released for public comment in December 2014. Approximately 2,420 responses to release of the draft SGCN list were received. The comments were generally supportive of the draft SGCN list, and the process used to develop the list. The draft SWAP was released for a 45 day public comment period in June 2015. Concurrent with the comment period, a public meeting was held in each of the nine DEC regions, providing a forum for discussion of the SWAP, as well as local conservation concerns. In total, more than 100 people attended the regional meetings, providing both broad comment on the role of the SWAP in environmental protection, and specific editorial suggestions. During the SWAP public comment period approximately 2100 comments were received. Most conservation partner organizations provided formal comment, and a letter jointly signed by 16 conservation partner organizations effectively compiled the various partner comments. The comments identified two aspects of the draft SWAP that could be improved; the statewide perspective lacked geographic specificity that would be helpful for implementation, and the prioritization of goals rather than conservation actions was overly broad. In response, the actions pertaining to high priority SGCN were identified, and sorted into actions that apply statewide, and actions that have a narrower geographic focus, described by ecoregion, watershed, and habitat type. This action prioritization better describes where in New York conservation actions are expected to yield the most benefits, allowing DEC and partners to focus SWAP implementation work on the highest priority species and habitats.

Chapter 3: Identifying Species of Greatest Conservation Need

In evaluating SGCN, we considered all mammals, fish, birds, amphibians, and reptiles present in New York, but considered only selected mollusks, crustaceans, and arthropods. The process to revise the SGCN list in New York involved a comprehensive review of the status of each species. The first step was to determine the current status of the 537 species designated as SGCN in the CWCS, plus an additional 60 species nominated for evaluation by DEC staff and species experts. This information was incorporated into species assessment documents, which were drafted by DEC staff in the Division of Fish, Wildlife, and Marine Resources (DFWMR). The species assessments briefly describe life history, protected status, current status and trends in abundance and distribution, percent of New York where the species occurs, relative importance of the New York population to the North American population, intrinsic vulnerability, viability, and conservation threats for each species.

Meetings of invited experts were held for each of the various taxa. At these meetings, information in the species assessments was reviewed and augmented or corrected where necessary. The taxonomic experts also provided numeric estimates of the certainty of the scientific information in the species assessments. Concurrent with drafting the species assessments, staff from the New York Cooperative Fish and Wildlife Research Unit at Cornell University, with input from a group of biodiversity experts from conservation partners and DEC staff, developed a model to categorize SGCN. The model inputs were the population criteria, threats, and estimates of certainty from the species assessments. This model guided listing and categorization of species, which is presented in Appendix 1. The draft list was reviewed by experts and subject to public review and comment in December 2014. As a result of comments received, three additional species were evaluated and added to list, and minor changes were made to the listing status for a small number of species.

The eastern spadefoot toad's name comes from the sickle-shaped spade on its hind feet that it uses for digging burrows. This species prefers well-drained, sandy soil in open forests, brushy areas, and meadows. It is not easy to detect because it spends most of its life underground, and emerges to breed in temporary pools created by intense rainstorms.

(Photo: Amanda Dillon, Albany Pine Bush Preserve Commission)

A timber rattlesnake basks in the sun before entering the den for winter hibernation. This species is threatened by habitat loss and illegal collection.

(Photo: NYSDEC)

Category Definitions

High-Priority Species of Greatest Conservation Need

The status of these species is known, and conservation action is needed in the next ten years. These species are experiencing a population decline, or have identified threats that may put them in jeopardy, and are in need of timely management intervention, or they are likely to reach critical population levels in New York.

Species of Greatest Conservation Need

The status of these species is known and conservation action is needed. These species are experiencing some level of population decline, have identified threats that may put them in jeopardy, and need conservation actions to maintain stable population levels or sustain recovery.

Species of Potential Conservation Need

A species whose status is poorly known, but there is an identified threat to the species or features of its life history that make it particularly vulnerable to threats. The species may be declining or begin to experience declines within the next ten years, and studies are needed to determine their actual status.

Extirpated Species

These species have been extirpated from New York, and no populations currently exist in New York State.

Non-SGCN

These species have been determined to be stable and secure and do not require management intervention over the next ten years to maintain their populations within New York. These include species that were evaluated because they were designated as SGCN in the CWCS or were nominated for evaluation as SGCN.

Never Present in New York

These are species that were designated as SGCN in the CWCS, but upon further investigation, are now thought to never have been present in New York.

Brook Trout- *Salvelinus fontinalis*
averages 6 - 10 inches in streams;
10 - 12 inches in ponds

Wild populations of brook trout are being conserved through the Eastern Brook Trout Join Venture.

Table 1 summarizes the number of species in each taxa designated as High Priority SGCN, SGCN, or SPCN.

Table 1. Taxonomic Summary of SGCN List

	High-Priority SGCN	SGCN	SPCN
Taxa			
Mammals	6	5	3
Birds	45	59	8
Reptiles	12	12	0
Amphibians	7	5	5
Freshwater Fish	15	27	0
Marine Fish	9	13	1
Sharks, Skates, and Rays	7	8	8
Whales, Dolphins, and Porpoises	6	1	0
Sea Turtles	4	0	0
Marine Mollusks	3	2	0
Crustacea and Meristomata	2	2	3
Freshwater Mollusks	14	13	15
Mayflies	1	6	12
Dragonflies and Damselflies	11	27	15
Stoneflies	0	4	6
Beetles	8	0	3
Butterflies and Moths	10	16	33
Bees	6	0	1
Total	**166**	**200**	**113**

SPECIES OF POTENTIAL CONSERVATION NEED

Updating the list of Species of Greatest Conservation Need (SGCN) involved assessing the status of 597 species, especially trends in its abundance and distribution in New York and neighboring states and provinces. These data were used to categorize SGCN and to designate high-priority SGCN. Population trend information was not available for some species because they have not been studied historically or are difficult to monitor or are inherently rare. Because it was not possible to assess their actual status, a new category was created—Species of Potential Conservation Need (SPCN). The SWAP contains recommendations for gathering additional information on these species so that it is possible to determine their actual status. At that time, the SGCN list can be updated to accommodate any species, as appropriate.

The brief summary in Table 2 indicates that the percentage of species in a taxa designated as SGCN varies widely, from 1.8 percent of the species of Lepidoptera (butterflies and moths) present in New York, to 61.5 percent of the reptiles currently extant in the state.

Table 2: Percentage of Species Present in New York listed as SGCN by Taxa

Taxa	Total Number of Species in NY	Number of Species Assessed	Number of SGCN	Number of High-Priority SGCN	Percent of Total listed as SGCN and High-Priority SGCN
Amphibians	32	17	5	7	37.5
Reptiles	39	25	12	12	61.5
Birds	485	120	59	45	21.4
Mammals	92	26	6	12	19.5
Freshwater Fish	165	53	27	15	25.4
Marine Fish	338	49	13	9	6.5
Lepidoptera	1437	112	16	11	1.8
Odonates	189	63	11	27	20.1
Freshwater Mollusks	134	55	13	14	20.1

In addition to this analysis of SGCN by taxa, one emerging conservation concern that impacts species from multiple taxa and has broad economic and ecological implications is the decline in pollinator species. Pollination is a symbiotic relationship between plants and animals where the animal receives food in the form of nectar or pollen, and the plant receives transfer of reproductive cells between individuals. Pollination is essential to the reproduction of roughly 75 percent of flowering plants worldwide. Declines in some pollinator species populations have been documented and traced to disease, habitat loss, pesticides, and changing agricultural practices. The nine bumblebee species and most of the 115 species of Lepidoptera listed as SGCN in the New York SWAP are pollinator species.

Young inland barrens buckmoth larvae are found in clusters on scrub oak in May and are black and spiny.
(Photo: Amanda Dillon, Albany Pine Bush Preserve Commission)

EXTIRPATED LARGE CARNIVORES

The CWCS included wolves, cougars, and lynx as SGCN and recommended studies to evaluate the feasibility of reintroducing these extirpated species to New York. In writing the SWAP, DEC chose not to include extirpated large carnivore species as SGCN in order to focus conservation resources on resident species that currently have a population at risk in New York.

Proponents of restoration have noted the research showing that loss of large predators can cause alterations of ecology at lower trophic levels, such as those we see with overabundant deer impacting forest regeneration. They have also provided economic justifications for restoring large carnivores, such as reducing the number of deer-vehicle collisions and increased opportunities for eco-tourism. Conversely, there is opposition to reintroducing large carnivores from people concerned about livestock depredation, possible impacts to game species, and the potential for attacks on humans.

Social surveys show there is some public support for large carnivores recolonizing New York through natural range expansion but less support for projects to reintroduce these species directly. The SWAP recommends actions to foster regional habitat connectivity, which will facilitate natural recolonization of New York by these extirpated large carnivores as conditions permit. Not including extirpated large carnivores on the SGCN list means that restoring them is not a conservation priority but does not prevent partner projects related to their restoration in New York.

Chapter 4: Location and Condition of Habitats

New York has a great diversity of habitat types. Some areas of New York are highly impacted by human land uses, but there are five areas of large, relatively intact forests: Adirondacks, Catskills, Allegheny, Tug Hill, and Rensselaer Plateau, and smaller forest blocks that occur at several locations throughout the state. Beach and dune systems are critical habitats on the Great Lakes and Long Island shorelines, and pine barren habitats sustain populations of SGCN at multiple locations. There is a diversity of wetland habitat types, including some that are globally rare. Stream systems range from mountain streams to major rivers flowing to the Atlantic Ocean, Mississippi River, and St. Lawrence River.

The habitat analysis conducted for the SWAP presents habitat locations and evaluates habitat conditions. The classification and location of habitat types in New York has been well documented and mapped by the New York Natural Heritage Program, The Nature Conservancy, and other partners. Habitat type is primarily defined by land cover, particularly vegetative cover. The habitat for each SGCN is described by habitat type, although the species may occupy only a subset of this habitat type in New York State. Given the complexities of assessing habitat condition by measuring on-the-ground parameters across such a large and diverse area, the habitat condition assessment relies heavily on a Geographic Information System (GIS) analysis. The habitat assessment is described below, and the complete report is available on the DEC website at: http://www.dec.ny.gov/animals/7179.html.

In 1972, DEC purchased over 2,000 acres for a Wildlife Management Area (WMA) within the Bashakill, the largest freshwater wetland in southern New York. DEC manages these lands to provide wildlife habitat and recreational opportunities.
(Photo: Jenny Murtaugh, NYSDEC)

Terrestrial Habitats

The terrestrial habitat classification system and map were completed as part of a regional habitat project supported by the Northeast Regional Conservation Needs Program. The terrestrial habitat classification system is presented in Table 3.

Table 3. Terrestrial Habitat Classifications

Formation Class	Formation	Macrogroup	New York Habitat Type
Forest and Woodland	Northeast Upland Forest	Central Oak-Pine	Oak-Pine Forest
			Oak Forest
			Pine Barrens
			Coastal Hardwoods
			Coastal Coniferous Barrens
		Northern Hardwood and Conifer	Mixed Northern Hardwoods
		Plantation/Pioneer Forest	Plantation, Disturbed Land, Pioneer Forest
		Exotic Upland Forest	Non-native Upland Forest
	Northeast Wetland Forest	Coastal Plain Swamp	Atlantic White Cedar Swamp
			Coastal Red Maple-Black Gum Swamp
		Central Hardwood Swamp	Hardwood Swamp
		Northeast Floodplain Forest	Floodplain Forest
			Riparian
		Northern Swamp	Conifer Forest Swamp
			Northern White Cedar Swamp
			Mixed Hardwood Swamp
	Boreal Upland Forest	Boreal Upland Forest	Spruce-Fir Forests and Flats
			Mountain Spruce-Fir Forests
	Boreal Wetland Forest	Boreal Forested Peatland	Boreal Forested Peatland
Shrubland and Grassland	Shrubland and Grassland	Glade and Savanna	Native Barrens and Savanna
		Outcrop and Summit Scrub	Rocky Outcrop
		Lake and River Shore	Lake and River Beach
		Disturbed Land/Pioneer	Non-native Shrublands
			Powerline
			Old Field/Managed Grasslands
	Coastal Scrub-Herb	Coastal Grassland/Shrubland	Great Lakes Dune and Swale
			Maritime Dunes

Formation Class	Formation	Macrogroup	New York Habitat Type
	Peatland	Northern Peatland	Open Acidic Peatlands
		Central Appalachian/Coastal Peatland	Open Alkaline Peatlands
	Freshwater Marsh	Coastal Plain Pond	Coastal Plain Pond
		Emergent Marsh	Freshwater Marsh
			Great Lakes Freshwater Estuary Marsh
		Wet Meadow/Shrub Marsh	Wet Meadow/Shrub Marsh
		Modified/Managed Marsh	Modified/Managed Marsh
Alpine	Alpine	Alpine	Alpine
			Subalpine Woodland and Shrub
Sparsely Vegetated Rock	Cliff and Rock	Cliff and Talus	Cliff and Talus
			Erosional Bluff
Agricultural	Agricultural	Agricultural	Cultivated Crops
			Pasture/Hay
Developed	Developed	Maintained Grasses and Mixed Cover	Urban and Recreational Grasses
		Urban/Suburban	Commercial/Industrial and Residential
			Residential Rural
		Subterranean	Caves and Tunnels
		Extractive	Surface Mining

Figure 1. Terrestrial Habitat Location

Legend

Alpine		Surface Mining	
Atlantic White Cedar Swamp		Non-native Shrublands	
Cliff and Talus		Old Field/Managed Grasslands	
Coastal Coniferous Barrens		NLCD remainders: classes 52, 78	
Coastal Hardwoods		Northern White Cedar Swamp	
Coastal Red Maple-Black Gum Swamp		Oak Forest/Pine Barrens	
Floodplain Forest		Oak-Pine Forest	
Freshwater Marsh		Open Acidic Peatland	
Freshwater Tidal Swamp		Open Alkaline Peatland	
Great Lakes Dune and Swale		Open Water	
Hardwood Swamp		Rocky Outcrop	
Maritime Dunes		Salt Marsh	
Mixed Hardwood Swamp		Spruce-Fir Forest and Flats	
Mixed Northern Hardwoods		Wet Meadow/Shrub Swamp	
Mountain Spruce-Fir Forest		Residential Rural	
Native Barrens and Savanna		Urban and Recreational Grasses	
Cultivated Crops		Commercial/Industrial and Residential	
Pasture/Hay		NLCD remainders: developed classes 21-24 & 31	
NLCD remainders: classes 81, 82			

Terrestrial habitat condition was assessed by scoring each habitat macrogroup type in the Index of Ecological Integrity (IEI) and the Landscape Condition Assessment (LCA). The IEI is a metric that depicts the ecological integrity of locations throughout the northeastern United States, based on environmental conditions existing in approximately 2010. The developers defined ecological integrity as the ability of a site (either local or at the landscape scale) to maintain important ecological functions over considerable time. The IEI considers three major components of landscape integrity: the level of anthropogenic stressors, the capacity to recover from disturbance, and connectivity.

The LCA depicts human impacts to habitats across the landscape of the state. The model includes 13 inputs: six transportation themes depicting roads of increasing size and impact and active rail lines; three development themes that increase in intensity; two types of utility corridor; and two managed open space themes (agricultural and open space).

These two indices of terrestrial habitat conditions were applied to various habitat types to predict the condition of that habitat type in each of the major ecoregions of the state. For each habitat type, there is also a list of SGCN that use the habitat, providing a link between habitat condition and SGCN.

Marine Habitats

The marine habitats in this plan are classified and described using the classification system developed through northeast regional and New York efforts. This is also the system used in the Species Status Assessments to link each SGCN to a habitat. The classification is hierarchical; this plan depicts and assesses nine marine types at the mesohabitat level, as shown in Table 4.

Table 4. Marine Habitat Types

System	Mesohabitat	Macrohabitat
Marine Habitats		
	Marine Intertidal	
		Artificial Structure
		Aquatic Bed
		Benthic Geomorphology
	Marine Subtidal Shallow	
		Artificial Structure
		Aquatic Bed
		Benthic Geomorphology
	Marine Subtidal Deep	
		Artificial Structure
		Benthic Geomorphology
Estuarine Habitats		
	Brackish Intertidal	
		Benthic Geomorphology
		Tidal Wetland
	Brackish Subtidal Shallow	
		Artificial Structure
		Aquatic Bed
		Benthic Geomorphology
	Brackish Subtidal Deep	
		Artificial Structure
		Benthic Geomorphology
	Freshwater Tidal Intertidal	
		Artificial Structure
		Aquatic Bed
		Benthic Geomorphology
	Freshwater Tidal Subtidal Shallow	
		Artificial Structure
		Aquatic Bed
		Benthic Geomorphology
	Freshwater Tidal Subtidal Deep	
		Benthic Geomorphology

Figure 2. Marine Habitat Types in New York

Legend

a. marine; subtidal deep	f. brackish; intertidal
b. marine; subtidal shallow	g. freshwater tidal; subtidal deep
c. marine; intertidal	h. freshwater tidal; subtidal shallow
d. brackish; subtidal deep	i. freshwater tidal; intertidal
e. brackish; subtidal shallow	j. upland and non-tidal
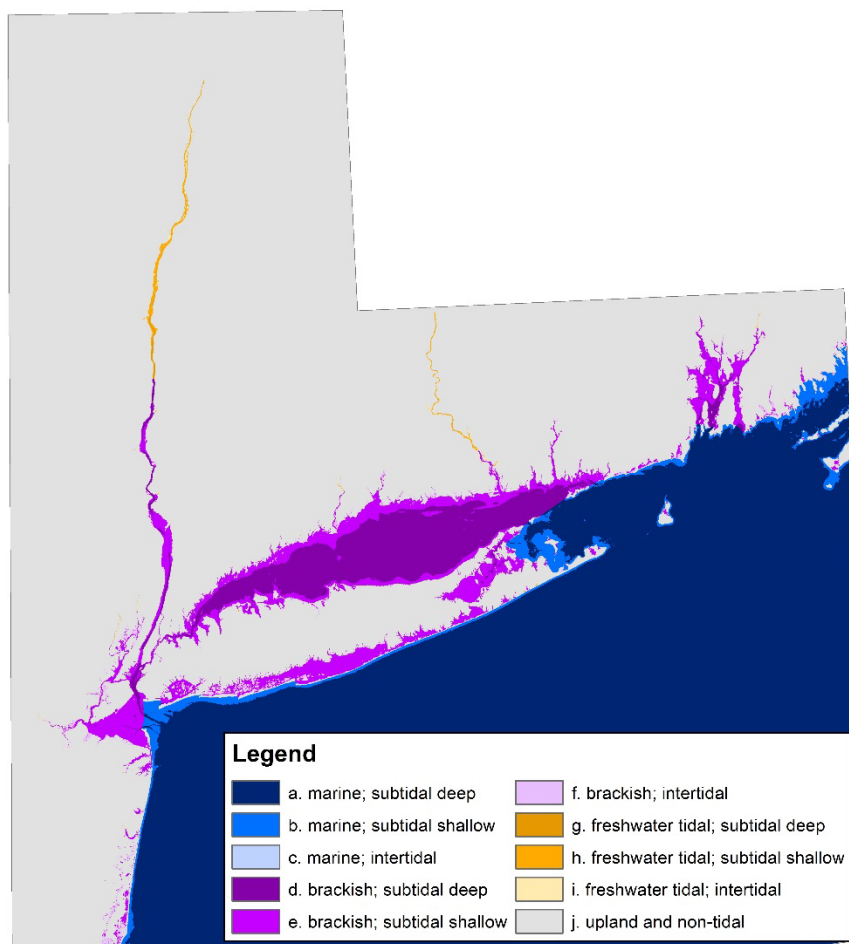
The Marine Habitat Condition Assessment followed the Watershed Boundary Dataset (formerly Hydrologic Unit Code) divisions, dividing the marine and estuarine environment into 24 areas. Marine habitat condition was assessed using scores from five metrics: heavy metal contamination in sediment, Chlorophyll A in open water, dissolved inorganic nitrogen in open water, dissolved inorganic phosphorus in open water, and upland condition adjacent to intertidal habitats. Metals contamination in sediment was assessed using results from combined sediment samples from the *EPA National Coastal Condition Report IV* and from the Hudson River Estuary Program Biocriteria Project. These sediment samples occur in many, but not all of the habitats described in this report; they seem to be most effective at capturing the shallow, sub-tidal zones. A combined metric was generated using the methods developed by EPA. First, the most recent concentration value for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were assembled. We used the ERL (Effects Range Low) and ERM (Effects Range Median) values and cutoffs for each metal published in the EPA report. Thus, each sample was assigned a good, fair, or poor rating based on the number of analyte readings exceeding the ERL and/or ERM.

Lying between blades of eelgrass, a bay scallop feeds on small microscopic plants carried by the water currents and a hard clam burrows in the muddy shores.
(Photo: Scott Hughes)

The System-Wide Eutrophication Model is a water quality model that was used to assess habitat condition based upon levels of chlorophyll A, dissolved inorganic nitrogen, and dissolved inorganic phosphorus in open water. Applying this model to marine habitats, and using cutpoints from the *EPA National Coastal Condition Report IV*, provided additional metrics of marine habitat condition. Finally, to assess the condition of intertidal habitats, the Landscape Condition Assessment model developed by New York Natural Heritage Program staff was used to analyze human impacts to adjacent upland habitats.

Freshwater Habitats

The Freshwater Habitat Assessment is organized by the eight-digit hydrologic unit codes, ten of which are wholly or partially in New York State.

Figure 3. Major (HUC 8) Watersheds of New York
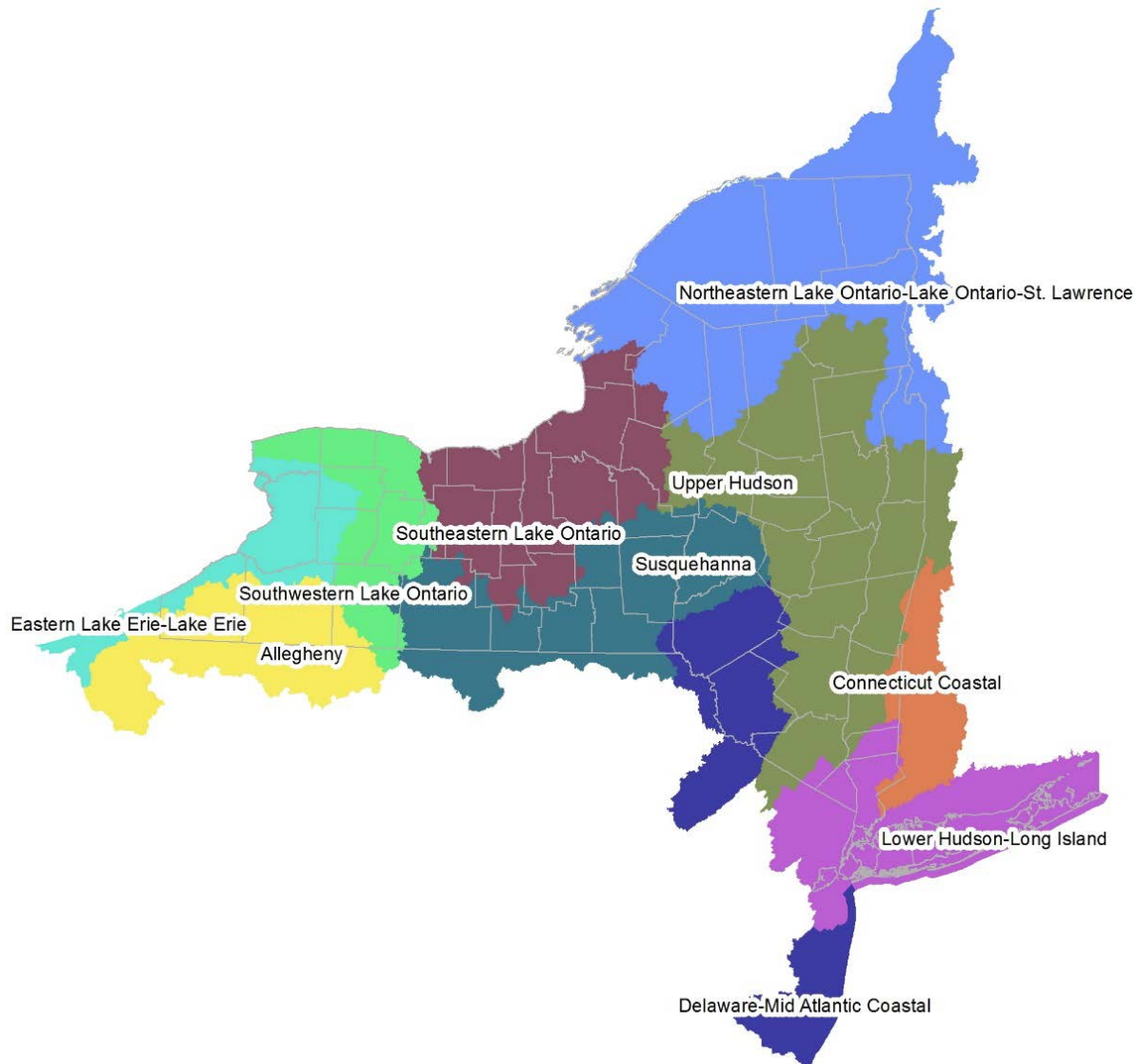
The aquatic habitat classification system was developed through a workgroup of biologists from the 13 northeast states and conservation partners, and is hierarchical based upon stream size, gradient, pH, and temperature. Lake habitats were classified based upon lake size and trophic state. This classification is presented in Table 5 and was used to map freshwater aquatic habitats for the entire state.

Table 5. Freshwater Aquatic Habitat Types

System	Gradient	Buffering	pH	Temperature
Headwater	Low Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Transitional Cool
				Warm
	Low-Moderate Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Cold
				Transitional Cool
	Moderate-High Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Cold
				Transitional Cool
	High Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Cold
				Transitional Cool

System	Gradient	Buffering	pH	Temperature
Small River	Low Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Transitional Cool
	Low-Moderate Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Transitional Cool
	Moderate-High Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Transitional Cool
	High Gradient	Low Buffered	Acidic	Cold
				Transitional Cool
				Warm
		Moderately Buffered	Neutral	Cold
				Transitional Cool
				Warm
		Highly Buffered	Calcareous	Transitional Cool
Medium River	Low Gradient	Moderately Buffered		Cold
				Transitional Cool
				Warm
	Low-Moderate Gradient	Moderately Buffered		Cold
				Transitional Cool
				Warm
	Moderate-High Gradient	Moderately Buffered		Cold
				Transitional Cool
				Warm

System	Gradient	Buffering	pH	Temperature
	High Gradient	Moderately Buffered		Cold
				Transitional Cool
				Warm
Great River	Low Gradient	Moderately Buffered		Warm
	Low-Moderate Gradient	Moderately Buffered		Transitional Cool
				Warm
	Moderate-High Gradient	Moderately Buffered		Warm
	High Gradient	Moderately Buffered		Warm
Lake	Pond	Oligotrophic		
		Mesotrophic		
		Eutrophic		
	Small Lake	Oligotrophic		
		Mesotrophic		
		Eutrophic		
	Medium Lake	Oligotrophic		
		Mesotrophic		
		Eutrophic		
	Large Lake	Oligotrophic		
		Mesotrophic		
		Eutrophic		
	Very Large Lake	Oligotrophic		
		Mesotrophic		
		Eutrophic		

American Eel- *Anguilla rostrata*
averages 24-40 inches

American eel populations have been reduced due to habitat loss and pollution.

Figure 4. Freshwater Aquatic Habitats Locations

Figure 4. Freshwater Aquatic Habitats Locations

Legend (left column):

— Headwater/Creek; Low Gradient; Low Buffered, Acidic; Cold
— Headwater/Creek; Low Gradient; Low Buffered, Acidic; Transitional Cool
— Headwater/Creek; Low Gradient; Low Buffered, AcidicWarm
— Headwater/Creek; Low Gradient; Moderately Buffered, Neutral; Cold
— Headwater/Creek; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
— Headwater/Creek; Low Gradient; Moderately Buffered, Neutral; Warm
— Headwater/Creek; Low Gradient; Highly Buffered, Calcareous; Transitional Cool
— Headwater/Creek; Low Gradient; Highly Buffered, Calcareous; Warm
— Headwater/Creek; Low-Moderate Gradient; Low Buffered, Acidic; Cold
— Headwater/Creek; Low-Moderate Gradient; Low Buffered, Acidic; Transitional Cool
— Headwater/Creek; Low-Moderate Gradient; Low Buffered, Acidic; Warm
— Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Cold
— Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
— Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Warm
— Headwater/Creek; Highly Buffered, Calcareous; Cold
— Headwater/Creek; Highly Buffered, Calcareous; Transitional Cool
— Headwater/Creek; Moderate-High Gradient; Low Buffered, Acidic; Cold
— Headwater/Creek; Moderate-High Gradient; Low Buffered, Acidic; Transitional Cool
— Headwater/Creek; Moderate-High Gradient; Low Buffered, Acidic; Warm
— Headwater/Creek; Moderate-High Gradient; Moderately Buffered, Neutral; Cold
— Headwater/Creek; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool
— Headwater/Creek; Moderate-High Gradient; Moderately Buffered, Neutral; Warm
— Headwater/Creek; Moderate-High Gradient; Highly Buffered, Calcareous; Cold
— Headwater/Creek; Moderate-High Gradient; Highly Buffered, Calcareous; Transitional Cool
— Headwater/Creek; High Gradient; Low Buffered, Acidic; Cold
— Headwater/Creek; High Gradient; Low Buffered, Acidic; Transitional Cool
— Headwater/Creek; High Gradient; Moderately Buffered, Neutral; Cold
— Headwater/Creek; High Gradient; Moderately Buffered, Neutral; Transitional Cool
— Headwater/Creek; High Gradient; Moderately Buffered, Neutral; Warm
— Headwater/Creek; High Gradient; Highly Buffered, Calcareous; Cold
— Headwater/Creek; High Gradient; Highly Buffered, Calcareous; Transitional Cool
— Small River; Low Gradient; Low Buffered, Acidic; Cold
— Small River; Low Gradient; Low Buffered, Acidic; Transitional Cool
— Small River; Low Gradient; Low Buffered, Acidic; Warm
— Small River; Low Gradient; Moderately Buffered, Neutral; Cold
— Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
— Small River; Low Gradient; Moderately Buffered, Neutral; Warm
— Small River; Low Gradient; Highly Buffered, Calcareous; Transitional Cool
— Small River; Low-Moderate Gradient; Low Buffered, Acidic; Cold

Legend (right column):

— Small River; Low-Moderate Gradient; Low Buffered, Acidic; Transitional Cool
— Small River; Low-Moderate Gradient; Low Buffered, Acidic; Warm
— Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Cold
— Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
— Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Warm
— Small River; Low-Moderate Gradient; Highly Buffered; Calcareous; Transitional Cool
— Small River; Moderate-High Gradient; Low Buffered, Acidic; Cold
— Small River; Moderate-High Gradient; Low Buffered, Acidic; Transitional Cool
— Small River; Moderate-High Gradient; Low Buffered, Acidic; Warm
— Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Cold
— Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool
— Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Warm
— Small River; Moderate-High Gradient; Highly Buffered, Calcareous; Transitional Cool
— Small River; High Gradient; Low Buffered, Acidic; Cold
— Small River; High Gradient; Low Buffered, Acidic; Transitional Cool
— Small River; High Gradient; Low Buffered, Acidic; Warm
— Small River; High Gradient; Moderately Buffered, Neutral; Cold
— Small River; High Gradient; Moderately Buffered, Neutral; Transitional Cool
— Small River; High Gradient; Moderately Buffered, Neutral; Warm
— Small River; High Gradient; Highly Buffered, Calcareous, Transitional Cool
— Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Cold
— Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
— Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Medium River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
— Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Cold
— Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
— Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Cold
— Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
— Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Medium River; Moderate-High Gradient; Moderately Buffered, Neutral; Cold
— Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Cold
— Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
— Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Large/Great River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Large/Great River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Large/Great River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
— Large/Great River; High Gradient; Assume Moderately Buffered (Size 3+ rivers) Warm

Freshwater habitat conditions were assessed by summarizing three metrics for each reach: the percentage of the local catchment covered by impervious surfaces, an index of the impact of riparian development and agriculture, and the number of stream crossings by roads. This enables an assessment of stream condition at the landscape scale, but does not reflect variables that could impact stream habitat conditions at a finer scale. Efforts will continue to refine the freshwater habitat condition assessment in New York to reflect local conditions, such as degree of shading, bottom substrate, and impediments to flow.

Chapter 5: Threats to SGCN in New York

Categorization of Threats

A threat is a human activity that has caused, or may cause, the loss of at least one percent of the population or distribution in New York. Threats to Species of Greatest Conservation Need were identified in the species assessments by DEC staff and partners and subsequently reviewed by taxonomic expert committees. Threats were categorized by adapting the International Union for Conservation of Nature (IUCN) standard classification of threats. Eleven of the 12 IUCN threat categories were used, with the IUCN threat category of Geologic Events excluded because it was thought to be impractical to plan conservation actions for this category relevant to New York State.

Loss of habitat to development is a serious threat to 215 SGCN and SPCN.

IUCN Threat Categories

1. **Residential & Commercial Development** – Threats from human settlements or other non-agricultural land uses with a substantial footprint

    1.1. Housing & Urban Areas – Cities, towns, and settlements, including non-housing development typically integrated with housing

    1.2. Commercial & Industrial Areas – Factories and other commercial centers

    1.3. Tourism & Recreation Areas – Tourism and recreation sites with a substantial footprint

2. **Agriculture & Aquaculture** – Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture

    2.1. Annual & Perennial Non-Timber Crops – Crops planted for food, fodder, fiber, fuel, or other uses

    2.2. Wood & Pulp Plantations – Stands of trees planted for timber or fiber outside natural forests, often with non-native species

    2.3. Livestock Farming & Ranching – Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also, domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)

    2.4. Marine & Freshwater Aquaculture – Aquatic animals raised in one location on farmed or non-local resources; also, hatchery fish allowed to swim in the wild

3. **Energy Production & Mining** – Threats from production of non-biological resources

    3.1. Oil & Gas Drilling – Exploring for, developing, and producing petroleum and other liquid hydrocarbons

    3.2. Mining & Quarrying – Exploring for, developing, and producing minerals and rocks

    3.3. Renewable Energy – Exploring, developing, and producing renewable energy

4. **Transportation & Service Corridors** – Threats from long, narrow transport corridors and the vehicles that use them, including associated wildlife mortality

    4.1. Roads & Railroads – Surface transport on roadways and dedicated tracks

    4.2. Utility & Service Lines – Transport of energy and resources

    4.3. Shipping Lanes – Transport on and in freshwater and ocean waterways

    4.4. Flight Paths – Air and space transport

5. **Biological Resource Use** – Threats from consumptive use of "wild" biological resources, including both deliberate and unintentional harvesting effects; also, persecution or control of specific species

   5.1. Hunting & Collecting Terrestrial Animals – Killing or trapping terrestrial wild animals for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch

   5.2. Gathering Terrestrial Plants – Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons

   5.3. Logging & Wood Harvesting – Harvesting trees and other woody vegetation for timber, fiber, or fuel

   5.4. Fishing & Harvesting Aquatic Resources – Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch

6. **Human Intrusions & Disturbance** – Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources

   6.1. Recreational Activities – People spending time in nature or traveling in vehicles outside established transport corridors, usually for recreational reasons

   6.2. War, Civil Unrest & Military Exercises – Actions by formal or paramilitary forces without a permanent footprint

   6.3. Work & Other Activities – People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research

7. **Natural System Modifications** – Threats from actions that convert or degrade habitat in service of managing natural or semi-natural systems, often to improve human welfare

Shoreline erosion from increased severe storms is a threat to SGCN.

   7.1. Fire & Fire Suppression – Suppression or increase in fire frequency and/or intensity outside its natural range of variation

   7.2. Dams & Water Management/Use – Changing water flow patterns from their natural range of variation, either deliberately or as a result of other activities

   7.3. Other Ecosystem Modifications – Other actions that convert or degrade habitat in service of managing natural systems to improve human welfare

8. **Invasive & Other Problematic Species & Genes** – Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance

   8.1. Invasive Non-Native/Alien Species – Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities

   8.2. Problematic Native Species – Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become out of balance or released directly or indirectly due to human activities

   8.3. Introduced Genetic Material – Human-altered or transported organisms or genes

9. **Pollution** – Threats from the introduction of exotic and/or excess materials or energy from point and non-point sources

   9.1. Household Sewage & Urban Waste Water – Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments

   9.2. Industrial & Military Effluents - Water-borne pollutants from industrial and military sources, including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments

   9.3. Agricultural & Forestry Effluents – Water-borne pollutants from agricultural, silivicultural, and aquacultural systems that include nutrients, toxic chemicals and/or sediments, including the effects of these pollutants on the site where they are applied

   9.4. Garbage & Solid Waste – Rubbish and other solid materials, including those that entangle wildlife

   9.5. Air-Borne Pollutants – Atmospheric pollutants from point and non-point sources

   9.6. Excess Energy – Inputs of heat, sound, or light that disturb wildlife or ecosystems

10. **Climate Change & Severe Weather** – Direct threats from climatic changes that may be linked to global warming and other severe climatic or weather events that are outside the natural range of variation or can wipe out a vulnerable species or habitat

    10.1. Habitat Shifting & Alteration – Changes in habitat composition and location

    10.1. Droughts – Periods in which rainfall falls below the normal range of variation

    10.2. Temperature Extremes – Periods in which temperatures exceed or go below the normal range of variation

    10.3. Storms & Flooding – Extreme precipitation and/or wind events

11. **Other**

Nonpoint source pollution from stormwater discharge threatens aquatic habitats.

Frequency of Threats

In identifying threats to SGCN and SPCN, the taxonomic expert committees noted threats by sub-category so that a species could have more than one identified threat under the same IUCN threat category, enabling a more precise description of threats to the species. A total of 2,829 species-threat combinations was identified for SGCN and SPCN. The broad category of "Pollution" with its six threat sub-categories was cited 646 times, amounting to 23 percent of all the identified threats. "Inadequately treated sewage and urban runoff" was noted as a threat to 158 species, and "industrial effluents" were also noted 160 times. "Agricultural and forestry pollution" was noted as a threat to 208 species, mostly related to erosion and increased sedimentation. "Airborne pollutants" were noted 50 times, primarily due to the deposition of acid and mercury in high-elevation areas of the state. "Excess energy" was noted 54 times, mostly related to impacts from light pollution but also including noise pollution in the vicinity of shipping lanes. "Solid waste" is a threat to 16 species due to the ingestion of plastics or other pollutants by wildlife.

"Invasive and problematic native species" was cited as a threat 448 times, with 301 species threatened by invasive species and 147 threatened by problematic native species. The "problematic native species" category was most commonly due to competition for resources or predation by human-subsidized predators like skunks and raccoons. More than a dozen invasive plant and animal species were identified as threats, and almost a quarter of these invasive species threats are pervasive, impacting more than 70 percent of the distribution of the native species.

"Climate change" was cited as a threat 420 times, with some species being negatively impacted by more than one sub-category of climate change. "Habitat shifting" is expected to affect 166 species, "increased storms and flooding" will impact 110 species, "increased drought" is a threat to 74, and "increased temperature extremes" are expected to impact 70 species.

"Natural system modifications" were cited as a threat 391 times, 187 of these related to habitat fragmentation from dams. "Fire suppression" was a threat to 31 SGCN, especially pine barren-dependent species. One-hundred-seventy-three other ecosystem modifications that impact SGCN were identified, including shoreline hardening to prevent erosion, ditching and dredging, and natural vegetation succession in grasslands and young forests.

"Loss of habitat to development" was cited as a threat 215 times, with 189 of these threats being from housing development. "Commercial and industrial development" is a threat to nine species, and "tourism and recreational development" is a threat to 17 species.

The four-toed salamander is the smallest salamander that occurs in New York State, measuring approximately 5 to 9 cm long. Commonly associated with sphagnum, this little salamander can be identified by having only four toes on its hind feet (other salamanders have five).
(Photo: Jenny Murtaugh, NYSDEC)

"Biological resource use" was cited as a threat 225 times. The IUCN categorization does not separate legal harvest from illegal take, although this distinction was noted by staff as threats were identified in the species assessments. One-hundred-thirty of the biological resource use threats are related to "fishing," mostly from by-catch or entanglement in fishing gear. "Hunting" was cited 48 times, mostly related to illegal collection for the pet trade. "Logging" was cited 47 times, with most of these threats related to in-stream impacts from increased sedimentation.

"Human intrusion and disturbance" is a threat to 150 species, with 106 of these related to recreation, mostly described as off-road vehicle use or boating in sensitive habitats. "Human work" related to disturbance was cited 37 times, mostly road, bridge, and building maintenance projects. "Military exercises" was cited as a threat to seven marine mammal species, all of the threat related to the use of sonar.

"Energy production and mining" was cited 144 times. Seventy-seven of these were related to renewable energy and included wind power development in upland areas of New York, as well as potential development of wind power off Long Island. Fifty-three of the energy production threats were related to oil and gas drilling, and included threats from hydraulic fracturing of shale to extract natural gas, as well as potential oil spills in marine waters. "Mining and quarrying" was cited as a threat to 14 species, about half of which are related to offshore sand mining for beach nourishment projects.

"Transportation and service corridors" were cited as threats 137 times, 83 of which were related to roads and railroads. The primary highway-related threat noted is the effect of road salting, although direct vehicle strike and habitat fragmentation were also identified as threats in this category. Twenty-nine transportation threats were noted as the potential for vessel strikes in shipping lanes or spills resulting from the transport of oil. Fourteen of the transportation threats were related to service lines—either birds colliding with towers during flight or being electrocuted while perching on the towers. Eleven species are threatened by collision with aircraft, with most of this threat identified as occurring at JFK Airport.

"Agriculture and aquaculture" were cited as a threat 53 times. Forty-nine of these threats were related to crop agriculture, mostly intensification of agriculture from pasture/hay to row crops. Livestock farming threatens two species, and wood plantations and aquaculture each threaten only one species.

The number of times that each threat was cited for High Priority SGCN, SGCN, and SPCN is shown in Table 6.

The spread of invasive species threatens ponds, lakes, and rivers throughout New York.

Table 6. Frequency of Threats

Threat	Number of Times Threat was Cited			
	High Priority SGCN	SGCN	SPCN	Total
1. Residential & Commercial Development				
Housing & Urban Areas	74	79	36	189
Commercial & Industrial Areas	7	1	1	9
Tourism & Recreation Areas	9	5	3	17
subtotals	*90*	*85*	*40*	*215*
2. Agriculture & Aquaculture				
Annual & Perennial Non-Timber Crops	27	16	6	49
Wood & Pulp Plantations	0	0	1	1
Livestock Farming & Ranching	1	1	0	2
Marine & Freshwater Aquaculture	0	1	0	1
subtotals	*28*	*18*	*7*	*53*
3. Energy Production & Mining				
Oil & Gas Drilling	25	24	4	53
Mining & Quarrying	4	6	4	14
Renewable Energy	41	32	4	77
subtotals	*70*	*62*	*12*	*144*
4. Transportation & Service Corridors				
Roads & Railroads	34	26	23	83
Utility & Service Lines	4	8	2	14
Shipping Lanes	17	12	0	29
Flight Paths	5	5	1	11
subtotals	*60*	*51*	*26*	*137*
5. Biological Resource Use				
Hunting & Collecting Terrestrial Animals	24	21	3	48
Gathering Terrestrial Plants	0	0	0	0
Logging & Wood Harvesting	21	20	6	47
Fishing & Harvesting Aquatic Resources	62	52	16	130
subtotals	*107*	*93*	*25*	*225*
6. Human Intrusions & Disturbance				
Recreational Activities	56	47	3	106
War, Civil Unrest & Military Exercises	6	1	0	7
Work & Other Activities	20	16	1	37
subtotals	*82*	*64*	*4*	*150*
7. Natural System Modifications				
Fire & Fire Suppression	11	11	9	31
Dams & Water Management/Use	56	91	40	187
Other Ecosystem Modifications	92	68	13	173
subtotals	*159*	*170*	*62*	*391*
8. Invasive & Other Problematic Species & Genes				
Invasive Non-Native/Alien Species	138	122	41	301
Problematic Native Species	75	65	7	147
Introduced Genetic Material	0	0	0	0
subtotals	*213*	*187*	*48*	*448*
9. Pollution				
Household Sewage & Urban Waste Water	58	81	19	158
Industrial & Military Effluents	50	62	48	160
Agricultural & Forestry Effluents	78	84	46	208
Garbage & Solid Waste	10	4	2	16
Air-Borne Pollutants	28	17	5	50
Excess Energy	17	17	20	54
subtotals	*241*	*265*	*140*	*646*
10. Climate Change & Severe Weather				
Habitat Shifting & Alteration	61	60	45	166
Droughts	32	29	13	74
Temperature Extremes	11	22	37	70
Storms & Flooding	48	51	11	110
subtotals	*152*	*162*	*106*	*420*
TOTALS	**1,202**	**1,157**	**470**	**2,829**

Magnitude of Threats

Levels of potential loss to the spatial distribution (scope), the population (severity), and the level of irreversibility were identified for each threat.

SCOPE: Spatial proportion of the distribution in New York that is expected to be affected in the next 10 years

- Narrow = affecting 1-10% of the occupied area in NY

- Restricted = affecting 11-30% of the occupied area in NY

- Widespread = affecting 31-70% of the occupied area in NY

- Pervasive = affecting 71-100% of the occupied area in NY

SEVERITY: The degree of population reduction in New York in the next 10 years that can be reasonably expected from the threat given the current circumstances and trends

- Low = degrade/reduce population by 1-10%

- Medium = degrade/reduce population by 11-30%

- High = degrade/reduce population by 30-70%

- Very High = degrade/reduce population by 71-100%

IRREVERSIBILITY: The degree to which the effects can be reduced and the species restored within New York

- Low = easily reversed, at a low cost, and/or within 0-5 years

- Medium = can be reversed with a reasonable commitment of resources within 6-20 years

- High = can be reversed, but not feasibly affordable or it would take 21-100 years

- Very High = cannot be reversed or it would take >100 years

Of the 2,829 identified threats to SGCN and SPCN, 673 (24 percent) were rated as having a scope that is pervasive, while 46 (1.6 percent) of threats were cited as having a severity of very high. This is an indication that while the identified threats often have a broad geographic scope and some are occurring in all parts of the state, in most cases, the decline in the population of a species is not due to a single threat but is a result of the cumulative impacts of multiple threats. This information is summarized in Table 7.

Table 7. Scope and Severity of Threats

	All SGCN and SPCN					
		Scope		Severity		
Threat	Number of times threat cited	Number of times threat was cited as causing loss/degradation of stated percentage of occupied area		Number of times threat was cited as resulting in population reduction by stated percentage		
		>30%	>70%	>10%	>30%	>70%
1. Residential & Commercial Development						
Housing & Urban Areas	189	90	10	49	7	4
Commercial & Industrial Areas	9	3	0	1	0	0
Tourism & Recreation Areas	17	1	0	5	1	0
subtotals	*215*	*94*	*10*	*55*	*8*	*4*
2. Agriculture & Aquaculture						
Annual & Perennial Non-Timber Crops	49	24	11	20	11	4
Wood & Pulp Plantations	1	0	0	0	0	0
Livestock Farming & Ranching	2	1	0	1	0	0
Marine & Freshwater Aquaculture	1	0	0	0	0	0
subtotals	*53*	*25*	*11*	*21*	*11*	*4*
3. Energy Production & Mining						
Oil & Gas Drilling	53	14	6	20	2	0
Mining & Quarrying	14	3	0	2	0	0
Renewable Energy	77	18	1	29	0	0
subtotals	*144*	*35*	*7*	*51*	*2*	*0*
4. Transportation & Service Corridors						
Roads & Railroads	83	60	12	13	1	1
Utility & Service Lines	14	2	0	2	0	0
Shipping Lanes	29	10	3	12	6	0
Flight Paths	11	2	2	3	2	1
subtotals	*137*	*74*	*17*	*30*	*9*	*2*
5. Biological Resource Use						
Hunting & Collecting Terrestrial Animals	48	31	21	8	1	0
Gathering Terrestrial Plants	0	0	0	0	0	0
Logging & Wood Harvesting	47	8	1	14	6	0
Fishing & Harvesting Aquatic Resources	130	84	54	54	15	0
subtotals	*225*	*123*	*76*	*76*	*22*	*0*
6. Human Intrusions & Disturbance						
Recreational Activities	106	48	18	17	10	0
War, Civil Unrest & Military Exercises	7	0	0	3	1	0
Work & Other Activities	37	11	5	2	0	0
subtotals	*150*	*59*	*23*	*22*	*11*	*0*
7. Natural System Modifications						
Fire & Fire Suppression	31	12	6	4	1	0
Dams & Water Management/Use	187	57	17	69	8	4
Other Ecosystem Modifications	173	92	40	92	21	2
subtotals	*391*	*161*	*63*	*165*	*30*	*6*
8. Invasive & Other Problematic Species & Genes						
Invasive Non-Native/Alien Species	301	149	79	126	34	11
Problematic Native Species	147	87	30	57	20	2
Introduced Genetic Material	0	0	0	0	0	0
subtotals	*448*	*236*	*109*	*183*	*54*	*13*
9. Pollution						
Household Sewage & Urban Waste Water	158	89	72	59	8	0
Industrial & Military Effluents	160	94	36	59	36	0
Agricultural & Forestry Effluents	208	121	46	84	51	1
Garbage & Solid Waste	16	6	5	3	1	0
Air-Borne Pollutants	50	30	10	18	9	0
Excess Energy	54	37	2	45	35	0
subtotals	*646*	*377*	*171*	*268*	*140*	*1*
10. Climate Change & Severe Weather						
Habitat Shifting & Alteration	166	125	80	60	30	14
Droughts	74	55	23	36	7	0
Temperature Extremes	70	63	49	54	43	1
Storms & Flooding	110	75	34	55	8	1
subtotals	*420*	*318*	*186*	*205*	*88*	*16*
TOTALS	**2,829**	**1,502**	**673**	**1,076**	**375**	**46**

A "multiplied pairs" approach was used to combine scope and severity of threats into a single numeric value. The scope and severity of 88 of the 2,829 identified threats was unknown, and these threats were excluded from the multiplied pairs analysis. The scope and severity measures that were identified by the taxonomic expert groups for the remaining 2,741 threats were converted to numeric values by assigning a value of 1 to 4, as follows:

Scope

1 = Narrow (affecting 1-10% of the occupied area in New York)

2 = Restricted (affecting 11-30% of the occupied area in New York)

3 = Widespread (affecting 31-70% of the occupied area in New York)

4 = Pervasive (affecting 71-100% of the occupied area in New York)

Severity

1 = Low (reduce/degrade population by 1-10%)

2 = Medium (reduce/degrade population by 11-30%)

3 = High (reduce/degrade population by 31-70%)

4 = Very High (reduce/degrade population by 71-100%)

The scope and severity values for each threat were multiplied to derive a combined score in one of nine categories (1, 2, 3, 4, 6, 8, 9, 12, 16). This combined value provides a single measure of the impact of each threat, identifying the relative impact of each threat. The results of the multiplied pairs analysis are shown in Table 8.

DEC and volunteers monitor horseshoe crab spawning. Horseshoe crab eggs are a vital food source for migrating shorebirds.
(Photo: NYSDEC)

Table 8. Threat Scope and Severity Multiplied Pairs (excluding unknown scope or severity threats)

Threat										
	Number of Times Each Threat was Cited for Each of 9 Values of Scope X Severity for all SGCN and SPCN									
	1	2	3	4	6	8	9	12	16	TOTAL
1. Residential & Commercial Development										
Housing & Urban Areas	49	26	50	15	26	5	1	5	0	177
Commercial & Industrial Areas	4	1	3	0	0	0	0	0	0	8
Tourism & Recreation Areas	6	8	2	0	0	0	0	0	0	16
subtotals	*59*	*35*	*55*	*15*	*26*	*5*	*1*	*5*	*0*	*201*
2. Agriculture & Aquaculture										
Annual & Perennial Non-Timber Crops	15	8	5	2	6	1	1	7	3	48
Wood & Pulp Plantations	0	1	0	0	0	0	0	0	0	1
Livestock Farming & Ranching	1	0	0	0	1	0	0	0	0	2
Marine & Freshwater Aquaculture	1	0	0	0	0	0	0	0	0	1
subtotals	*17*	*9*	*5*	*2*	*7*	*1*	*1*	*7*	*3*	*52*
3. Energy Production & Mining										
Oil & Gas Drilling	21	7	6	13	4	2	0	0	0	53
Mining & Quarrying	8	3	1	0	2	0	0	0	0	14
Renewable Energy	30	14	9	16	8	0	0	0	0	77
subtotals	*59*	*24*	*16*	*29*	*14*	*2*	*0*	*0*	*0*	*144*
4. Transportation & Service Corridors										
Roads & Railroads	9	11	44	9	3	6	0	1	0	83
Utility & Service Lines	10	1	1	1	1	0	0	0	0	14
Shipping Lanes	10	5	4	4	3	0	3	0	0	29
Flight Paths	7	1	1	0	0	1	0	0	1	11
subtotals	*36*	*18*	*50*	*14*	*7*	*7*	*3*	*1*	*1*	*137*
5. Biological Resource Use										
Hunting & Collecting Terrestrial Animals	14	2	9	16	1	5	0	1	0	48
Gathering Terrestrial Plants	0	0	0	0	0	0	0	0	0	0
Logging & Wood Harvesting	15	16	11	2	2	0	0	0	0	46
Fishing & Harvesting Aquatic Resources	25	12	9	38	16	18	8	4	0	130
subtotals	*54*	*30*	*29*	*56*	*19*	*23*	*8*	*5*	*0*	*224*
6. Human Intrusions & Disturbance										
Recreational Activities	38	17	23	14	2	3	6	3	0	106
War, Civil Unrest & Military Exercises	0	4	0	2	1	0	0	0	0	7
Work & Other Activities	21	4	6	3	0	2	0	0	0	36
subtotals	*59*	*25*	*29*	*19*	*3*	*5*	*6*	*3*	*0*	*149*
7. Natural System Modifications										
Fire & Fire Suppression	8	10	7	3	0	3	0	0	0	31
Dams & Water Management/Use	54	25	22	48	16	3	2	2	4	176
Other Ecosystem Modifications	25	35	18	26	30	20	5	13	0	172
subtotals	*87*	*70*	*47*	*77*	*46*	*26*	*7*	*15*	*4*	*379*
8. Invasive & Other Problematic Species & Genes										
Invasive Non-Native/Alien Species	59	35	41	82	21	19	9	13	11	290
Problematic Native Species	33	12	33	26	16	7	9	8	2	146
Introduced Genetic Material	0	0	0	0	0	0	0	0	0	0
subtotals	*92*	*47*	*74*	*108*	*37*	*26*	*18*	*21*	*13*	*436*
9. Pollution										
Household Sewage & Urban Waste Water	24	33	13	28	3	40	2	5	0	148
Industrial & Military Effluents	30	19	21	30	6	8	32	3	0	149
Agricultural & Forestry Effluents	25	38	20	37	15	9	40	10	0	194
Garbage & Solid Waste	10	0	1	2	0	2	0	1	0	16
Air-Borne Pollutants	12	4	11	8	5	2	5	3	0	50
Excess Energy	5	4	0	10	0	0	35	0	0	54
subtotals	*106*	*98*	*66*	*115*	*29*	*61*	*114*	*22*	*0*	*611*
10. Climate Change & Severe Weather										
Habitat Shifting & Alteration	19	6	23	48	16	14	8	6	14	154
Droughts	3	13	18	12	9	13	6	0	0	74
Temperature Extremes	4	1	5	8	7	2	2	40	1	70
Storms & Flooding	15	10	19	20	22	17	1	5	1	110
subtotals	*41*	*30*	*65*	*88*	*54*	*46*	*17*	*51*	*16*	*408*
TOTAL	**610**	**386**	**436**	**523**	**242**	**202**	**175**	**130**	**37**	**2,741**

Description of Threats

1. **Habitat Loss and Fragmentation Due to Development**

   Habitat loss due to development is one of the leading threats to biodiversity in New York and was identified as a threat to 175 SGCN and 40 SPCN. This threat category includes housing and urban areas, commercial and industrial development, and recreation areas (marinas and ski resorts). Development of housing and urban areas was cited most frequently, followed by tourism and recreational areas, and then commercial and industrial development. The difference between the number of times that residential development was identified as a threat, and the relatively few times that commercial development was noted is likely due to "suburban sprawl," where development of natural and agricultural land outpaces human population growth. But more important than the relative number of threats identified in each

The frosted elfin is a state-threatened species, with population declines from habitat loss and fire suppression. Host plants for frosted elfin are wild indigo and lupine, which grow in sandy soil habitats that experience frequent disturbance. Active management of these habitats is necessary to maintain conditions favorable to the host plants.
(Photo: Amanda Dillon, Albany Pine Bush Preserve Commission)

   sub-category of development is the overall threat of the cumulative effects of residential, commercial, and recreational development.

   Development reduces the quantity and quality of habitat for SGCN. As suburban sprawl occurs throughout New York, development degrades the ecological value of remaining natural habitat patches through habitat fragmentation. Effects of habitat fragmentation are loss of connectivity to patches of similar or complementary habitats, the creation of "sink" habitats in which meta-population dynamics are lost in isolated patches, increased susceptibility to predation from edge effects, and a reduction in the types of species the habitat can support.

   The effects of exurban development on wildlife in the Adirondack Park have been studied by the Wildlife Conservation Society. This work documented that the construction of houses and roads alters wildlife communities, increasing populations of predators and competitors that previously occurred in lower numbers (e.g., blue jay, American crow, gray squirrel). The combined effect of these changes tends to favor certain kinds of species over others–omnivores over insectivores, residents over migrants, generalists over habitat specialists (especially interior forest specialists), and tree nesters over ground nesters. Scarlet tanager is one example of a specialized interior forest-dwelling species that must compete with generalist species that use exurban development as habitat.

2. **Agriculture and Aquaculture**

   Agriculture was identified as a threat to 46 SGCN and seven SPCN. Most of these threats were related to an intensification of agricultural activities, primarily the conversion of pasture and hay lands to row crops. The expansion of biofuels production has led to an increase in the amount of acreage in corn production. Most of this increase is a result of conversion of pasture lands, although some of this increased agriculture is a result of clearing forested lands. Sediment and nutrient runoff from agricultural operations impacts waterbodies in some areas of the state, and this impact was noted separately from threats from agricultural pesticides and nutrient runoff. Aquaculture is a relatively small industry in New York and was identified as a threat to only one marine fish species, cunner.

3. **Energy Production and Mining**

   Energy production and mining was cited as a threat to 132 SGCN and 12 SPCN. Most of these threats are related to wind power development and the potential development of hydraulic fracturing in New York. Threats placed in the Renewable Energy sub-category were related to interactions with and habitat loss from both terrestrial and off-shore wind turbine projects. Neotropical migrants face

the threat of collision with turbines in the marine environment, and grassland and forest birds are especially vulnerable to the threat of wind power due to habitat loss as a result of building the turbines. A number of off-shore wind turbine projects have been proposed that could potentially pose a threat to SGCN sharks, fish, whales, shorebirds, sea ducks, and pelagic birds, if those projects are constructed. Whether turbines in New York have a population level-effect on birds (and potentially marine species if off-shore projects were approved) remains unknown. They are, however, the greatest threat to the tree bats (red, hoary, and silver-haired bat). For tree bats, turbines pose a threat primarily during the fall migration period.

Horizontal drilling and high-volume hydraulic fracturing (HVHF) is a process that has been developed to extract natural gas from gas-bearing shale formations. This process requires construction of drilling pads, wastewater containment facilities, construction of roads, and pipelines to transport the extracted gas. These activities can be a threat to wildlife in multiple ways: pollution, habitat destruction, water withdrawals, the introduction of invasive species, and exacerbating climate change. After the gathering and analysis of threat data for the SWAP was completed, HVHF was banned in New York. HVHF is included in the threat analysis, and should the current ban be lifted during the 10 year timeframe of the SWAP, this threat information will again become relevant.

Mining and quarrying was one of the less frequent threats to be noted, but where it was cited it impacted multiple species. SGCN snakes are frequently impacted by mining, as the activity often destroys or degrades parts of their habitat. Mining operations destroy eastern rat snake den habitats, while the activities often disturbed the basking sites of northern copperheads, and both the basking and den sites of timber rattlesnakes are affected. The eastern wormsnake is particularly affected by mining and excavation due to its fossorial (burrowing) nature.

Sand mining and dredging poses a threat to some SGCN and SPCN shorebirds and ocean birds, including Cory's shearwater, greater shearwater, harlequin duck, American golden plover, and sanderling. Gravel mining is a threat to two species of tiger beetle that are SGCN—the Appalachian tiger beetle and the cobblestone tiger beetle. Changes in hydrology due to gravel and limestone mining threatens the habitat of watercress snail.

4. **Transportation and Service Corridors**

Transportation and service corridors were identified as threats to 111 SGCN and 26 SPCN. It is a broad category which includes roads and railroads, utility and service lines, shipping lanes, and flight paths. Roads and railroads pose the greatest threat, which may be a factor of their prevalence on the landscape. Utility and service lines are another corridor-type development that is prevalent throughout the state. Utility corridors can degrade and fragment forest habitats, but 25 SGCN were noted to use power lines as an important habitat. The Karner blue butterfly, for instance, will use utility and service lines if lupine is present, and occasionally as a corridor to travel between patches and colonize new areas.

Roads and railroads are a threat to SGCN through both direct mortality from road kill, and more frequently, habitat fragmentation and the adverse effects of road salt. Salt used for road de-icing affects wildlife directly and indirectly. Birds may ingest road salt crystals for grit, and consumption of even small amounts of salt can result in toxicosis and death for birds. Wildlife such as moose are also attracted to the roadway to ingest salt crystals, which leads to higher incidents of vehicular accidents and road kills. Road salt can also cause a decline among populations of salt-sensitive species in the freshwater aquatic environment. Damage to vegetation can have significant impact on wildlife habitat by destroying food resources, shelter and breeding and nesting sites, and by creating a favorable environment for non-native invasive species. Chloride in surface waters can be toxic to many forms of aquatic life. Aquatic species impacted include fish, macro-invertebrates, insects, and amphibians.

Road mortality is a threat to reptiles and amphibians more than any other taxa. It was cited as a threat to 32 amphibians and reptiles, often widespread in scope. It is also a threat to some birds, especially raptors, and an identified threat to the least weasel and New England cottontail. New York has an extensive road network and statewide has the tenth-highest road density in the United States. In addition to the high density of roads, high traffic volume increases the likelihood that an animal seeking to cross the road will be unsuccessful or be struck by a vehicle.

Power lines are an important cause of mortality for birds, both through electrocution and fatal collisions. Large birds of prey, with their broad wingspan and propensity for perching on high structures, are especially susceptible and have the greatest incidence of electrocution.

Shipping lanes, next to roads and railroads, are the second most prevalent transportation and service corridor threat affecting SGCN. Scientists with the Bioacoustics Research Program at the Cornell Lab of Ornithology have captured the sounds of three whale species in the waters around New York City: the humpback, fin and North Atlantic right whale. All three whale species are listed as Endangered under the Federal Endangered Species Act and are New York SGCN. In addition to the hazard to marine life of being struck by a vessel, there is concern that the noise from large ships can impact whale communication and impair critical behaviors. A study of reported ship strikes on whales between 1975 and 2002 found that fin whales were the most commonly affected species of

The eastern hog-nosed snake occurs in open woodlands or pine barrens that provide the sandy soils, toads, and small invertebrates that this snake requires. In the Northeast, the northern limit of the range is reached in the sand plains of Saratoga County, New York, though populations are known farther north in southern Ontario. Long-term trends, especially in northern portions of the range, suggest declines due to loss of habitat, road mortality, and human intervention, but most populations appear to be stable in the short term.

(Photo: Jenny Murtaugh, NYSDEC)

whale, with 75 records. Between 2005 and 2010, there were nine confirmed deaths of fin whales caused by vessel collisions, including one reported off Southampton, NY.

Flight paths were cited as a threat 11 times. Much of this threat is due to the proximity of JFK Airport, New York's largest airport, and Jamaica Bay, which provides important habitat for dozens of bird species. Once heavily polluted, the restoration of Jamaica Bay over the last 40 years has led to an increase in the viability and variety of the species of wildlife that live there. The National Park Service, which oversees Jamaica Bay as part of the Gateway National Recreation Area, identifies the area as significant habitat. A colony of 15 pairs of laughing gulls was observed nesting at Jamaica Bay in 1979. By 1990, 7,629 nesting pairs were counted, and more than half of the bird strikes at JFK are reported to be laughing gulls.

5. Biological Resource Use

Use of biological resources through recreational hunting and fishing is common throughout New York. These activities are regulated by licensing, length of open season, bag limits, type of implement allowed, and minimum size requirements. Commercial fishing occurs primarily in marine waters and is also closely regulated to conserve the resource. Legal, regulated hunting and fishing are carefully managed to ensure sustainable use. Illegal take impacts 41 species, mostly related to the collection of live amphibians and reptiles for the pet trade. In the last decade, there have been multiple arrests and prosecutions for the illegal sale of reptiles and amphibians in New York, yet the black market trade continues. The other identified threats to SGCN associated with harvest are a result of by-catch (the catch of species other than those targeted).

Logging and wood harvesting can cause habitat disturbance, and siltation that results from improper logging practices is identified as a threat to brook trout, as well as 18 odonate (dragonfly and damselfly) species.

6. Human Intrusions and Disturbance

Recreational activities were cited as a threat to SGCN and SPCN 106 times, totaling 70 percent of the human intrusion and disturbance category. Recreational activities which were noted to create disturbance include: boating, paddling, photography, birding, beach use, rock climbing, spelunking, ATV use, collecting reptiles and amphibians, whale watching, clamming, and visiting natural attractions.

Boating was one of the most common recreational threats, affecting a wide range of species including: terns and shorebirds, whales, fish, and sea turtles. These impacts are both direct, such a propeller strikes, and indirect, such as the loss of submerged aquatic vegetation that is important to species of fish like the four-spine stickleback, lined seahorse, nine-spine stickleback, northern pipefish, northern puffer, and three-spine stickleback. Boating also can cause disturbance of natural behaviors in some species.

ATV use in sensitive habitats can affect wildlife, including: upland frogs, snakes, and turtles, and some insects.

All species of cave bats listed as SGCN are threatened by disturbance of their hibernacula, either from recreational spelunking or from research. Human presence disturbs hibernating bats, and humans may also may transport White Nose Syndrome among sites. Human intrusion and disturbance of SGCN habitat also occurs through work activities, the most common of which are bridge projects and other in-stream work that impacts the freshwater bivalve species that inhabit those waters.

Military sonar was identified as a threat affecting marine mammals, including blue, fin, humpback, North Atlantic right, sei, and sperm whales, and harbor porpoise. Noise pollution is a threat to cetaceans (whales and dolphins), which rely heavily on sound to communicate. Increasing levels of anthropogenic noise in the ocean hamper this intra-specific communication. The oceans are getting progressively louder, and there are busy shipping lanes in the waters of New York. Acoustic monitoring in the New York Bight region in 2008 and 2009 found elevated levels of background noise, due in large part to shipping traffic.

Several species of large whales have been found to increase the amplitude of their calls in response to high levels of noise, which could lead to increased energy consumption. Above a certain threshold level of noise, some whale species are known to stop vocalizing, and there is also the potential for masking of calls if background noise occurs within the frequencies used by calling whales. This could lead to difficulty finding other whales and impairment of essential social behaviors.

7. Natural System Modifications

Modification of natural ecological systems was cited as a threat 329 times for SGCN and 62 times for SPCN. Several species are impacted by more than one modification of the natural ecosystem. In aquatic habitats, this alteration occurs through the construction of dams, hardening of shorelines, and stream channelization. Altering the flow of riparian habitats with dams and bridges, and for water supply, flood control, agriculture, and development, directly and indirectly affects fish and wildlife. Movement of populations of aquatic species such as fish and freshwater bivalves is inhibited, and habitat for all species dependent on stream systems is lost outright or degraded through decreased conveyance and

Unique in appearance, the smooth green snake is a small, slender snake with bright green scales and a white or pale yellow belly. This species primarily occurs in grassy areas, where it feeds on crickets, grasshoppers and caterpillars. This species has declined due to forest succession.

(Photo: Jenny Murtaugh, NYSDEC)

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. Flooding of fast water river stretches impairs spawning habitat for species such as lake sturgeon. In addition, manipulation of water levels in major lake systems like Lake Ontario impacts shoreline wetlands and submerged aquatic vegetation in the near shore zone. Throughout the state, wetlands and tributaries that are flooded by dams have diminished value as spawning and nursery habitats for some species of 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, and alters macroinvertebrate communities. Excessive sand and sediment loads also contribute to the formation of significant sedimentation deltas at the mouths of tributary streams. Such deltas can restrict fish migration into the tributaries and exacerbate impacts from non-native aquatic vegetation.

In terrestrial habitats, the natural system modifications threat category is primarily related to succession and fire suppression. Natural succession of vegetative communities is a threat to grassland and young forest-dependent species. Wildland fire causes a return of habitats to an earlier successional stage, a natural process which is prevented through human suppression of these fires.

8. Invasive and Problematic Native Species

The proliferation of non-native plants and animals is degrading the quality of upland and aquatic habitat throughout New York. About 15 percent of introduced plant and animal species have spread into natural habitats, to the detriment of the native species. These harmful exotic plants and animals are called "invasive species." A species is considered invasive when it is not native to the ecosystem and its introduction causes significant harm to the ecology, economy, or human health. Invasive species are harmful to the economy as they can be damaging to forestry, agriculture, and cultural infrastructure, or cause a loss of recreation and tourism. The ecological damage from invasive species is due to direct competition with native species, altered food webs, a loss of biodiversity, and loss of ecosystem functions in degraded habitats.

In all habitat types, residential and commercial development increases the risk of new occurrences of invasive exotic plants and animals. Vectors for introduction of invasive species include soil movement, unintended transport on equipment, and intentional introduction of invasive species in landscaping activities.

In wetland and aquatic habitats, plant species such as purple loosestrife, Eurasian water milfoil, water chestnut, Japanese knotweed, and common reed can displace native plant species, disrupt ecological processes, and have less value to wildlife than the native species they replace. Transport of these aquatic invasive species in New York has historically been facilitated by the extensive canal system, and more recently by the frequent movement of recreational boats between waterbodies.

Invasive aquatic animals degrade habitat quality and can fundamentally alter ecosystem processes. Zebra mussels have spread to many water bodies throughout New York, impacting water supply infrastructure, native mussel species, plankton, and other aquatic species. Zebra mussels, and their deep-water relative, the quagga mussel, are a key link in the cycle of Type E botulism in the Great Lakes, which has caused episodic large-scale die-offs of piscivorous (fish-eating) waterbirds. In the Hudson River, zebra mussels have caused a reduction in the biomass of other benthic (bottom-dwelling) animals and depleted dissolved oxygen. This depletion of dissolved oxygen negatively impacts aquatic animals and exacerbates degradation of water quality.

There are 25 species of invasive fish in New York, and several introduced fish species have established populations within the state, some of which have impacted aquatic ecosystems. Native fish have also been distributed to additional watersheds, both through early fisheries management programs and more recently through unintentional releases from bait buckets. Sea lamprey, a parasitic fish native to Lake Ontario and Lake Champlain that feeds on the body fluids of other fish, have had a significant negative effect on sport fish populations in those waters as well as other large lakes in New York. The intentional or unintentional introduction of non-native fishes has occurred in

lakes and ponds statewide, causing drastic declines in native species such as brook trout. Other aquatic invasive species that impact natural resources in New York include the spiny water flea, fish hook water flea, rusty crayfish, common carp, and alewife.

In terrestrial upland habitats, invasive exotic plants and animals introduced through human activity reduce biodiversity. There are more than 50 identified invasive terrestrial plant species in New York, including garlic mustard, Japanese barberry, and multiflora rose. On the prohibited/regulated list (which is available at http://www.dec.ny.gov/animals/265.html), there are also more than 10 vertebrate animal invasive species, including the Eurasian boar and mute swan, more than 10 invertebrate invasive animals, and four species of invasive fungi.

Bat populations have been drastically impacted by another invasive species, a fungus called *Pseudogymnoascus destructans*, which causes a disease, white-nose syndrome (WNS), so named for the white fungus which grows on the muzzle and other areas of exposed skin on bats. This fungal invader was unintentionally introduced to North America from Europe, first appearing in New York in 2006, and since has spread throughout eastern North America and has led to population declines of greater than 90 percent for some bat species.

Drawing a blood sample from a little brown myotis
(Photo: Jenny Murtaugh, NYSDEC)

Problematic native wildlife species can also present a threat to SGCN if they occur in sensitive locations or overabundant populations. The threats from native species are a result of direct predation by subsidized predators, competition for nest sites, and a reduction in habitat quality through alteration of vegetative composition and structure. Problematic native species identified as threats to SGCN include various gulls, cowbirds, raccoon, skunk, fox, beaver, and deer.

9. **Pollution**

Pollution was the most frequently identified threat to SGCN in New York. Often the harmful effects and sources of pollution are known, and the threat is currently being addressed through successful implementation of regulatory programs to achieve pollution control. Advances in analytical chemistry have refined our measurement of pollutant levels, and research continues to identify new environmental pollutants, such as pharmaceuticals and micro-plastics. Although our current environment is significantly cleaner than it was when the Clean Water Act, Clean Air Act, and the National Environmental Policy Act were first enacted in the 1970s, the cumulative effects of legacy pollutants and modern pollution will continue to be a threat to some SGCN for many years.

In the aquatic environment, the cause of pollution is often excessive nutrient loading, which is a result of both 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. Elevated nutrient levels in water bodies contributes to excessive algal and vegetative growth, exacerbating the spread of aquatic nuisance plants and diminishing the value of aquatic habitats for fish and wildlife. Municipal wastewater treatment facility discharges and failing residential septic systems were identified as a threat to 139 SGCN and 19 SPCN. Stormwater runoff from developed areas is a major source of water pollution in New York. Impervious surfaces such as roofs and pavement reduce infiltration of precipitation to the ground, resulting in increased surface runoff. This flow of water carries sediment, nutrients, chemicals, oils, and solid waste into waterways, causing multiple deleterious impacts to aquatic systems. In addition to the stormwater that directly enters waterbodies, another source of pollution is when stormwater is collected in sewerage systems that combine wastewater with stormwater. During intense storms, these combined sewer systems can be overwhelmed, resulting in a direct discharge of the pollution through a combined sewer overflow (CSO). Reducing CSO discharges has been a challenge for environmental managers for many years

and will continue to be a major goal of pollution-control programs, but it is costly and requires collaboration among municipalities to achieve meaningful benefits for aquatic habitats. Maintaining and upgrading wastewater treatment facilities and controlling non-point source pollution continues to be a major challenge for municipalities throughout New York.

In addition to urban wastewater and stormwater pollution, many waterbodies in New York have excessive loading of nutrients from agricultural sources. Non-point source runoff from farms has accelerated the process of eutrophication in water bodies throughout New York and was identified as a threat to 162 SGCN and 46 SPCN. In many areas of the state, cost-share programs to mitigate agricultural sources of pollution are administered through a collaboration of county, state, and federal government agencies. While these cost-share programs have demonstrated success at reducing pollution from runoff, this effort must be continued to include more farms and ensure lasting benefits.

Great progress has been made in controlling industrial pollution, yet some challenges remain. Discharge of metals and other toxic substances to the aquatic environment from discrete point sources is carefully regulated through the State Pollutant Discharge Elimination System Program, but the cumulative effect of current discharges and the legacy pollutants from historic discharges continues to have negative impacts, particularly in the marine environment. Negative impacts to SGCN resulting from the withdrawal of cooling water and the discharge of heated water at electric generation facilities remains a significant challenge. Industrial pollution was identified as a threat to 112 SGCN and 48 SPCN.

Historic discharges of polychlorinated biphenyls (PCBs) have polluted major water bodies such as the Hudson River, Lake Champlain, the Great Lakes, and the St. Lawrence River, negatively impacting these aquatic ecosystems. PCBs entered these aquatic systems by direct discharge from industrial sites, where they have contaminated the sediment and entered the food web. PCBs are persistent in the environment, attach strongly to soils and river sediments, and readily accumulate in fish, wildlife, and humans. Remediation projects are complete or underway on all of these major contaminated sites, but work continues to determine the extent of natural resource damage and monitor the effectiveness of remediation efforts.

In addition to these discharges of pollutants to the aquatic environment, atmospheric deposition of pollution was identified as a threat to 45 SGCN and five SPCN, particularly in the high-elevation areas of the state. The two main pollutants in atmospheric deposition that are impacting wildlife in New York are acid and mercury. Acid deposition, sometimes called acid rain, has been recognized as a threat to forest and aquatic habitats in New York for more than 30 years. Burning of coal at electrical generation facilities and other industrial facilities in the upper Midwest releases nitrogen and sulfur, which is converted to nitric and sulfuric acid in the atmosphere. These discharges are carried northeast via wind currents and deposited at high-elevation sites downwind, including 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. Although these emissions are now controlled through the Clean Air Act, and the montane habitats are recovering, it will be many years until the negative effects of acid deposition are fully ameliorated.

Spotted turtles have experienced a range-wide decline of more than 50% over the past 75 years. Trends in New York State are difficult to determine because of a lack of abundance or distribution data, but areas in southern New York, where the species was once common, are no longer inhabited. Historic records from individual researchers and museum collections suggest a loss of populations in the mid-Hudson Valley, western Long Island, and the New York City area.

(Photo: Ryan von Linden)

Mercury pollution has been an increasing concern in New York, as research has linked high mercury levels to impaired reproduction in some SGCN, and the human health effects from mercury have resulted in fish consumption advisories for waterbodies throughout New York State. In the environment, elemental mercury can be converted to methylmercury, which then enters the food web, leading to impairments to reproduction and health. Like acid deposition, the source of the mercury emissions in the upper Midwest is now under regulatory control, but the effects of this pollution will continue to impair ecosystem function for many years. Additional research is needed to document and evaluate the impacts of mercury pollution and to better understand the mechanisms that cause mercury to accumulate in some species more than others.

While the lead used in fishing tackle and shotgun ammunition has long been recognized as a pollutant that can be harmful to wildlife, the lead in bullets is now also recognized as a pollutant threat to wildlife, particularly bald eagles and other carrion-eating birds. Lead poisoning can occur when the birds consume the spent bullet fragments in carcasses that have been shot. Bullets made from non-toxic material are now available, and informational materials to heighten awareness of this problem are underway.

10. **Climate Change and Severe Weather**

Climate change is a threat to natural systems in and of itself, but it also exacerbates other threats and can undermine management actions, even actions that have been applied successfully in the past. As with any other threat to species and habitats, the first step is identifying the cause, scope, and severity of the observed and predicted impacts that stem directly from climate change. Natural climatic changes can occur suddenly, such as when a meteor strikes the earth, but most often climate change has been a slow process occurring over thousands or even millions of years, with gradual changes to the earth's hydrologic and thermal regimes. The slow pace of these changes has historically enabled species to adapt to the changing conditions, but contemporary climate change is occurring at a pace that may be faster than wildlife can now adapt. Responding and adapting to climate change is a challenge for the management of both cultural and natural systems. Protection of human infrastructure such as energy and transportation systems is a priority in the developed environment, while maintaining functional ecosystem processes in natural systems is a challenge for natural resource managers.

Climate change is already affecting New York, and these impacts are projected to grow. The main impacts of climate change in New York include higher average temperatures and precipitation, more severe storms, more frequent and longer heat waves, and sea-level rise. Average temperatures across the Northeast rose two degrees Fahrenheit (˚F), and precipitation increased more than 10 percent from 1859 to 2011. Intense, damaging rainfall events have increased measurably across the Northeast in recent decades, and the proportion of annual rainfall that falls in the heaviest one percent of rain events increased by more than 70 percent from 1958 to 2010. Intense storm events are increasingly common, causing widespread flooding. Rising sea levels will increase the frequency and severity of damaging storm surges and shoreline flooding. Sea-level rise will also permanently inundate certain low-lying coastal areas and dramatically accelerate coastal erosion, threatening the ecologically important salt marshes and estuaries of Long Island, which serve as critical feeding grounds for migrating waterfowl and other birds and nursery habitat for fish and other aquatic organisms.

There are a variety of information sources, guidance documents, and decision tools for natural resource managers to develop strategies and actions to adapt to climate change. Some examples of general information and guidance can be found in the *National Fish, Wildlife, and Plants Climate Adaptation Strategy (2012), Integrating Climate Change into the State Wildlife Action Plans (2015)*, developed by the Northeast Climate Science Center and partners, and Climate Smart Conservation materials developed by the National Wildlife Federation and partners (2014). These and other useful materials are being organized in the U.S. Climate Resilience Toolkit, which will be accompanied by regional information in the upcoming New York Climate Change Science Clearinghouse.

New York has been a leading state in evaluating the impacts of climate change and adapting policies and regulations based upon scientific information. State policies are based on the global scale report from the Intergovernmental Panel on Climate Change, national initiatives such as the National Climate

Assessment, and state-level reports such as the Sea Level Rise Task Force, NYS 2100 Commission, Climate Action Council Interim Report, and ClimAID. In addition, New York City's sustainability and adaptation initiatives, as part of PlaNYC and OneNYC, rely on similar information sources.

The direct impacts of climate change on SGCN and habitats in New York were evaluated in three vulnerability assessments: *Vulnerability of At-risk species to Climate Change in New York* written by the Natural Heritage Program (2011), *Assessing the Vulnerability of Key Habitats in New*

Male (l) and female (r) Karner blue butterfly
(Photo: Jenny Murtaugh, NYSDEC)

York, written by the National Wildlife Federation (2013), and *Managing Species of Conservation Need in the Face of Climate Change: A Landscape and Trait-based Approach*, a Cornell University master's thesis written by Chris Nadeau (2014). These reports have provided natural resource managers in New York with information and tools to guide management decisions. Adaptation to climate change is informed at a regional scale by *The Vulnerabilities of Northeast Fish and Wildlife Habitats to Sea Level Rise*, coauthored by the National Wildlife Federation and Manomet Center for Conservation (2014), and *Resilient Sites for Terrestrial Conservation*, written by The Nature Conservancy (2012).

In 2014, the National Audubon Society released *Audubon's Birds and Climate Change Report: A Primer for Practitioners*. This report was developed on a continental scale and lists climate-sensitive bird species, models climate suitability, and prioritizes spatial areas likely to provide suitable climates for particular bird species. Audubon New York and partners can use the data tools developed by this project to assess climate change adaptation strategies in New York and evaluate priority areas for bird conservation in New York.

Chapter 6. Conservation Actions

Given the large number of SGCN and SPCN and the wide array of threats that are causing population declines, numerous actions must be taken to mitigate these threats and stabilize populations. Some of the needed actions are targeted towards individual species or locations, while others are broad in their geographic scope and beneficial to a suite of species. Ecologists describe this dichotomy of actions as a coarse filter/fine filter approach. The coarse filter conserves a suite of species or systems, while the fine filter describes actions directed at only a few species or locations. Both types of actions are necessary to have an effective conservation program, but this does complicate efforts to develop an objective system to prioritize conservation actions.

A Microsoft Access database was developed to facilitate analysis of proposed conservation actions. The coarse filter/fine filter approach was incorporated by describing two levels of actions—program actions and project actions. Program actions are broad in scope and ongoing, while project actions describe work to implement the program action at specific locations. Program actions were first categorized into one of five broad action groups:

Over the past several years, DEC staff have captured, banded, and placed transmitters on more than 70 short-eared owls. Using a variety of nets, DEC staff safely capture them and northern harriers, determine their age and sex if possible, and gather other biological information. The short-eared owl is surprisingly docile when being handled, making processing relatively easy. Staff place a unique federal identification band on each owl's leg to facilitate reporting if it is seen again or recovered. A lightweight radio or satellite backpack-style transmitter is also placed on each owl so that it can be tracked.

- Address Threats – the action directly addresses the threat.

- Direct Species Benefit – the action benefits the population of the species or habitat.

- Population Surveillance/Monitoring – the action monitors the status of the species or habitat.

- Planning – the action plans for restoration, recovery, or management of the species or habitat.

- Research – the action increases our understanding of the species or habitat.

The second categorization of program actions was into the IUCN Conservation Action classification system to allow comparability of actions among the northeast states. Each action was then linked to the SGCN that it would benefit. Where possible, information on readiness, durability, cost, and relative priority of the action was also estimated by DEC staff and entered into the database for each action. The database provides a tool to evaluate proposed actions and guide management decision-making on priorities for implementation.

More than 600 actions to conserve SGCN and SPCN were identified by DEC staff and conservation partners. In the database, each of these actions was linked to species that would benefit from that action, resulting in 3,804 species-action links. These species-action links are enumerated by the IUCN Action Classifications in Table 9.

Table 9. Number of Conservation Actions in SWAP Database

Category #	IUCN Category	IUCN SubCategory	Actions (N)	High Priority SGCN	SGCN	SPCN
				N	N	N
1.1	Land/Water Protection	Purchase Development Easement	27	16	7	4
1.2		Purchase Fee Title	56	25	28	3
2.1	Land/Water Management	Site Management/Restoration	330	143	161	26
2.2		Invasive Species/Pathogen Control	74	37	36	1
2.3		Habitat and natural process restoration	288	69	121	98
2.4		Water quality Improvement	163	55	68	40
2.5		Atmospheric pollution control	80	26	19	35
3.1	Species Management	Harvest Management	35	13	14	8
3.2		Recovery Plan Implementation	11	10	0	1
3.3		Reintroduction	12	8	2	2
3.4		Captive Breeding/Headstarting/Rehabilitation	26	16	9	1
4.2	Education	Staff Training	12	7	5	0
4.3		Public Awareness /Outreach	137	63	48	26
5.1	Law and Policy	Legislation	4	3	1	0
5.2		Department Regulation/Policy change	382	143	176	63
5.4		Law Enforcement	46	16	24	6
6.2	Economic Incentives	Alternate product development and support	1	0	1	0
6.4		Landowner Incentive Program	105	29	42	34
6.5		Aid to municipalities	34	13	16	5
7.1	Capacity Building	Technical Assistance to municipalities	1	1	0	0
7.2		Interagency/Interstate/International Cooperative	122	57	62	3
7.4		Watershed/Regional Planning	9	4	4	1
8.1	Research	Taxonomy	9	6	3	0
8.2		Population size, distribution, and trends	255	66	99	90
8.3		Life History,Ecology, and Habitat	407	140	159	108
8.4		Harvest	9	3	2	4
8.5		Threats	207	68	85	54
8.6		Effectiveness of Actions	15	13	2	0
9.1	Conservation Planning	Species Recovery Plan	107	61	38	8
9.2		Area Management Plan	52	33	18	1
10.1	Monitoring	Population	533	236	232	65
10.2		Harvest	13	3	9	1
10.4		Habitat	151	43	73	35
11.1	Other	Other Actions	91	26	46	19
		Totals	3804	1452	1610	742

The conservation actions have been summarized and compiled into goals and objectives in this chapter.

The goals for conservation action are to:

- Protect adequate and viable habitats for SGCN

- Manage habitats to benefit SGCN

- Protect SGCN populations to reverse declines in abundance or loss of range

- Manage SGCN to restore self-sustaining populations

- Develop and maintain current monitoring data on SGCN abundance, distribution, and condition

- Foster research to improve our knowledge regarding SGCN populations and habitats

- Effectively communicate with all audiences regarding conservation of SGCN to inform the public and engage the conservation community

- Continue to integrate conservation of SGCN into the many forms of natural resource planning

1. **Goal:** Protect adequate and viable habitats for SGCN.

    1.1. **Objective:** Protect important SGCN habitats through acquisition of easements or fee title

        1.1.1. **Action:** Identify specific locations or focus areas of key SGCN habitats that are a priority for protection, and make this information available to conservation partners. **Measure:** Number of locations identified for habitat protection

        1.1.2. **Action:** Use the Open Space Plan to designate important SGCN habitats for priority acquisition. **Measure:** Number of acres protected

        1.1.3. **Action:** Acquire fee title on parcels that provide important SGCN habitat and habitat connectivity. **Measure:** Number of acres protected

        1.1.4. **Action:** Acquire conservation easements on land that has or can be managed to provide important SGCN habitats. **Measure:** Number of acres protected

    1.2. **Objective:** Use existing regulatory authority to reduce habitat loss.

        1.2.1. **Action:** Prevent installation of improperly designed shoreline hardening structures. **Measure:** Linear feet of shoreline habitat protected by structure that does not negatively impact SGCN

        1.2.2. **Action:** Update state wetlands regulatory mapping for Article 24 (Freshwater Wetlands Act) and Article 25 (Tidal Wetlands Act), and include freshwater wetlands of "Unusual Local Importance" that provide important habitat for SGCN. **Measure:** Acres of wetlands added to regulatory maps

        1.2.3. **Action:** Reclassify high-diversity stream reaches to protect key habitats from disturbance and discharges. **Measure:** Number of known high-diversity stream reaches classified as C(t) or higher

        1.2.4. **Action:** Reduce negative impacts to SGCN from the intake of cooling water and the discharge of heated water at electric generation facilities. **Measure:** All facilities have implemented measures to reduce impingement and entrainment of SGCN at water intakes and the discharge of heated water.

        1.2.5. **Action:** Reduce negative impacts of altered flow in streams and rivers. **Measure:** Number of permits modified or issued that ensure adequate flow

    1.3. **Objective:** Protect habitat viability by developing and maintaining programs to reduce environmental contamination and pollution.

        1.3.1. **Action:** Reduce the occurrence of combined sewer overflow discharges. **Measure:** The number of waste water treatment plants that have been updated to reduce combined sewer overflow events

1.3.2. Action: Adopt point-source discharge permit limits that reduce impacts to SGCN at key locations. Measure: Reduction in discharge permit limits at key facilities

1.3.3. Action: Continue programs to reduce non-point source pollution. Measure: Reduction in amount of non-point source pollution entering waterbodies

1.4. Objective: Reduce the negative impacts to SGCN from atmospheric deposition of mercury and acid.

1.4.1. Action: Continue controlling mercury discharges from energy-generating and industrial facilities. Measure: Decline in mercury levels in impacted SGCN

1.4.2. Action: Continue controlling acid discharges from combustion sources. Measure: Increase in pH in impacted waters

1.5. Objective: Reduce the atmospheric discharges of greenhouse gases that are contributing to climate change.

1.5.1. Action: Continue policies to reduce greenhouse gas emission in New York by 40 percent by 2030 and 80 percent by 2050. Measure: Total carbon dioxide emissions in the New York Greenhouse Gas Inventory

1.5.2. Action: Minimize negative impacts to wildlife from state energy policies to reduce emissions, such as large-scale renewable power generation. Measure: Integration of up-to-date research on impacts to wildlife and potential mitigation actions into environmental reviews

2. Goal: Manage and restore habitats to benefit SGCN.

2.1. Objective: Control problematic native species and invasive species deleterious to SGCN.

2.1.1. Action: Control invasive plants in key SGCN habitats. Measure: Number of acres with dominant native vegetation restored

2.1.2. Action: Manage and control the spread of invasive insect species in forested SGCN habitats. Measure: Estimate of reduction or prevention of forest damage

2.1.3. Action: Manage submerged aquatic vegetation in marine, estuarine, and freshwater habitats to promote the growth of plant species beneficial to SGCN. Measure: Number of acres with dominant native vegetation restored

2.1.4. Action: Manage white-tailed deer populations to foster forest regeneration where regeneration is impacted by overabundant deer. Measure: Estimate of percent loss of forest regeneration

2.1.5. Action: Control double-crested cormorants, gulls, and problematic mammalian predators at locations where they are negatively impacting nesting birds or other SGCN. Measure: Nesting success of SGCN species

2.1.6. Action: Control feral cat colonies in priority SGCN habitats. Measure: Number of cat colonies present

2.1.7. Action: Implement plan for mute swan control. Measure: Number of mute swan is reduced to management goal.

2.1.8. Action: Continue aquatic habitat reclamation projects. Measure: Amount of habitat reclaimed.

2.1.9. Action: Continue sea lamprey control program. Measure: Wounding rate on SGCN fish species.

2.2. Objective: Control or limit introductions of new invasive species.

2.2.1. Action: Implement the aquatic invasive species management plan. Measure: The aquatic invasive species plan is implemented.

2.2.2. Action: Continue development of rapid response mechanisms and long-term strategies to control new occurrences of terrestrial invasive species. Measure: An invasive species strategic plan, including rapid response protocols, is completed.

2.3. Objective: Manage natural succession to maintain the diversity of vegetative systems and native forest types and age classes to support self-sustaining populations of the full array of native terrestrial wildlife.

2.3.1. Action: Restore and maintain grassland habitats within grassland focus areas. Measure: Number of acres of appropriately managed for grassland SGCN

2.3.2. Action: Implement management to restore and maintain habitat for young forest-dependent species on state lands. Measure: Number of acres of forest in young stage

2.3.3. Action: Encourage private forest owners to manage their forest lands for the benefit of young forest SGCN. Measure: Acres of private forest land primarily managed for young SGCN

2.3.4. Action: Improve vertical structure of mature forest stands via silviculture to balance ground cover, understory, mid-story, and canopy. Measure: Basal area and vertical measures

2.3.5. Action: Manage succession in fire-adapted habitats. Measure: Number of acres managed annually

2.3.6. Action: Establish and implement financial incentive programs to promote management of habitat for SGCN on private lands. Measure: Number of acres enrolled in incentive programs

2.3.7. Action: Support development of local markets for low-value forest products. Measure: Percent of forested landscape on which net-profit timber sales are feasible

2.4. Objective: Maintain and restore ecological integrity of habitats for SGCN.

2.4.1. Action: Restore or enhance riparian buffers at key locations. Measure: Miles of stream bank re-vegetated

2.4.2. Action: Restore natural hydrologic flow regime through barrier mitigation in waters critical to SGCN. Measure: Miles of natural stream flow reconnected in key SGCN habitats

2.4.3. Action: Restore critical marine habitats for SGCN species, including salt marshes, shellfish beds, eelgrass beds, beaches, and dunes. Measure: Acres of SGCN habitat restored

2.4.4. Action: Protect groundwater aquifers from pollution on Long Island. Measure: Nutrient and contaminant levels in groundwater

2.4.5. Action: Allow natural shoreline dynamic processes to occur on public lands and natural areas that support coastal SGCN. Measure: Miles of shoreline restored to conditions dominated by natural processes

2.4.6. Action: Restore viable habitats and host fish species in historic freshwater mussel locations. Measure: Area of SGCN habitat restored

2.4.7. Action: Manage protected lands to ensure habitat is suitable for target SGCN. Measure: Acres of managed habitats on protected lands

2.4.8. Action: Promote sustainable forestry on managed lands by working with consulting foresters to increase the acreage certified as managed for sustainable forestry. Measure: Acres of forest enrolled in sustainable forestry certification programs

2.4.9. Action: Implement recommendations of NYS 2100 Commission and the Community Risk and Resiliency Act. Measure: Number of permits that include resiliency considerations

2.5. Objective: Manage human disturbance in SGCN habitats.

    2.5.1. Action: Restrict public access to bat hibernacula. Measure: Number of hibernacula with restricted access

    2.5.2. Action: Restrict dredging between April and August in shallow estuarine SGCN habitats. Measure: Estimate of reproductive success of SGCN spawning in shallow estuary habitats in closed areas

    2.5.3. Action: Restrict recreational use of off-road vehicles in important SGCN habitats. Measure: Number of acres protected

    2.5.4. Action: Continue beach closures and other beach management practices to protect shorebirds during the nesting season. Measure: Nesting success of shorebirds in protected areas

2.6. Objective: Promote habitat connectivity for SGCN.

    2.6.1. Action: Restore and maintain natural habitats in linkage areas between large blocks of habitat for SGCN. Measure: Number of acres of viable habitat in identified linkage areas.

    2.6.2. Action: Work with Highway and Transportation departments to reduce road mortality of SGCN. Measure: Number of projects implemented to reduce road mortality

    2.6.3. Action: Remove or replace culverts and dams that impede passage of aquatic SGCN in high-priority areas. Measure: Miles of SGCN habitat with restored connectivity

    2.6.4. Action: Construct fishways to enable natural migrations of diadromous fish species. Measure: Number of fishways constructed

    2.6.5. Action: Foster northeast regional habitat connectivity projects for New York and regional SGCN. Measure: Identification of important habitat linkages between New York and neighboring states and provinces

2.7. Objective: Promote practices to improve habitat for pollinator species by providing a diversity of flowering plants throughout the active season.

    2.7.1. Action: Enhance pollinator habitat on state lands. Measure: acres of pollinator habitat enhanced

    2.7.2. Action: Provide information on pollinator-friendly landscaping and agricultural practices on DEC website. Measure: Number of visits to pollinator habitat management webpage

3. Goal: Protect SGCN populations to reverse declines in abundance or loss of range.

3.1. Objective: Maintain appropriate legal protection for all SGCN.

    3.1.1. Action: Revise the New York Endangered/Threatened Species list. Measure: 6NYCRR Part 182 is revised.

    3.1.2. Action: Ensure that New York marine fish and shark harvesting regulations remain consistent with federal regulations. Measure: Assessment of regulatory consistency

    3.1.3. Action: Modify Environmental Conservation Law and New York Code of Rules and Regulations to more clearly define native freshwater mussels as protected wildlife. Measure: Modification of wildlife definition in law and regulations

4. Goal: Manage SGCN to restore self-sustaining populations.

4.1. Objective: Restore populations of SGCN.

    4.1.1. Action: Implement recovery plans that have been developed for Endangered and Threatened species (eastern cricket frog, massasauga rattlesnake, spruce grouse, bald eagle, black skimmer, Karner blue butterfly, and cisco). Measure: Increase in population size or area of distribution for the species

4.1.2. Action: Continue New England cottontail rabbit restoration projects. Measure: Acres of managed habitat

4.1.3. Action: Continue the American shad restoration program. Measure: Appropriate level of abundance in Hudson and Delaware rivers

4.1.4. Action: Continue spruce grouse restoration project. Measure: Spruce grouse population size

4.1.5. Action: Continue lake sturgeon reintroduction project. Measure: Number of self-sustaining populations restored

4.1.6. Action: Continue deepwater cisco reintroduction project. Measure: Number of self-sustaining populations established

4.1.7. Action: Continue round whitefish restoration project. Measure: Number of self-sustaining populations restored

4.1.8. Action: Continue sauger restoration program. Measure: Number of self-sustaining populations restored

4.1.9. Action: Collaborate with neighboring states to manage SGCN populations that cross state boundaries. Measure: Number of collaborative projects with neighboring states

4.1.10. Action: Continue eastern hellbender head-starting project. Measure: Self-sustaining populations are restored in the Allegheny and Susquehanna rivers.

4.1.11. Action: Evaluate population restoration projects for additional SGCN, and implement those projects that are deemed feasible.

4.2. Objective: Maintain a Fish and Wildlife Health Program to document the causes of fish and wildlife mortality and occurrence of any disease outbreaks impacting SGCN.

4.2.1. Action: Investigate mortality of SGCN as appropriate, and report unusual incidences of mortality through the DEC Wildlife Resources Center and Animal Health Diagnostic Center at the College of Veterinary Medicine at Cornell University. Measure: A summary report on causes of wildlife mortality in New York is available on an annual basis.

4.3. Objective: Reduce mortality of wounded or stranded marine species.

4.3.1. Action: Continue the Marine Mammal and Sea Turtle Rescue Program. Measure: Number of rescues of injured or stranded marine species

5. Goal: Develop and maintain current monitoring data on SGCN populations and habitats.

5.1. Objective: Develop a comprehensive monitoring strategy for SGCN.

5.1.1. Action: Define SGCN monitoring needs and design a strategy to meet these needs. Measure: A monitoring strategy is drafted.

5.1.2. Action: Continue woodcock singing ground survey, ruffed grouse hunting log, and bow hunter log projects. Measure: Number of logs submitted by volunteers participating in the programs

5.2. Objective: Conduct surveys as necessary to determine SGCN population trends.

5.2.1. Action: Expand freshwater mussel inventory to unsurveyed waters. Measure: Number of surveys conducted in unsurveyed watersheds

5.2.2. Action: Develop a freshwater mussel monitoring strategy to detect serious declines and long-term population trends. Measure: A monitoring plan is drafted.

5.2.3. Action: Continue to monitor hibernating bat populations and physical conditions in the hibernacula. Measure: Number of hibernacula monitored annually

5.2.4. Action: Periodically survey for SGCN insects in suitable habitats. Measure: Surveys are conducted on at least a 10-year cycle.

5.2.5. Action: Use Vessel Trip Reports to gather data on marine SGCN. Measure: System in place to collect data from Vessel Trip Reports.

5.2.6. Action: Develop and implement a whale monitoring program. Measure: A monitoring program is implemented.

5.2.7. Action: Monitor responses of grassland and young forest SGCN populations to management efforts on state and private lands. Measure: Monitoring programs implemented.

5.2.8. Action: Continue SGCN fish surveys on no less than a 10-year cycle. Measure: Number of SGCN fish surveys completed

5.3. Objective: Monitor levels of contaminants in SGCN in various locations in the state.

5.3.1. Action: Monitor chemical contaminants in fish, bird, and mammal top predators. Measure: Number of species monitored for contaminants

5.4. Objective: Monitor key habitat conditions for SGCN.

5.4.1. Action: Continue current programs (listed in Appendix 2) that monitor habitat parameters. Measure: Number of habitat monitoring programs

5.4.2. Action: Continue to monitor occurrences of harmful algae blooms. Measure: Annual statistics on harmful algae blooms are available for select waters.

5.4.3. Action: Continue to periodically map eel grass and other marine and estuarine aquatic vegetation beds. Measure: Current aquatic vegetation maps are available for key areas.

5.4.4. Action: Initiate a monitoring program for deep, cold Adirondack lakes that may serve as refuges for sensitive SGCN from the effects of climate change. Measure: Number of lakes monitored

5.4.5. Action: Conduct periodic status and trends analyses of tidal and freshwater wetlands. Measure: Analytical report produced.

5.4.6. Action: Monitor whales to determine habitat use and inform development of strategies to reduce and prevent ship strikes. Measure: A monitoring program is designed and implemented.

5.5. Objective: Develop and maintain data management systems to share data among partnerships and better integrate New York data into regional collaborations.

5.5.1. Action: Review existing data-sharing programs such as Avian Knowledge Network to determine the most effective data-sharing system. Measure: An evaluation of biological data sharing agreements is completed.

5.5.2. Action: Continue to participate in regional SGCN assessments and data sharing to plan regional SGCN conservation actions. Measure: Number of regional SGCN actions implemented

6. Goal: Foster research to improve our knowledge regarding SGCN populations and habitats.

6.1. Objective: Foster research that improves our understanding of SGCN population dynamics.

6.1.1. Action: Investigate use of environmental DNA to confirm species presence. Measure: A report on the use of environmental DNA to detect SGCN or other rare species is produced.

6.1.2. Action: Investigate reproductive success and recruitment to the breeding population for SGCN that are experiencing severe population declines. Measure: Number of reports or publications on SGCN population viability

6.2. Objective: Research SGCN habitat use.

    6.2.1. Action: Document SGCN use of wetlands less than 12.4 acres not currently protected under Article 24. Measure: Number of smaller wetlands identified as key SGCN habitat

    6.2.2. Action: Identify habitat components that are critical to particular life stages of SGCN. Measure: Number of research projects to identify key SGCN microhabitats

7. Goal: Communicate effectively with all audiences regarding conservation of SGCN to inform the public and engage the conservation community.

    7.1. Objective: Inform the public about conservation of SGCN.

        7.1.1. Action: Distribute information on SGCN conservation to the public. Measure: Number of presentations, articles, web hits, and events focused on SGCN conservation

        7.1.2. Action: Develop a report on "the state of wildlife in New York" for a non-technical audience. Measure: A document on the current status of wildlife is published.

    7.2. Objective: Consult with all levels of government and conservation partners to seek a unity of effort in conserving SGCN.

        7.2.1. Action: Sponsor workshops or symposia related to SGCN conservation. Measure: Number of public events convened on SGCN conservation topics

        7.2.2. Action: Support Conservation Advisory Councils, Environmental Management Councils, and similar efforts to build local capacity for natural resource conservation. Measure: Number of local governments that maintain citizen councils

        7.2.3. Action: Share information regarding important SGCN, their habitats, and best-practices conservation actions with county and town governments to inform their land-use decision making and conservation efforts. Measure: Number of local governments that adopt modified plans, policies, or procedures to conserve SGCN and their habitats

    7.3. Objective: Support citizen science programs to engage people in the conservation of SGCN.

        7.3.1. Action: Continue existing citizen science monitoring projects. Measure: Number of citizen science projects monitoring wildlife and habitats.

8. Goal: Continue to integrate conservation of SGCN into key natural resource planning.

    8.1. Objective: Develop and maintain interagency cooperatives to protect and manage SGCN.

        8.1.1. Action: Participate in existing cooperatives to include SGCN in program implementation, including the Great Lakes Restoration Initiative, Lake Champlain Basin Program, Chesapeake Bay Program, Susquehanna River Basin Commission, and Hudson River Estuary Program. Measure: Number of interagency cooperatives incorporating SGCN needs into planning documents

        8.1.2. Action: Participate in existing interstate fish and wildlife cooperatives to include SGCN in program implementation, including: Lake Champlain Fish and Wildlife Cooperative, Delaware and Susquehanna River fisheries cooperatives, Atlantic States Marine Fisheries Commission, and Great Lakes Fisheries Commission. Measure: Number of actions that benefit SGCN or their habitats

        8.1.3. Action: Implement existing natural resource plans, including the Great Lakes Action Agenda, Hudson River Action Agenda, Ocean Action Plan, Lake Champlain Opportunities for Action Management Plan, Mohawk River Basin Action Agenda, and the Finger Lakes Watershed Plan. Measure: Number of implementation actions conserving SGCN habitats or populations

8.1.4. Action: Continue the collaborative biodiversity conservation work of the northeastern states, including the Regional Conservation Needs Program and the Northeast Fish and Wildlife Diversity Technical Committee. Measure: Number of regional conservation projects

8.1.5. Action: Continue to engage with the Appalachian, North Atlantic, and Upper Midwest and Great Lakes Landscape Conservation Cooperatives (LCC). Measure: Number of LCC projects in New York that benefit SGCN

8.2. Objective: Management for SGCN habitat is incorporated into DEC Unit Management Plans, Wildlife Management Area habitat management plans, and State Park Master Plans.

8.2.1. Action: Develop a narrative on young habitat (shrublands, forest lands, and grasslands) that can be used in state land management planning documents. Measure: SGCN-focused actions are included in all appropriate state land management planning.

8.2.2. Action: Provide training for DEC and conservation partner staff regarding specific habitat requirements for young forest SGCN. Measure: Number of staff attending training sessions.

8.3. Objective: Build local capacity for conserving SGCN and their habitats.

8.3.1. Action: Foster collaborations to strengthen Smart Growth programs. Measure: The number of communities integrating Smart Growth into planning

8.3.2. Action: Continue support of the Land Trust Alliance and similar private, not-for-profit conservation organizations. Measure: Amount of funding available to the Conservation Partnership Program that is used for conserving SGCN habitats

8.3.3. Action: Provide technical assistance to local governments about tools and strategies for conserving SGCN through home rule authority. Measure: Number of communities assisted

8.4. Objective: Develop focus areas for key species and habitats.

8.4.1. Action: Identify focus areas for high-priority SGCN and important habitats. Measure: Number of focus areas designated

Northern red salamanders are typically found under rocks, logs, and leaf litter in moist forests near streams, ponds, bogs, and wet meadows. Larvae develop in clean, cool streams and brooks. This species has disappeared from some areas where it was found historically, but it remains abundant in other such areas. A recent population trend is unknown.

(Photo: Jenny Murtaugh, NYSDEC)

Chapter 7. Monitoring SGCN, Habitats, and Project Effectiveness

SGCN Monitoring

There is a strong body of science to inform the monitoring of fish and wildlife. Monitoring protocols and accepted methods for statistical analysis of monitoring data are well established for several taxa. For some species, there are monitoring records covering many decades, with robust statistical analysis of the data to elucidate the cause of detected changes. For other species, there are no established monitoring programs and little available information on abundance and distribution. Birds are relatively well monitored, and the information is widely shared through bird lists and eBird. Some mammals, such as cave bats, have systematic monitoring, but other SGCN mammals, like the least weasel, are so rare that a structured monitoring program is not possible. Freshwater fish are regularly surveyed by DEC biologists, so in most cases, distribution and population trends can be determined with a high degree of certainty. Similarly, most marine fish are recorded in regular surveys, although some species are rarely encountered due to their rarity or selection of less surveyed habitats. Amphibian and reptile populations are likewise surveyed by DEC and conservation partners, but this effort is often focused on a particular locality or species rather than being conducted through a systematic statewide program. SWG funding has enabled DEC to monitor freshwater mussel populations in parts of the state, but there was no systematic monitoring of mussels prior to the advent of the SWG Program. Several insect taxa have been surveyed for presence/absence, but only a few species with protected status have ongoing monitoring to detect trends in distribution and abundance.

The USFWS monitors species and habitats in the National Wildlife Refuge (NWR) system. There are 12 National Wildlife Refuges located in New York. Iroquois National Wildlife Refuge is the largest, with 10,828 acres, followed by the 9,809-acre Montezuma NWR. These two refuges are a matrix of wetland and upland habitats used by numerous SGCN and provide critical stopover sites for migrating birds. The 597-acre Shawangunk Grassland NWR provides important habitat for grassland SGCN, as does the Wallkill River NWR that is shared between New York and New Jersey.   The Long Island National Wildlife Refuge Complex comprises nine units and protects approximately 6,500 acres of important SGCN habitats. NWR monitoring provides a baseline from which to measure change, as well as detailed monitoring of select species and habitats.

Appendix 2 contains lists of monitoring programs in New York, including DEC and partner monitoring programs and USFWS monitoring on National Wildlife Refuges in New York. These continuing monitoring efforts provide fundamental information for a number of SGCN and are the core of current species and habitat monitoring efforts in New York. However, these monitoring programs often originate from specific information needs and collectively do not form the type of unified program that can lead to greater efficiencies in monitoring effort.

Habitat Monitoring

Habitat parameters are frequently recorded as a component of other projects, but there is no ongoing, systematic monitoring of all habitat types in New York. Monitoring programs are typically focused on program goals and are not focused specifically on SGCN. For aquatic habitats, monitoring is mostly related to environmental quality and often measures impairment of human use rather than evaluating the functionality of natural systems. The environmental monitoring conducted by the DEC Bureau of Habitat measures levels of chemical contamination, determines contaminant uptake and effects in biota, and continues monitoring after the restoration of contaminated sites. Forest habitat monitoring is conducted through the Forest Inventory and Analysis Program, but there are few comprehensive monitoring programs for non-forested terrestrial habitats. Currently, numerous monitoring programs are conducted throughout New York, recording important information for species and habitats. The data collected by these monitoring projects is analyzed and archived by DEC staff or conservation partner organizations and is made available upon request to other agencies, researchers, or the public.

Improving Efficiency of Monitoring Programs

Designing and implementing a comprehensive and useful environmental monitoring program has long been a goal of conservation in New York. The CWCS proposed a comprehensive monitoring program for SGCN but also noted that DEC does not have the staff and resources that would be needed to design and implement such a program. Because of these resource limitations, the systematic development of a program to monitor SGCN was not fully implemented, although some progress has been made in monitoring populations and habitats of SGCN. SWG funding has enabled DEC to develop and implement improved monitoring of amphibians, reptiles, freshwater mussels, birds, and other taxa.

A pilot project to develop a multi-species monitoring approach was conducted by the Hudson River Estuary Program. This project combined sampling methodologies from the North American Marsh Bird Monitoring Program and the North American Amphibian Monitoring Program to develop a more efficient monitoring program for SGCN. Combining occupancy modeling with field surveys for multiple species by volunteers and professional staff produced a more efficient means of monitoring SGCN. There is potential to expand this approach to multi-species monitoring in other areas of the state, but doing so would require a rigorous program design and continued commitment of funding and staffing resources.

To be effective, monitoring programs must be designed to meet specific objectives, such as documentation of baseline conditions, compliance monitoring, and identifying trends over time. Monitoring must also factor in the threats to species and habitats, so that monitoring provides more than population surveys and includes measures of habitat that can be used to assess the direct impacts of threats and the level of ecological integrity. The most valuable monitoring data is collected using standardized methodologies over a long time period in order to establish trends and link the causes and effects of observed changes.

Monitoring the Effectiveness of Conservation Actions

Monitoring the performance of conservation actions has been a longstanding challenge for environmental resource managers. Traditional measures, such as number of acres of habitat restored, sometimes do not result in immediate improvement in the stability of the population. Due to the statistical margin of error, natural population variability, and lag time, it can be difficult to document population increases with precision. Additionally, even when population improvements are documented, a direct causal link between the measured improvement and a particular conservation action sometimes cannot be documented with available data.

Efforts to facilitate monitoring of conservation actions at the northeast regional level and national level are ongoing. The northeast states have developed a standardized terminology for conservation planning in the Northeast through the Lexicon Project and a regional SWAP database to store and query regional data. These two efforts will facilitate rollup of state-level data for analysis at a regional level, providing a base of information for the assessment of landscape-scale conservation projects. At the national level, the USFWS has developed Tracking and Reporting Actions for the Conservation of Species (TRACS), a tracking and reporting system for conservation actions funded by the Wildlife and Sport Fish Restoration Program, including SWG. TRACS will provide improved long-term tracking of project outcomes, facilitating an evaluation of project effectiveness and informing state and federal management of wildlife resources.

The northeast states collaborated to develop a Northeast Regional Monitoring and Performance Measures Framework. This report developed representative habitats and species groups, stressors to these resources, and proposed indicators of status and trends, as shown in Table 10.

Fish, Wildlife, and Habitats	Proposed Indicators	Threats/Stressors
1. Forests	• Forest area – by forest type-evaluation of CCAP and NLCD data • Forest area – by reserve status-protected lands data layer • Forest composition and structure – FIA data • Forest bird population trends	• Forest fragmentation index • Acid deposition index • Age/structure classes of forests
2. Freshwater streams and river systems	• Distribution and population status of native eastern brook trout • Index of biotic integrity • Riparian area condition • Native fish condition • Local connectedness	• Percent impervious surface • Stream connectivity (length of open river) and number of blockages • Distribution and population status of non-indigenous aquatic species • Flow alteration • Human conversion of natural land cover
3. Freshwater wetlands	• Size/area of freshwater wetlands • Buffer area and condition (buffer index) • Hydrology – upstream surface water retention • Hydrology – high and low stream • Wetland bird SGCN population trends • Stand age in forested wetlands	• Percent impervious surface • Road density • Wetland connectivity
4. Highly migratory species	• Migratory SGCN raptor population index • Shorebird SGCN abundance • Bat population trends • Abundance of diadromous fish • Presence of monarch butterfly	• Habitat loss • Pollution • Disease
5. Lakes and ponds	• Overall Productivity of Common Loons • Index of biological integrity	• Percent impervious surface/landscape integrity • Percent shoreline developed (shoreline integrity) • Proximity of roads • Presence of dams
6. Managed grasslands and shrublands	• Grassland Breeding Bird LIP surveys • Young forest bird surveys	• Succession
7. Regionally Significant Species of Greatest Conservation Need	• Population trends and reproductive productivity of federally listed species • State-listing status and heritage rank of highly imperiled wildlife • Population trends of species of high responsibility and concern	• Habitat loss • Pollution • Disease
8. Unique habitats in the Northeast	• Wildlife presence/absence • Wildlife population trends	• Proximity to human activity/roads • Land use/land cover changes • Loss of connectivity • Predicted development

Using the regional indicators in the Northeast Monitoring Framework, The Nature Conservancy assessed the current conditions of species and habitats in the Northeast. This project employed a GIS analysis to evaluate habitat condition, population trends, and land protection status. The final report, *Conservation Status of Fish, Wildlife, and Natural Habitats in the Northeast Landscape*, provides baseline measures at the regional level from which to gauge progress on conservation efforts. Refining this data and using it for evaluating conservation progress at the state level in New York is an ongoing effort to support updating the SWAP and to evaluate other conservation efforts.

Building upon the effort to design performance measures at the northeast regional level, the Association of Fish and Wildlife Agencies' Teaming with Wildlife Committee formed an Effectiveness Measures Workgroup to develop a framework that can be used by states to improve performance reporting. The workgroup's report, *Measuring the Effectiveness of State Wildlife Grants*, recommends indicators to measure status and trends of natural resources, as well as effectiveness of conservation actions supported by SWG. The report provides templates for reporting results of conservation actions and methods to incorporate this information into grant reporting and adaptive management. The effectiveness measures for conservation actions are shown in Table 11.

Table 11. Measures for Monitoring Effectiveness of SWAP Conservation Actions.

IUCN Action Category	Action Number	Sub-Category	Effectiveness Measure
Land/Water Protection	1.1	Purchase Development Easement	Number of Acres in Easement
	1.2	Purchase Fee Title	Number of Acres Purchased
Land/Water Management	2.1	Site Management/Restoration	Habitat Measures
	2.2	Invasive Species/Pathogen Control	Species Measures
	2.3	Habitat/Natural Process Restoration	Habitat Measures
	2.4	Water Quality Point Source Control	Pollutant load reductions
	2.5	Atmospheric Pollution Control	Pollutant load reductions
Species Management	3.1	Harvest Management	Evidence that data are being used to guide harvest
	3.2	Recovery Plan Implementation	Species Measures
	3.3	Reintroduction	Evidence of Breeding Happening at Sites
	3.4	Captive Breeding/Headstarting	Species Measures
Education	4.1	Licensing/Certification Programs	Special Licenses Issued
	4.2	Staff Training	Number of Individuals Receiving Training
	4.3	Public Awareness/Outreach	Evidence that Outreach is Reducing Threats
Law and Policy	5.1	Legislation	Percentage of Stakeholders Who Support Legislation
	5.2	Regulation/Policy change	Percentage of Stakeholders Who Support Regulation
	5.3	Voluntary Professional Standards/Codes	Percentage of Stakeholders Who Agree to Participate
	5.4	Law Enforcement	Available Staff or Capacity
Economic Incentives	6.1	Private Buyout	N/A
	6.2	Alternate Product Development	N/A
	6.3	Market Forces	N/A
	6.4	Landowner Incentive Program	Number of acres managed
	6.5	Aid to municipalities	Percent of Target Audience Receiving Aid

IUCN Action Category	Action Number	Sub-Category	Effectiveness Measure
Capacity Building	7.1	Technical Assistance to municipalities	Percent of Target Audience that Receives Technical Assistance
	7.2	Interagency Cooperative	Key Stakeholders involved in Cooperative
	7.3	Obtaining Funding	N/A
	7.4	Watershed/Regional Planning	Key Stakeholder Support for the Plan
Research	8.1	Taxonomy	Evidence that data are being used to inform conservation actions
	8.2	Population size, distribution, and trends	Evidence that data are being used to inform conservation actions
	8.3	Life History and Ecology	Evidence that data are being used to inform conservation actions
	8.4	Harvest	Evidence that data are being used to determine allowed harvest
	8.5	Threats	Evidence that data are being used to inform conservation actions
	8.6	Effectiveness of Actions	Evidence that data are being used to inform management decision-making
Conservation Planning	9.1	Species Recovery Plan	Species Measures
	9.2	Area Management Plan	Habitat Measures
	9.3	Harvest	Evidence that data are being used to determine allowed harvest
Monitoring	10.1	Population	Species Measures
	10.2	Harvest	Evidence that data are being used to determine allowed harvest
	10.3	Trade	N/A
	10.4	Habitat	Habitat Measures
Other	11.1		N/A

Chapter 8. Implementation

Implementation of the SWAP will involve several government agencies and conservation partners, as well as private individuals, and will be accomplished primarily through existing partnership agreements and inter-agency committees. DEC staff work with a wide variety of partners in the management of SGCN and their habitats, and in many cases actions identified in the SWAP will be best implemented through these partnerships and cooperative programs. The inter-agency partnerships are guided by an Executive or Steering Committee comprised of representatives from federal, state, and local government agencies, as well as conservation and community organizations. Sub-committees and technical workgroups are formed as necessary to evaluate data and develop recommendations. This structure provides a mechanism for deliberation of environmental policy, and a broad base for implementation of conservation actions. Partnerships in landscape scale conservation include:

- Appalachian Joint Venture
- Appalachian Landscape Conservation Cooperative
- Atlantic Coast Joint Venture
- Eastern Brook Trout Joint Venture
- Hudson River Estuary Program
- Mohawk River Basin Program
- North Atlantic Landscape Conservation Cooperative
- Partners in Amphibian and Reptile Conservation
- Peconic Estuary Program
- Staying Connected Initiative
- Upper Midwest and Great Lakes Landscape Conservation Cooperative

Cooperative Programs specific to fish and wildlife management include:

- Atlantic States Marine Fisheries Commission
- Great Lakes Fisheries Commission
- Lake Champlain Fish and Wildlife Management Cooperative
- Northeast Fish and Wildlife Diversity Technical Committee
- New York Cooperative Fish and Wildlife Research Unit

Measuring the carapace of a spotted turtle found in the Albany Pine Bush. Spotted turtles have experienced a range-wide decline of more than 50% over the past three generations. Trends in New York State are difficult to determine because of a lack of abundance or distribution data, but areas in southern New York where the species was once common are no longer inhabited. Historic records suggest a loss of populations in the mid-Hudson Valley, western Long Island, and the New York City area.

(Photo: K. Breisch)

Interstate/International Watershed Management Programs include:

- Chesapeake Bay Program
- Great Lakes Restoration Initiative
- Lake Champlain Basin Program
- Susquehanna River Basin Commission

Federal agency partners include:

- Department of Defense
- Environmental Protection Agency
- National Oceanic and Atmospheric Administration
- U.S. Geologic Survey
- U.S. Department of Agriculture
- U.S. Fish and Wildlife Service
- U.S. Forest Service

New York State agencies include:

- Adirondack Park Agency
- Albany Pine Bush Commission
- Department of Agriculture and Markets
- Department of State
- Department of Transportation
- Environmental Facilities Corporation
- Lake George Park Commission
- Long Island Central Pine Barrens Commission
- New York State Museum
- Office of Parks Recreation and Historic Preservation
- Tug Hill Commission

Indian Nations are also collaborating with New York State on environmental projects, including the SWAP. The currently recognized Indian Nations by New York are:

- Cayuga Nation
- Oneida Nation
- Onondaga Nation
- Seneca Nation
- Shinnecock Indian Nation
- St. Regis Mohawk Tribe
- Tonawanda Seneca Nation
- Tuscarora Nation
- Unkechaug Indian Nation

The Haudenosaunee Environmental Task Force, a collaborative organization of Indian Nations, also partners with New York State in implementation of environmental protection programs, including the SWAP.

New York City is an important partner in implementing the SWAP. In addition to management of wildlife and habitat within the city, the New York City Department of Environmental Protection owns and manages significant land in the forests surrounding their water supply reservoirs. These lands are protected from development and maintained in natural vegetative cover, providing habitat for dozens of SGCN.

Numerous local governments and agencies will have a part in implementation of the SWAP. County and town governments in New York have used the SWAP in developing local conservation plans, and in planning for recreational use of their parks and open space. County Soil and Water Conservation Districts regularly work with DEC staff and other conservation professionals on projects that benefit SGCN.

The non-governmental organizations will play a large SWAP implementation role. Many of the conservation partner organizations are stewards of significant natural resources, and have tremendous staff capabilities. These organizations include:

- Adirondack Council
- American Bird Conservancy
- Audubon New York
- Cary Institute
- Conservation Fund Advisory Board
- Cornell Lab of Ornithology
- Ducks Unlimited
- Group for the East End
- Land Trust Alliance
- National Audubon Society
- National Fish and Wildlife Foundation
- National Wild Turkey Federation
- National Wildlife Federation
- NatureServe
- NYS Conservation Council
- NYS Trappers Association
- Open Space Institute
- Pheasants Forever
- Ruffed Grouse Society
- The Nature Conservancy
- Trout Unlimited
- Wildlands Network
- Wildlife Conservation Society
- Wildlife Rehabilitation Council
- Wolf Conservation Center

Ruffed grouse are a popular game bird, but are declining due to loss of early successional forest habitats. DEC and partners have launched the Young Forest Initiative to increase the percentage of this habitat type on Wildlife Management Areas.

In addition to these state and national level organizations, there are many local clubs and organizations that will also contribute to implementation. These smaller groups help disseminate environmental information, and often have monitoring projects that collect valuable data on local conditions.

Universities will conduct many projects that contribute to SWAP implementation, especially Cornell University, and multiple campuses of the State University of New York, including Environmental Science and Forestry, Albany, Cobleskill, Buffalo, New Paltz, Oswego, Potsdam, Plattsburgh, and Brockport.

Research actions to better understand the life history and population status of SGCN will be conducted by not-for-profit organizations and the academic community. Implementation of these actions will somewhat depend upon available funding, and staff with particular expertise, so it is not possible to assign the needed research to any particular university or organization. However, all research partners will collaborate to make continuous progress on research to fill in the data gaps regarding species, habitats, and threats.

Outreach and communication of natural resource conservation issues is a cross-cutting goal that strengthens a public conservation ethic for protection and management. DEC and conservation partners have many ongoing outreach programs, including classroom presentations, teacher training, media communications, publication of non-technical reports, and volunteer stewardship projects. Volunteer Stewardship Agreements are increasingly used to implement conservation projects. Citizen Science has been used to conduct avian monitoring, such as the Breeding Bird Atlases, Mountain Birdwatch, eBird, and Hawk Watches, as well as odonate surveys, and to monitor monarch butterfly migration. There is potential to increase volunteer science and stewardship projects to gather data on species abundance, distribution, habitat characteristics, and to record phenology of seasonal events. All of these are important data for assessing the impacts of climate change on SGCN.

Projects to survey, monitor, or research SGCN will often require a DEC Special License or Temporary Revocable Permit, most commonly a License to Collect, Sell, or Possess. This license authorizes the holder to possess wildlife for education, exhibition, propagation, bird banding, and scientific purposes, and requires the holder to submit annual reports documenting activities carried out under the license. Another Special License that is relevant to conservation of SGCN is a Wildlife Rehabilitator License, which allows for the treatment and release of injured wildlife. The Wildlife Rehabilitation Council provides training and support for rehabilitating injured wildlife in New York. Wildlife Rehabilitators are frequently also engaged in education, presenting information on wildlife conservation to school and community groups, often with displays of non-releasable animals. Wildlife rehabilitators are also often the first point of professional contact for diseased wildlife specimens, and they work closely with the DEC Wildlife Pathology Unit to implement the Wildlife Health Program Strategic Plan.

Priorities for Implementation

Priority conservation actions have been identified using two criteria. First, prioritization was established in the model that guided development of the SGCN list, as described in Chapter 3. This prioritization of species identified 166 high priority SGCN. Second, DEC staff, in collaboration with partners, identified the conservation actions for each SGCN, and detailed information on scope, readiness, durability, relative priority, and estimated cost of the action in a database. Conservation actions identified for high priority SGCN were then evaluated to determine the number of threats addressed, the number of species expected to benefit, and the relative priority of the action. Then, conservation actions identified as high priority were separated by habitat type (terrestrial, freshwater aquatic, and marine/estuarine), and further characterized as those which apply statewide, and those which are more applicable to a smaller geographic area. The geographic areas of the priority conservation actions are identified by ecoregion for terrestrial species, by watershed for the freshwater aquatic species, and by habitat type for the marine/estuarine habitats.

This prioritization of conservation actions was reviewed by the SWAP Advisory Committee, which provided additional details on the species expected to benefit in each ecoregion and watershed, and the current conservation programs that should be continued as priorities.

Terrestrial Species and Habitats

Statewide Priority Actions

- Foster conservation of pollinator habitats.

- Revise the New York Endangered/Threatened list.

- Conduct periodic surveys for SGCN insects.

- Archive data on reports of SGCN amphibian and reptile species in a database.

- Continue periodic population surveys at bat hibernacula and identify bat summer range.

- Conduct and publish a breeding bird atlas.

Moose have established a viable population in New York, but their habitat is vulnerable to climate change. Research by DEC, Cornell, SUNY ESF, WCS, and others is determining the population size and health of moose in New York.

- Promote sustainable forestry by working with consulting foresters to increase the forest acreage certified as managed for sustainable forestry.

North Atlantic Coast

- Natural habitat protection and restoration in priority habitats.
  - Pine Barrens
  - Beaches and Dunes
  - Tidal Wetlands
  - Coastal Plain Swamp
  - Coastal Grassland/Shrubland
  - Coastal Plain Pond

- Prevent installation of improperly designed shoreline hardening structures.

- Manage human disturbance in key habitats.
  - Beach closures
  - Off-road vehicle use

- Control of invasive and problematic native plant and animal species.
  - Southern pine beetle
  - Gulls
  - Mute swans
  - Feral cats
  - White-tailed deer
  - Long Island Invasive Species Management Area Very High and High-ranked plant species
  - Long Island Invasive Species Management Area established animal species

- Strengthen Smart Growth and other sustainable community development programs.

- Continue monitoring programs in National Wildlife Refuges.

- Monitor eastern tiger salamander population and protect critical habitats.

- Document presence of southeastern mud turtle.

- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (oystercatcher, black skimmer, cattle egret, piping plover, roseate tern, saltmarsh sparrow, seaside sparrow, buff-breasted sandpiper, little gull, whimbrel, red knot, short-billed dowitcher, little bluet, scarlet bluet, pine barrens bluet, nine-spotted lady beetle, Hessel's hairstreak, southeast mud turtle, eastern tiger salamander).

- Protect groundwater aquifers from pollution.

Lower New England/Northern Piedmont

- Natural habitat protection and restoration in priority habitats.

    – Central Oak-Pine

    – Northern Hardwood and Conifer

    – Central Hardwood Swamp

    – Emergent Marsh

    – Wet Meadow/Shrub Marsh

    – Cliff and Talus

    – Grassland/Shrubland

- Prevent installation of improperly designed shoreline hardening structures.

- Strengthen Smart Growth and other sustainable community development programs.

- Control of invasive and problematic native plant and animal species.

    – White-tailed deer

    – Emerald Ash Borer

    – Hemlock Wooly Adelgid

    – Gypsy Moth

    – Mute swans

    – Feral cats

    – All Prohibited Plant Species

- Restore or enhance riparian buffers at key locations.

- Foster northeast regional habitat connectivity projects.

- Continue New England cottontail habitat management and restoration efforts.

- Survey for presence of Allegheny woodrat.

- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (golden-winged warbler, Kentucky warbler, sable clubtail, eastern hog-nosed snake, eastern musk turtle, woodland box turtle, Atlantic coast leopard frog, eastern cricket frog, sable clubtail, northern metalmark, Henry's elfin, Karner blue butterfly, Allegheny woodrat).

Spotted turtles are prone to illegal collection for the black market.

(Photo: Andrea Chaloux)

- Continue citizen science SGCN and habitat monitoring projects.
- Implement Cricket Frog Recovery Plan.
- Implement Bog Turtle Recovery Plan.
- Implement Karner Blue Butterfly Recovery Plan
- Implement the Hudson River Action Agenda.

High Allegheny Plateau

- Natural habitat protection and restoration in priority habitats.
  - Central Oak-Pine
  - Northern Hardwood and Conifer
  - Boreal Upland Forest
  - Northern Swamp
  - Cliff and Talus
  - Grassland/Shrubland
- Control mercury discharge from energy production and industrial facilities.
- Control of invasive and problematic native plant and animal species.
  - White-tailed deer
  - Emerald Ash Borer
  - Hemlock Wooly Adelgid
  - Mute swans
  - Feral cats
  - All Prohibited Plant Species
- Restore or enhance riparian buffers at key locations.
- Foster northeast regional habitat connectivity projects.
- Continue golden-winged warbler habitat management.
- Forest habitat management to maintain young forest.
- Conduct periodic surveys for Eastern long-tailed salamander presence.
- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (eastern hellbender, long-tailed salamander, Septima's clubtail),

Western Allegheny Plateau

- Natural habitat protection and restoration in priority habitats.
  - Northern Hardwood and Conifer
  - Northeast Floodplain Forests
  - Emergent Marsh
- Restore or enhance riparian buffers at key locations.
- Control invasive and problematic native plant and animal species.
  - Emerald Ash Borer
  - All Prohibited Plant Species

Great Lakes

- Natural habitat protection and restoration in priority habitats.
  - Northern Hardwood and Conifer
  - Central Oak-Pine
  - Northeast Floodplain Forests
  - Northern Swamp
  - Glades and Savanna
  - Grassland/Shrubland
  - Northern Peatland

Great Lakes and coastal beaches are important habitats that can be impacted by human recreation.

- Restore or enhance riparian buffers at key locations.
- Control of invasive and problematic native plant and animal species.
  - White-tailed deer
  - Emerald Ash Borer
  - Mute swans
  - Feral cats
  - All Prohibited Plant Species
- Prevent installation of improperly designed shoreline hardening structures.
- Manage massasauga rattlesnake habitat at Cicero Swamp.
- Continue grassland breeding bird habitat management.
- Evaluate chorus frog taxonomy and distribution.
- Protect and manage piping plover nesting habitat.
- Continue monitoring programs in National Wildlife Refuges.
- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (piping plover, massasauga rattlesnake, eastern spiny softshell turtle, queensnake, bogbean buckmoth).
- Implement the Great Lakes Action Agenda and the Lake Ontario St. Lawrence River Plan 2014.

St. Lawrence/Champlain Valley

- Natural habitat protection and restoration in priority habitats.
  - Northern Hardwood and Conifer
  - Central Oak-Pine
  - Central Hardwood Swamp
  - Northeast Floodplain Forest
  - Northern Swamp
  - Glades and Savanna
  - Emergent Marsh
- Restore or enhance riparian buffers at key locations.
- Forest habitat management to maintain young forest.

- Continue grassland breeding bird habitat management.
- Control of invasive and problematic native plant and animal species.
  - Emerald Ash Borer
  - All Prohibited Plant Species
- Foster northeast regional habitat connectivity projects.
- Evaluate chorus frog taxonomy and distribution.
- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (black tern, common nighthawk, whip-poor-will, eastern musk turtle).

Northern Appalachian/Boreal Forest

- Natural habitat protection and restoration in priority habitats.
  - Alpine
  - Northeast Floodplain Forests
  - Northern Hardwood and Conifer
  - Boreal Upland Forest
  - Northern Swamp
  - Outcrop and Summit
  - Cliff and Talus
  - Northern Peatland
  - Emergent Marsh
  - Wet Meadow Shrub Marsh
- Foster northeast regional habitat connectivity projects.
- Restore or enhance riparian buffers at key locations.
- Continue to implement spruce grouse recovery plan.
- Control of invasive and problematic native plant and animal species.
  - Emerald Ash Borer
  - All Prohibited Plant Species
- Implement conservation projects for high priority SGCN with the New York population endemic to this ecoregion (rusty blackbird, American three-toed woodpecker, bay-breasted warbler, Bicknell's thrush, Cape May warbler, gray jay, olive-sided flycatcher, spruce grouse, boreal snaketail, pygmy snaketail).

Freshwater Aquatic Species and Habitats

Statewide Priority Actions

- Remove or replace high-priority barriers that impede aquatic organism passage.
- Continue SGCN fish surveys.
- Monitor chemical contaminants in fish.
- Continue and expand freshwater mussel surveys.

Lower Hudson/Long Island

- Monitor population and assess spawning habitat of banded sunfish.
- Continue programs to restore and monitor populations of American shad.
- Manage submerged aquatic vegetation to maintain communities dominated by natural vegetation.
- Monitor Atlantic sturgeon population, spawning, recruitment, and habitat use.
- Monitor shortnose sturgeon population.
- Survey for presence of tidewater mucket mussel.
- Remove barriers to the migration of alewife and American eel.

Upper Hudson/Mohawk

- Continue round whitefish restoration efforts.
- Assess taxonomy of summer sucker and unknown sucker variant.

Delaware

- Evaluate American eel population, life history, and harvest.
- Survey extant populations and restore historic habitat of comely shiner.
- Survey for presence of ironcolor shiner.
- Assess swallowtail shiner population and habitat.
- Continue programs to restore and monitor populations of American shad.
- Survey for presence of dwarf wedgemussel.

Susquehanna

- Restore aquatic habitat connectivity for American eel migration.
- Survey extant populations and restore historic habitat of comely shiner.
- Assess swallowtail shiner population and habitat.
- Continue eastern hellbender headstarting project.
- Survey for presence of green floater mussel.
- Continue Eastern Brook Trout Joint Venture.
- Protect habitats of freshwater mussel SGCN.

Allegheny

- Inventory bluebreast darter population and habitat.
- Evaluate success of gilt darter restoration and continue trap and transfer as necessary.
- Continue paddlefish population restoration.
- Survey population and protect habitat of river redhorse.
- Restore sauger and monitor population.
- Survey spotted darter population and protect spawning habitats.
- Continue eastern hellbender headstarting project.
- Protect habitats of freshwater mussel SGCN.
- Survey for presence of clubshell, rayed bean, and wavy rayed lampmussel.

Lake Erie

- Survey mooneye population and habitat usage.
- Assess sauger population and habitat use, and restore historic habitats where feasible.
- Survey for presence of slippershell mussel.
- Implement the Great Lakes Action Agenda.

Lake Ontario

- Restore aquatic habitat connectivity for American eel migration.
- Assess population and restore habitat of bigeye chub.
- Develop and implement restoration plan for bloater.
- Continue lake sturgeon restoration efforts.
- Continue restoration and monitor restored populations of northern sunfish.
- Continue Chittenango ovate amber snail conservation efforts.
- Continue remediation of pollutants in Great Lakes Areas of Concern.
- Survey for presence of deertoe and rainbow mussel.
- Continue cisco, deepwater sculpin, and lake trout restoration efforts
- Continue sea lamprey control program.
- Implement the Great Lakes Action Agenda and the Lake Ontario St. Lawrence River Plan 2014.

Round whitefish are also called "frostfish" for their tendency to spawn under ice in high altitude lakes. Round whitefish populations are being restored through hatchery propagation.
(Photo: Lisa Holst,, NYSDEC)

St. Lawrence River

- Continue lake sturgeon restoration efforts.

- Survey mooneye population and habitat usage.

- Continue round whitefish restoration efforts.

- Monitor pugnose shiner population and habitat use.

- Implement the Great Lakes Action Agenda and the Lake Ontario St. Lawrence River Plan 2014.

Lake Champlain

- Continue work to restore Atlantic salmon habitat and control sea lampreys.

- Continue round whitefish restoration efforts.

- Assess sauger population and habitat use, and restore habitat where feasible.

Marine and Estuarine Species and Habitats

- Time of year restrictions on dredging.

- Continue response to marine animal strandings.

- Continue developing strategies to adapt to sea level rise.

- Continue to implement recommendations of NYS Seagrass Task Force.

- Prevent installation of improperly designed shoreline hardening structures

- Continue collaboration with the Federal regulatory agencies to maintain a science-based system of regulation that ensures sustainable and equitable harvest of marine species.

- Continue collaborations and partnerships to research, monitor, and manage marine resources such as horseshoe crabs and menhaden.

- Construct fishways to allow natural migrations of diadromous fish species.

Marine Intertidal Mesohabitat

- Document and evaluate avian use of intertidal habitats.

Marine Subtidal Shallow Mesohabitat

- Document shark, skate, and ray use of this habitat.

- Document sea turtle use of this habitat.

Marine Subtidal Deep Mesohabitat

- Continue marine mammal monitoring programs.

- Assess winter flounder population and habitat use.

Brackish Intertidal Mesohabitat

- Document and evaluate avian use of intertidal habitats.

- Survey fish abundance and distribution in intertidal habitats.

- Restore salt marsh habitats impaired by pollution or structural modifications.

- Assess population status of Northern diamond-backed terrapins.

Brackish Subtidal Shallow Mesohabitat

- Document use of this habitat by tautog, northern pipefish, winter flounder, fourspine stickleback, and other high priority marine fish SGCN.

- Conduct periodic surveys of population and habitat use by bay scallops and eastern oysters.

- Develop and implement a blue crab management plan.

Brackish Subtidal Deep Mesohabitat

- Assess American lobster abundance and distribution.

- Assess winter flounder population and habitat use.

Freshwater Intertidal Mesohabitat

- Document and evaluate avian use of intertidal habitats.

- Restore habitat in non-barrier island tidal wetlands.

Freshwater Subtidal Shallow Mesohabitat

- Monitor Atlantic sturgeon and shortnose sturgeon population, spawning, recruitment, and habitat use.

- Develop and implement a Blue Crab Management Plan.

Freshwater Subtidal Deep Mesohabitat

- Monitor Atlantic sturgeon and shortnose sturgeon population, spawning, recruitment, and habitat use.

It is important to recognize that delivery of any and all actions will benefit SGCN, and irrespective of prioritization, various conservation partners may have the ability to implement actions that are within the scope of their mission, geographic footprint, or programmatic resources to deliver.

Priorities for SPCN will be to gather the information necessary to determine the actual status of the species/species groups and to better understand the threats affecting the status of those species. Although not currently listed as SGCN, these are species for which some level of inquiry is necessary to ensure their status in New York is not in jeopardy.

Annual Assessment of SWAP Implementation

Assessment of progress on implementation of the CWCS has been accomplished through two mechanisms, and each of these mechanisms will be maintained for ongoing assessment of SWAP implementation.

First, a tracking spreadsheet for SWG-funded projects has been maintained by DEC. This spreadsheet compiles project proposals, budgets, annual progress reports, final reports, and any resultant publications into a single location that is accessible to DEC staff. More than 100 projects are currently tracked in this way, and availability of the reports and data has been a valuable asset to staff and conservation partners. However, there are conservation projects that support SGCN species that are not SWG-funded and DEC will develop a process for tracking these projects as well.

A second means of tracking implementation of the CWCS has been federal aid project reporting. Federally-funded projects require an annual progress report and that a final report be submitted to the USFWS. These project reports are maintained on DEC servers, and are made available to staff and partners. Although these project reports are not always linked to specific CWCS/SWAP recommendations, their availability provides staff access to information on specific project accomplishments, and allows program managers to track progress on SWAP implementation.

These two mechanisms effectively track DEC implementation of the SWAP, but there is no established methodology to assess SWAP implementation by conservation partner organizations. Many partner implementation projects are known to DEC, either through collaborative relations between staff at DEC and partner organizations, or through DEC issuance of Special Licenses to collect and possess wildlife. But there is no formal mechanism in place to document this partner SWAP implementation work, or to record implementation projects which do not have any DEC involvement. In order to provide a more complete record of SWAP implementation, DEC will work with conservation partners to explore options for accounting for SGCN-focused conservation work in all sectors. This information can then be added to the project tracking maintained by DEC, providing for a more unified and comprehensive assessment of SWAP implementation.

A DEC crew applies a tracking tag to an Atlantic sturgeon. New York waters provide critical habitat for this Endangered species.
(Photo: NYSDEC)

Chapter 9. Adaptively Managing SGCN and habitats

The existing monitoring of species, habitats, and project effectiveness provides a strong foundation for adaptively managing SGCN and their habitats. There are opportunities to improve the efficiency of monitoring efforts, using concepts like indicator species to maintain a balance between monitoring costs and the expenses of management and restoration projects. Monitoring is a critical component of environmental management, and is essential to managing adaptively. Monitoring must be well planned, to ensure that the monitoring data will enable the appropriate statistical analysis to answer management questions. Quality assurance is an important concern in a monitoring program, and it must be integrated into program design, data collection, and data analysis.

Occasionally issues arise which require immediate action, especially related to wildlife disease and invasive species. Managers must quickly assess the new information, determine the level of threat to natural resources, and sometimes take immediate action to control the threat. Examples of this emergency response type of natural resource management include the response to chronic wasting disease, white nose syndrome, botulism E, and the establishment of a northern snakehead population. Because of the obvious and immediate need for action, this type of crisis response necessitates managing adaptively more than issues that allow a more deliberative approach to resource management.

Wildlife management must integrate management, outreach, and monitoring efforts. An example of this integrative management approach is currently being used in forest management to improve wildlife habitat. Young forest dependent species are declining across the state due to natural forest succession, leading to population declines in SGCN dependent upon young forest habitat. The integrative management approach has coupled habitat improvement efforts with educational programs to help build a public understanding of the importance of young forests to wildlife diversity. This long-term forest habitat improvement program is expected to increase habitat quantity and quality for a number of SGCN, by integrating education, management, and monitoring.

Projects to update management and conservation plans for several SGCN are also using an integrative management approach. Conservation plans have been developed for a number of species, such as the northern cricket frog and eastern massasauga. The species conservation plans include provisions for monitoring the effects of recommended management actions. Updating long-standing programs to reflect the current status of the species requires continuous management adaptation to focus recovery work where it can be most effective.

Monitoring of SGCN, habitats, and program effectiveness is an ongoing and essential component of environmental management. Only through monitoring can we measure the successes of our management programs, and learn from our failures. But monitoring can be expensive, and funding spent on monitoring is funding that is not being used directly for management programs. So with these considerations, DEC and conservation partners will continue to manage adaptively, using monitoring results to guide management actions.

Wildlife management and monitoring programs are also critical to addressing the direct and indirect impacts of climate change. As discussed earlier, climate change introduces new impacts, such as sea-level rise, but it also has the potential to affect all other threats to SGCN as well as system response to management actions. Even previously successful management interventions could no longer work in the future. Successful integration of climate change into natural resource management will require learning from the system as it changes and being able to adapt as needed.

Effective conservation is a cycle of planning, implementing, and assessing, then revising plans based on implementation progress and current information. In updating the 2006 CWCS, the 2015 SWAP marks a full completion of this cycle. New York State and its conservation partners are committed to this cyclic model of conservation, and will continue implementation and assessment, with the next major revision of the SWAP scheduled for 2025.

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Appendix 1. Species Lists

High Priority Species of Greatest Conservation Need		
The status of these species is known and conservation action is needed in the next ten years. These species are experiencing a population decline, or have identified threats that may put them in jeopardy, and are in need of timely management intervention or they are likely to reach critical population levels in New York.		

Common Name	Scientific Name	Taxon
Allegheny woodrat	*Neotoma magister*	Mammals
Indiana myotis	*Myotis sodalis*	Mammals
Little brown myotis	*Myotis lucifugus*	Mammals
New England cottontail	*Sylvilagus transitionalis*	Mammals
Northern myotis	*Myotis septentrionalis*	Mammals
Eastern pipistrelle	*Perimyotis subflavus*	Mammals
American black duck	*Anas rubripes*	Birds
American three-toed woodpecker	*Picoides tridactylus*	Birds
Barn owl	*Tyto alba*	Birds
Bay-breasted warbler	*Setophaga castanea*	Birds
Bicknell's thrush	*Catharus bicknelli*	Birds
Black rail	*Laterallus jamaicensis*	Birds
Black skimmer	*Rynchops niger*	Birds
Black tern	*Chlidonias niger*	Birds
Bobolink	*Dolichonyx oryzivorus*	Birds
Brown thrasher	*Toxostoma rufum*	Birds
Buff-breasted sandpiper	*Tryngites subruficollis*	Birds
Canada warbler	*Cardellina canadensis*	Birds
Cape May warbler	*Dendroica tigrina*	Birds
Cattle egret	*Bubulcus ibis*	Birds
Common nighthawk	*Chordeiles minor*	Birds
Eastern meadowlark	*Sturnella magna*	Birds
Golden-winged warbler	*Vermivora chrysoptera*	Birds
Grasshopper sparrow	*Ammodramus savannarum*	Birds
Gray jay	*Perisoreus canadensis*	Birds
Henslow's sparrow	*Ammodramus henslowii*	Birds
Horned lark	*Eremophila alpestris*	Birds
Kentucky warbler	*Geothlypis formosus*	Birds
King rail	*Rallus elegans*	Birds
Little gull	*Hydrocoloeus minutus*	Birds
Loggerhead shrike	*Lanius ludovicianus*	Birds
Northern bobwhite	*Colinus virginianus*	Birds
Olive-sided flycatcher	*Contopus borealis*	Birds

High Priority Species of Greatest Conservation Need		
Piping plover	*Charadrius melodus*	Birds
Prothonotary warbler	*Protonotaria citrea*	Birds
Red knot	*Calidris canutus*	Birds
Red-headed woodpecker	*Melanerpes erythrocephalus*	Birds
Roseate tern	*Sterna dougallii*	Birds
Rusty blackbird	*Euphagus carolinus*	Birds
Saltmarsh sparrow	*Ammodramus caudacutus*	Birds
Seaside sparrow	*Ammodramus maritimus*	Birds
Sedge wren	*Cistothorus platensis*	Birds
Semipalmated sandpiper	*Calidris pusilla*	Birds
Short-billed dowitcher	*Limnodromus griseus*	Birds
Short-eared owl	*Asio flammeus*	Birds
Spruce grouse	*Falcipennis canadensis*	Birds
Upland sandpiper	*Bartramia longicauda*	Birds
Vesper sparrow	*Pooecetes gramineus*	Birds
Whimbrel	*Numenius phaeopus*	Birds
Whip-poor-will	*Caprimulgus vociferus*	Birds
Yellow-breasted chat	*Icteria virens*	Birds
Blanding's turtle	*Emydoidea blandingii*	Reptiles
Bog turtle	*Glyptemys muhlenbergii*	Reptiles
Eastern hog-nosed snake	*Heterodon platirhinos*	Reptiles
Eastern massasauga	*Sistrurus catenatus catenatus*	Reptiles
Eastern musk turtle	*Sternotherus odoratus*	Reptiles
Eastern spiny softshell	*Apalone spinifera spinifera*	Reptiles
Queensnake	*Regina septemvittata*	Reptiles
Southeastern mud turtle	*Kinosternon subrubrum subrubrum*	Reptiles
Spotted turtle	*Clemmys guttata*	Reptiles
Timber rattlesnake	*Crotalus horridus*	Reptiles
Wood turtle	*Glyptemys insculpta*	Reptiles
Woodland box turtle	*Terrapene carolina carolina*	Reptiles
Atlantic Coast leopard frog	*Lithobates kauffeldi*	Amphibians
Blue-spotted salamander	*Ambystoma laterale*	Amphibians
Eastern cricket frog	*Acris crepitans*	Amphibians
Eastern hellbender	*Cryptobranchus alleganiensis*	Amphibians
Eastern long-tailed salamander	*Eurycea longicauda*	Amphibians
Eastern tiger salamander	*Ambystoma tigrinum*	Amphibians
Four-toed salamander	*Hemidactylium scutatum*	Amphibians

High Priority Species of Greatest Conservation Need		
American eel	*Anguilla rostrata*	Freshwater Fish
Bigeye chub	*Hybopsis amblops*	Freshwater Fish
Bloater	*Coregonus hoyi*	Freshwater Fish
Bluebreast darter	*Etheostoma camurum*	Freshwater Fish
Comely shiner	*Notropis amoenus*	Freshwater Fish
Gilt darter	*Percina evides*	Freshwater Fish
Mooneye	*Hiodon tergisus*	Freshwater Fish
Northern sunfish	*Lepomis peltastes*	Freshwater Fish
Paddlefish	*Polyodon spathula*	Freshwater Fish
River redhorse	*Moxostoma carinatum*	Freshwater Fish
Sauger	*Sander canadensis*	Freshwater Fish
Spotted darter	*Etheostoma maculatum*	Freshwater Fish
Summer sucker	*Catostomus utawana*	Freshwater Fish
Swallowtail shiner	*Notropis procne*	Freshwater Fish
Unknown sucker variant	*Catostomus* sp.	Freshwater Fish
American shad	*Alosa sapidissima*	Marine Fish
Atlantic sturgeon	*Acipenser oxyrinchus*	Marine Fish
Atlantic tomcod	*Microgadus tomcod*	Marine Fish
Fourspine stickleback	*Apeltes quadricus*	Marine Fish
Lined seahorse	*Hippocampus erectus*	Marine Fish
Northern pipefish	*Syngnathus fuscus*	Marine Fish
Tautog	*Tautoga onitis*	Marine Fish
Threespine stickleback	*Gasterosteus aculeatus*	Marine Fish
Winter flounder	*Pseudopleuronectes americanus*	Marine Fish
Dusky shark	*Carcharhinus obscurus*	Sharks, Skates, and Rays
Porbeagle shark	*Lamna nasus*	Sharks, Skates, and Rays
Roughtail stingray	*Dasyatis centroura*	Sharks, Skates, and Rays
Sand tiger shark	*Carcharias taurus*	Sharks, Skates, and Rays
Thorny skate	*Amblyraja radiata*	Sharks, Skates, and Rays
Thresher shark	*Alopias vulpinus*	Sharks, Skates, and Rays
White shark	*Carcharodon carcharias*	Sharks, Skates, and Rays
Blue whale	*Balaenoptera musculus*	Marine Mammals
Fin whale	*Balaenoptera physalus*	Marine Mammals
Harbor porpoise	*Phocoena phocoena*	Marine Mammals
North Atlantic right whale	*Eubalaena glacialis*	Marine Mammals
Sei whale	*Balaenoptera borealis*	Marine Mammals
Sperm whale	*Physeter catodon*	Marine Mammals

High Priority Species of Greatest Conservation Need		
Green turtle	*Chelonia mydas*	Sea turtles
Kemp's ridley	*Lepidochelys kempii*	Sea turtles
Leatherback sea turtle	*Dermochelys coriacea*	Sea turtles
Loggerhead turtle	*Caretta caretta*	Sea turtles
Bay scallop	*Argopecten irradians*	Marine Mollusks
Eastern oyster	*Crassostrea virginica*	Marine Mollusks
Hard clam	*Mercenaria mercenaria*	Marine Mollusks
American lobster	*Homarus americanus*	Crustaceans
Horseshoe crab	*Limulus polyphemus*	Meristomata
Alewife floater	*Anodonta implicata*	Freshwater Mollusks
Black sandshell	*Ligumia recta*	Freshwater Mollusks
Brook floater	*Alasmidonta varicosa*	Freshwater Mollusks
Chittenango ovate amber snail	*Novisuccinea chittenangoensis*	Freshwater Mollusks
Clubshell	*Pleurobema clava*	Freshwater Mollusks
Deertoe	*Truncilla truncata*	Freshwater Mollusks
Dwarf wedgemussel	*Alasmidonta heterodon*	Freshwater Mollusks
Green floater	*Lasmigona subviridis*	Freshwater Mollusks
Rainbow	*Villosa iris*	Freshwater Mollusks
Rayed bean	*Villosa fabalis*	Freshwater Mollusks
Slippershell mussel	*Alasmidonta viridis*	Freshwater Mollusks
Tidewater mucket	*Leptodea ochracea*	Freshwater Mollusks
Wabash pigtoe	*Fusconaia flava*	Freshwater Mollusks
Wavy-rayed lampmussel	*Lampsilis fasciola*	Freshwater Mollusks
Tomah mayfly	*Siphlonisca aerodromia*	Mayflies
Tiger spiketail	*Cordulegaster erronea*	Dragonflies and Damselflies
Little bluet	*Enallagma minusculum*	Dragonflies and Damselflies
Scarlet bluet	*Enallagma pictum*	Dragonflies and Damselflies
Pine barrens bluet	*Enallagma recurvatum*	Dragonflies and Damselflies
Sable clubtail	*Gomphus rogersi*	Dragonflies and Damselflies
Septima's clubtail	*Gomphus septima*	Dragonflies and Damselflies
Skillet clubtail	*Gomphus ventricosus*	Dragonflies and Damselflies
Green-faced clubtail	*Gomphus viridifrons*	Dragonflies and Damselflies
Boreal snaketail	*Ophiogomphus colubrinus*	Dragonflies and Damselflies
Pygmy snaketail	*Ophiogomphus howei*	Dragonflies and Damselflies
Gray petaltail	*Tachopteryx thoreyi*	Dragonflies and Damselflies
Two-spotted lady beetle	*Adalia bipunctata*	Beetles
Appalachian tiger beetle	*Cicindela ancocisconensis*	Beetles

High Priority Species of Greatest Conservation Need		
Hairy-necked tiger beetle	*Cicindela hirticollis*	Beetles
Cobblestone tiger beetle	*Cicindela marginipennis*	Beetles
Northern barrens tiger beetle	*Cicindela patruela patruela*	Beetles
Nine-spotted lady beetle	*Coccinella novemnotata*	Beetles
Transverse lady beetle	*Coccinella transversoguttata*	Beetles
Three-banded lady beetle	*Coccinella trifasciata*	Beetles
Northern metalmark	*Calephelis borealis*	Butterflies and Moths
Henry's elfin	*Callophrys henrici*	Butterflies and Moths
Hessel's hairstreak	*Callophrys hesseli*	Butterflies and Moths
Frosted elfin	*Callophrys irus*	Butterflies and Moths
Mottled duskywing	*Erynnis martialis*	Butterflies and Moths
Persius duskywing	*Erynnis persius persius*	Butterflies and Moths
Bogbean buckmoth	*Hemileuca* sp. 1	Butterflies and Moths
Karner blue butterfly	*Plebejus melissa samuelis*	Butterflies and Moths
Southern grizzled skipper	*Pyrgus wyandot*	Butterflies and Moths
Northern oak hairstreak	*Satyrium favonius ontario*	Butterflies and Moths
Rusty-patched bumble bee	*Bombus affinis*	Bees
Ashton's cuckoo bumble bee	*Bombus ashtoni*	Bees
Northern amber bumble bee	*Bombus borealis*	Bees
Yellow bumble bee	*Bombus fervidus*	Bees
Yellow-banded bumble bee	*Bombus terricola*	Bees
American bumble bee	*Bombus pensylvanicus*	Bees

Species of Greatest Conservation Need		
The status of these species is known and conservation action is needed. These species are experiencing some level of population decline, have identified threats that may put them in jeopardy, and need conservation actions to maintain stable population levels or sustain recovery.		
Common Name	**Scientific Name**	**Taxon**
Hoary bat	*Lasiurus cinereus*	Mammals
Moose	*Alces americanus*	Mammals
Eastern small-footed myotis	*Myotis leibii*	Mammals
Eastern red bat	*Lasiurus borealis*	Mammals
Silver-haired bat	*Lasionycteris noctivagans*	Mammals
American bittern	*Botaurus lentiginosus*	Birds
American kestrel	*Falco sparverius*	Birds
American oystercatcher	*Haematopus palliatus palliatus*	Birds
American woodcock	*Scolopax minor*	Birds
Bald eagle	*Haliaeetus leucocephalus*	Birds
Black scoter	*Melanitta americana*	Birds
Black-bellied plover	*Pluvialis squatarola*	Birds
Black-billed cuckoo	*Coccyzus erythropthalmus*	Birds
Black-crowned night-heron	*Nycticorax nycticorax*	Birds
Black-throated blue warbler	*Setophaga caerulescens*	Birds
Blue-winged teal	*Anas discors*	Birds
Blue-winged warbler	*Vermivora cyanoptera*	Birds
Bonaparte's gull	*Chroicocephalus philadelphia*	Birds
Caspian tern	*Hydroprogne caspia*	Birds
Cerulean warbler	*Setophaga cerulea*	Birds
Common eider	*Somateria mollissima*	Birds
Common goldeneye	*Bucephala clangula*	Birds
Common loon	*Gavia immer*	Birds
Common tern	*Sterna hirundo*	Birds
Cory's shearwater	*Calonectris diomedea borealis*	Birds
Forster's tern	*Sterna forsteri*	Birds
Glossy ibis	*Plegadis falcinellus*	Birds
Golden eagle	*Aquila chrysaetos*	Birds
Great egret	*Ardea alba*	Birds
Greater scaup	*Aythya marila*	Birds
Greater yellowlegs	*Tringa melanoleuca*	Birds
Gull-billed tern	*Gelochelidon nilotica*	Birds
Harlequin duck	*Histrionicus histrionicus*	Birds
Horned grebe	*Podiceps auritus*	Birds

Species of Greatest Conservation Need		
Laughing gull	*Leucophaeus atricilla*	Birds
Least bittern	*Ixobrychus exilis*	Birds
Least tern	*Sternula antillarum*	Birds
Lesser scaup	*Aythya affinis*	Birds
Little blue heron	*Egretta caerulea*	Birds
Long-eared owl	*Asio otus*	Birds
Long-tailed duck	*Clangula hyemalis*	Birds
Louisiana waterthrush	*Parkesia motacilla*	Birds
Northern goshawk	*Accipiter gentilis*	Birds
Northern harrier	*Circus cyaneus*	Birds
Northern pintail	*Anas acuta*	Birds
Peregrine falcon	*Falco peregrinus*	Birds
Pied-billed grebe	*Podilymbus podiceps*	Birds
Prairie warbler	*Setophaga discolor*	Birds
Purple sandpiper	*Calidris maritima*	Birds
Razorbill	*Alca torda*	Birds
Red-shouldered hawk	*Buteo lineatus*	Birds
Ruddy duck	*Oxyura jamaicensis*	Birds
Ruddy turnstone	*Arenaria interpres*	Birds
Ruffed grouse	*Bonasa umbellus*	Birds
Scarlet tanager	*Piranga olivacea*	Birds
Snowy egret	*Egretta thula*	Birds
Surf scoter	*Melanitta perspicillata*	Birds
Tricolored heron	*Egretta tricolor*	Birds
White-winged scoter	*Melanitta fusca*	Birds
Willet	*Tringa semipalmata*	Birds
Wood thrush	*Hylocichla mustelina*	Birds
Worm-eating warbler	*Helmitheros vermivorum*	Birds
Yellow-crowned night-heron	*Nyctanassa violacea*	Birds
Yellow rail	*Coturnicops noveboracensis*	Birds
Common ribbonsnake	*Thamnophis sauritus sauritus*	Reptiles
Eastern fence lizard	*Sceloporus undulatus*	Reptiles
Eastern ratsnake	*Pantherophis alleghaniensis*	Reptiles
Eastern wormsnake	*Carphophis amoenus amoenus*	Reptiles
Northern black racer	*Coluber constrictor constrictor*	Reptiles
Northern coal skink	*Plestiodon anthracinus anthracinus*	Reptiles
Northern copperhead	*Agkistrodon contortrix mokasen*	Reptiles

Species of Greatest Conservation Need		
Northern diamond-backed terrapin	*Malaclemys terrapin terrapin*	Reptiles
Northern map turtle	*Graptemys geographica*	Reptiles
Short-headed gartersnake	*Thamnophis brachystoma*	Reptiles
Smooth greensnake	*Opheodrys vernalis*	Reptiles
Snapping turtle	*Chelydra serpentina*	Reptiles
Common mudpuppy	*Necturus maculosus*	Amphibians
Eastern spadefoot	*Scaphiopus holbrookii*	Amphibians
Fowler's toad	*Bufo fowleri*	Amphibians
Marbled salamander	*Ambystoma opacum*	Amphibians
Western chorus frog	*Pseudacris triseriata*	Amphibians
Atlantic salmon	*Salmo salar*	Freshwater Fish
Banded sunfish	*Enneacanthus obesus*	Freshwater Fish
Bigmouth shiner	*Notropis dorsalis*	Freshwater Fish
Black bullhead	*Ameiurus melas*	Freshwater Fish
Black redhorse	*Moxostoma duquesnei*	Freshwater Fish
Blackchin shiner	*Notropis heterodon*	Freshwater Fish
Blacknose shiner	*Notropis heterolepis*	Freshwater Fish
Bridle shiner	*Notropis bifrenatus*	Freshwater Fish
Brook trout (wild)	*Salvelinus fontinalis*	Freshwater Fish
Cisco	*Coregonus artedi*	Freshwater Fish
Deepwater sculpin	*Myoxocephalus thompsonii*	Freshwater Fish
Eastern sand darter	*Ammocrypta pellucida*	Freshwater Fish
Iowa darter	*Etheostoma exile*	Freshwater Fish
Ironcolor shiner	*Notropis chalybaeus*	Freshwater Fish
Lake chub	*Couesius plumbeus*	Freshwater Fish
Lake sturgeon	*Acipenser fulvescens*	Freshwater Fish
Lake trout (wild)	*Salvelinus namaycush*	Freshwater Fish
Longnose sucker	*Catostomus catostomus*	Freshwater Fish
Mountain brook lamprey	*Ichthyomyzon greeleyi*	Freshwater Fish
Muskellunge	*Esox masquinongy*	Freshwater Fish
Ohio lamprey	*Ichthyomyzon bdellium*	Freshwater Fish
Pugnose shiner	*Pugnose shiner*	Freshwater Fish
Redfin shiner	*Lythrurus umbratilis*	Freshwater Fish
Round whitefish	*Prosopium cylindraceum*	Freshwater Fish
Swamp darter	*Etheostoma fusiforme*	Freshwater Fish
Tonguetied minnow	*Exoglossum laurae*	Freshwater Fish
Western pirate perch	*Aphredoderus sayanus gibbosus*	Freshwater Fish

Species of Greatest Conservation Need		
Alewife	*Alosa pseudoharengus*	Marine Fish
Atlantic silverside	*Menidia menidia*	Marine Fish
Bay anchovy	*Anchoa mitchilli*	Marine Fish
Blueback herring	*Alosa aestivalis*	Marine Fish
Cunner	*Tautogolabrus adspersus*	Marine Fish
Inland silverside	*Menidia beryllina*	Marine Fish
Atlantic menhaden	*Brevoortia tyrannus*	Marine Fish
Mummichog	*Fundulus heteroclitus*	Marine Fish
No. American ninespine stickleback	*Pungitius pungitius occidentalis*	Marine Fish
Northern puffer	*Sphoeroides maculatus*	Marine Fish
Oyster toadfish	*Opsanus tau*	Marine Fish
Shortnose sturgeon	*Acipenser brevirostrum*	Marine Fish
Spotfin killifish	*Fundulus luciae*	Marine Fish
Barndoor skate	*Dipturus laevis*	Sharks, Skates, and Rays
Basking shark	*Cetorhinus maximus*	Sharks, Skates, and Rays
Clearnose skate	*Raja eglanteria*	Sharks, Skates, and Rays
Little skate	*Leucoraja erinacea*	Sharks, Skates, and Rays
Rosette skate	*Leucoraja garmani virginica*	Sharks, Skates, and Rays
Sandbar shark	*Carcharhinus plumbeus*	Sharks, Skates, and Rays
Shortfin mako	*Isurus oxyrinchus*	Sharks, Skates, and Rays
Winter skate	*Leucoraja ocellata*	Sharks, Skates, and Rays
Humpback whale	*Megaptera novaeangliae*	Marine Mammals
Blue mussel	*Mytilus edulis*	Marine Mollusks
Ribbed mussel	*Geukensia demissa*	Marine Mollusks
Atlantic marsh fiddler crab	*Uca pugnax*	Crustaceans
Blue crab	*Callinectes sapidus*	Crustaceans
Mucket	*Actinonaias ligamentina*	Freshwater Mollusks
Elktoe	*Alasmidonta marginata*	Freshwater Mollusks
Three-ridge	*Amblema plicata*	Freshwater Mollusks
Plain pocketbook	*Lampsilis cardium*	Freshwater Mollusks
Yellow lampmussel	*Lampsilis cariosa*	Freshwater Mollusks
Pocketbook	*Lampsilis ovata*	Freshwater Mollusks
Eastern pondmussel	*Ligumia nasuta*	Freshwater Mollusks
Eastern pearlshell	*Margaritifera margaritifera*	Freshwater Mollusks
Round pigtoe	*Pleurobema sintoxia*	Freshwater Mollusks
Pink heelsplitter	*Potamilus alatus*	Freshwater Mollusks
Kidneyshell	*Ptychobranchus fasciolaris*	Freshwater Mollusks

Species of Greatest Conservation Need		
Lilliput	*Toxolasma parvum*	Freshwater Mollusks
Paper pondshell	*Utterbackia imbecillis*	Freshwater Mollusks
A mayfly	*Ameletus tarteri*	Mayflies
A mayfly	*Dannella provonshai*	Mayflies
A mayfly	*Epeorus punctatus*	Mayflies
A mayfly	*Epeorus suffusus*	Mayflies
A mayfly	*Siphlonurus barbaroides*	Mayflies
A mayfly	*Siphlonurus barbarus*	Mayflies
Comet darner	*Anax longipes*	Dragonflies and Damselflies
Dusky dancer	*Argia translata*	Dragonflies and Damselflies
Horned clubtail	*Arigomphus cornutus*	Dragonflies and Damselflies
Four-spotted pennant	*Brachymesia gravida*	Dragonflies and Damselflies
Double-ringed pennant	*Celithemis verna*	Dragonflies and Damselflies
Arrowhead spiketail	*Cordulegaster obliqua*	Dragonflies and Damselflies
Atlantic bluet	*Enallagma doubledayi*	Dragonflies and Damselflies
New England bluet	*Enallagma laterale*	Dragonflies and Damselflies
Blackwater bluet	*Enallagma weewa*	Dragonflies and Damselflies
Mantled baskettail	*Epitheca semiaquea*	Dragonflies and Damselflies
Seaside dragonlet	*Erythrodiplax berenice*	Dragonflies and Damselflies
Spine-crowned clubtail	*Gomphus abbreviatus*	Dragonflies and Damselflies
Midland clubtail	*Gomphus fraternus*	Dragonflies and Damselflies
Rapid's clubtail	*Gomphus quadricolor*	Dragonflies and Damselflies
American rubyspot	*Hetaerina americana*	Dragonflies and Damselflies
Rambur's forktail	*Ischnura ramburii*	Dragonflies and Damselflies
Lyre-tipped spreadwing	*Lestes unguiculatus*	Dragonflies and Damselflies
Needham's skimmer	*Libellula needhami*	Dragonflies and Damselflies
Cyrano darner	*Nasiaeschna pentacantha*	Dragonflies and Damselflies
Southern sprite	*Nehalennia integricollis*	Dragonflies and Damselflies
Umber shadowdragon	*Neurocordulia obsoleta*	Dragonflies and Damselflies
Extra-striped snaketail	*Ophiogomphus anomalus*	Dragonflies and Damselflies
Brook snaketail	*Ophiogomphus aspersus*	Dragonflies and Damselflies
Common sanddragon	*Progomphus obscurus*	Dragonflies and Damselflies
Spatterdock darner	*Rhionaeschna mutata*	Dragonflies and Damselflies
Mocha emerald	*Somatochlora linearis*	Dragonflies and Damselflies
Russet-tipped clubtail	*Stylurus plagiatus*	Dragonflies and Damselflies
Illinois snowfly	*Allocapnia illinoensis*	Stoneflies
Ohio snowfly	*Allocapnia ohioensis*	Stoneflies

Species of Greatest Conservation Need		
A stonefly	*Isogenoides frontalis*	Stoneflies
Quebec stripetail	*Isoperla gibbsae*	Stoneflies
Bay underwing	*Catocala badia*	Butterflies and Moths
Herodias underwing	*Catocala herodias gerhardi*	Butterflies and Moths
Jair underwing	*Catocala jair*	Butterflies and Moths
Waxed sallow	*Chaetaglaea cerata*	Butterflies and Moths
A noctuid moth	*Chytonix sensilis*	Butterflies and Moths
Melsheimer's sack bearer	*Cicinnus melsheimeri*	Butterflies and Moths
Regal moth	*Citheronia regalis*	Butterflies and Moths
A hand-maid moth	*Datana ranaeceps*	Butterflies and Moths
Imperial moth	*Eacles imperialis pini*	Butterflies and Moths
Brown-bordered geometer	*Eumacaria madopata*	Butterflies and Moths
A noctuid moth	*Eucoptocnemis fimbriaris*	Butterflies and Moths
Barrens buckmoth	*Hemileuca maia maia*	Butterflies and Moths
Jutta arctic	*Oeneis jutta*	Butterflies and Moths
A noctuid moth	*Orthodes obscura*	Butterflies and Moths
Checkered white	*Pontia protodice*	Butterflies and Moths
Pink sallow	*Psectraglaea carnosa*	Butterflies and Moths

Species of Potential Conservation Need		
A species whose status is poorly known, but there is an identified threat to the species, or features of its life history that make it particularly vulnerable to threats. The species may be declining, or begin to experience declines within the next ten years, and studies are needed to determine their actual status.		
Common Name	**Scientific Name**	**Taxon**
American pygmy shrew	*Sorex hoyi*	Mammals
Least weasel	*Mustela nivalis*	Mammals
No. American least shrew	*Cryptotis parva*	Mammals
American golden plover	*Pluvialis dominica*	Birds
Great shearwater	*Puffinus gravis*	Birds
Hudsonian godwit	*Limosa haemastica*	Birds
Marbled godwit	*Limosa fedoa*	Birds
Red-necked phalarope	*Phalaropus lobatus*	Birds
Sanderling	*Calidris alba*	Birds
Tennessee warbler	*Oreothlypis peregrina*	Birds
Thayer's gull	*Larus thayeri*	Birds
Boreal chorus frog	*Pseudacris maculata*	Amphibians
Jefferson salamander	*Ambystoma jeffersonianum*	Amphibians
Mink frog	*Lithobates septentrionalis*	Amphibians
Northern red salamander	*Pseudotriton ruber ruber*	Amphibians
Southern leopard frog	*Lithobates sphenocephalus utricularius*	Amphibians
Striped killifish	*Fundulus majalis*	Marine Fish
Atlantic torpedo ray	*Torpedo nobiliana*	Sharks, Skates, and Rays
Blue shark	*Prionace glauca*	Sharks, Skates, and Rays
Cownose ray	*Rhinoptera bonasus*	Sharks, Skates, and Rays
Longfin mako shark	*Isurus paucus*	Sharks, Skates, and Rays
Scalloped hammerhead shark	*Sphyrna lewini*	Sharks, Skates, and Rays
Smooth hammerhead shark	*Sphyrna zygaena*	Sharks, Skates, and Rays
Smooth skate	*Malacoraja senta*	Sharks, Skates, and Rays
Tiger shark	*Galeocerdo cuvier*	Sharks, Skates, and Rays
Clam shrimp	*Cyzicus gynecia*	Crustaceans
Devil crawfish	*Cambarus diogenes*	Crustaceans
Piedmont groundwater amphipod	*Stygobromus tenuis tenuis*	Crustaceans
Banded physa	*Physella vinosa*	Freshwater Mollusks
Buffalo pebblesnail	*Gillia altilis*	Freshwater Mollusks
Campeloma spire snail	*Cincinnatia cincinnatiensis*	Freshwater Mollusks
Canadian duskysnail	*Lyogyrus walkeri*	Freshwater Mollusks
Coldwater pond snail	*Stagnicola woodruffi*	Freshwater Mollusks
File rams-horn	*Planorbella pilsbryi*	Freshwater Mollusks

Species of Potential Conservation Need		
Fringed valvata	*Valvata lewisi*	Freshwater Mollusks
Globe siltsnail	*Birgella subglobosus*	Freshwater Mollusks
Gravel pyrg	*Marstonia letsoni*	Freshwater Mollusks
Hickorynut	*Obovaria olivaria*	Freshwater Mollusks
Lance aplexa	*Aplexa elongata*	Freshwater Mollusks
Mossy valvata	*Valvata sincera*	Freshwater Mollusks
Purplecap valvata	*Valvata perdepressa*	Freshwater Mollusks
Spindle lymnaea	*Acella haldemani*	Freshwater Mollusks
Watercress snail	*Fontigens nickliniana*	Freshwater Mollusks
A mayfly	*Acentrella barbarae*	Mayflies
A mayfly	*Ameletus tertius*	Mayflies
A mayfly	*Baetis rusticans*	Mayflies
A mayfly	*Eurylophella bicoloroides*	Mayflies
A mayfly	*Leucrocuta thetis*	Mayflies
A mayfly	*Nixe rusticalis*	Mayflies
A mayfly	*Plauditus gloveri*	Mayflies
A mayfly	*Procloeon mendax*	Mayflies
A mayfly	*Procloeon ozburni*	Mayflies
A mayfly	*Procloeon simile*	Mayflies
A mayfly	*Procloeon vicinum*	Mayflies
A mayfly	*Rhithrogena anomala*	Mayflies
Subarctic darner	*Aeshna subarctica*	Dragonflies and Damselflies
Subarctic bluet	*Coenagrion interrogatum*	Dragonflies and Damselflies
Cobra clubtail	*Gomphus vastus*	Dragonflies and Damselflies
Southern pygmy clubtail	*Lanthus vernalis*	Dragonflies and Damselflies
Southern spreadwing	*Lestes australis*	Dragonflies and Damselflies
Yellow-sided skimmer	*Libellula flavida*	Dragonflies and Damselflies
Elfin skimmer	*Nannothemis bella*	Dragonflies and Damselflies
Broad-tailed shadowdragon	*Neurocordulia michaeli*	Dragonflies and Damselflies
Lake emerald	*Somatochlora cingulata*	Dragonflies and Damselflies
Forcipate emerald	*Somatochlora forcipata*	Dragonflies and Damselflies
Delicate emerald	*Somatochlora franklini*	Dragonflies and Damselflies
Incurvate emerald	*Somatochlora incurvata*	Dragonflies and Damselflies
Ocellated emerald	*Somatochlora minor*	Dragonflies and Damselflies
Black meadowhawk	*Sympetrum danae*	Dragonflies and Damselflies
Ebony boghaunter	*Williamsonia fletcheri*	Dragonflies and Damselflies
A stonefly	*Alloperla leonarda*	Stoneflies

	Species of Potential Conservation Need	
Lawrence sallfly	*Alloperla voinae*	Stoneflies
Scotia sallfly	*Alloperla vostoki*	Stoneflies
Paddle stripetail	*Isoperla myersi*	Stoneflies
Spiny salmonfly	*Pteronarcys comstocki*	Stoneflies
Gaspe sallfly	*Utaperla gaspesiana*	Stoneflies
Salt marsh tiger beetle	*Cicindela marginata*	Beetles
One-spotted tiger beetle	*Cicindela unipunctata*	Beetles
Sylvan hygrotus diving beetle	*Hygrotus sylvanus*	Beetles
Coastal heathland cutworm	*Abagrotis nefascia benjamini*	Butterflies and Moths
Well-marked cutworm	*Abagrotis orbis*	Butterflies and Moths
A noctuid moth	*Agrotis obliqua*	Butterflies and Moths
An ear moth	*Amphipoea erepta ryensis*	Butterflies and Moths
A noctuid moth	*Apamea inordinata*	Butterflies and Moths
Gorgone checkerspot	*Chlosyne gorgone*	Butterflies and Moths
Monarch butterfly	*Danaus plexippus*	Butterflies and Moths
Switchgrass dart	*Dichagyris acclivis*	Butterflies and Moths
A geometrid moth	*Digrammia denticulata*	Butterflies and Moths
Shadowy arches moth	*Drasteria adumbrata*	Butterflies and Moths
A geometrid moth	*Euchlaena madusaria*	Butterflies and Moths
Olympia marble	*Euchloe olympia*	Butterflies and Moths
Fawn brown dart	*Euxoa pleuritica*	Butterflies and Moths
Marsh fern moth	*Fagitana littera*	Butterflies and Moths
Blueberry gray	*Glena cognataria*	Butterflies and Moths
A notodontid moth	*Heterocampa varia*	Butterflies and Moths
Pine pinion moth	*Lithophane lepida lepida*	Butterflies and Moths
Pale green pinion moth	*Lithophane viridipallens*	Butterflies and Moths
Jack pine looper	*Macaria marmorata*	Butterflies and Moths
Black-bordered lemon moth	*Marimatha nigrofimbria*	Butterflies and Moths
Pin-striped slug moth	*Monoleuca semifascia*	Butterflies and Moths
Grey woodgrain	*Morrisonia mucens*	Butterflies and Moths
A noctuid moth	*Paectes abrostolella*	Butterflies and Moths
Chain fern borer moth	*Papaipema stenocelis*	Butterflies and Moths
Stinging rose caterpillar moth	*Parasa indetermina*	Butterflies and Moths
A noctuid moth	*Phoberia ingenua*	Butterflies and Moths
Slender flower moth	*Schinia bifascia*	Butterflies and Moths
Golden aster flower moth	*Schinia tuberculum*	Butterflies and Moths
Maroonwing moth	*Sideridis maryx*	Butterflies and Moths

Species of Potential Conservation Need		
Barrens itame	*Speranza exonerata*	Butterflies and Moths
Scribble sallow	*Sympistis perscripta*	Butterflies and Moths
Acadian swordgrass moth	*Xylena thoracica*	Butterflies and Moths
Pine barrens zanclognatha	*Zanclognatha martha*	Butterflies and Moths
Black and gold bumble bee	*Bombus auricomus*	Bees

Non-SGCN – Extirpated from New York		
These species have been extirpated from New York and no populations currently exist in the state.		
Common Name	**Scientific Name**	**Taxon**
Canada lynx	*Lynx canadensis*	Mammals
Cougar	*Puma concolor*	Mammals
Wolf	*Canis lupus*	Mammals
Gravel chub	*Erimystax x-punctatus*	Freshwater Fish
Kiyi	*Coregonus kiyi*	Freshwater Fish
Lake chubsucker	*Erimyzon sucetta*	Freshwater Fish
Mud sunfish	*Acantharchus pomotis*	Freshwater Fish
Shortnose cisco	*Coregonus reighardi*	Freshwater Fish
Shortnose gar	*Lepisosteus platostomus*	Freshwater Fish
Silver chub	*Macrhybopsis storeriana*	Freshwater Fish
Spoonhead sculpin	*Cottus recei*	Freshwater Fish
Fat pocketbook	*Potamilus capax*	Freshwater Mollusks
Fawnsfoot	*Truncilla donaciformis*	Freshwater Mollusks
Mapleleaf	*Quadrula quadrula*	Freshwater Mollusks
Pimpleback	*Quadrula pustulosa*	Freshwater Mollusks
Pink mucket	*Lampsilis abrupta*	Freshwater Mollusks
Round hickorynut	*Obovaria subrotunda*	Freshwater Mollusks
Salamander mussel	*Simpsonaias ambigua*	Freshwater Mollusks
Snuffbox	*Epioblasma triquetra*	Freshwater Mollusks
White heelsplitter	*Lasmigona complanata*	Freshwater Mollusks
Yellow sandshell	*Lampsilis teres*	Freshwater Mollusks
Appalachian jewelwing	*Calopteryx angustipennis*	Dragonflies and Damselflies
Elusive clubtail	*Stylurus notatus*	Dragonflies and Damselflies
Ringed boghaunter	*Williamsonia lintneri*	Dragonflies and Damselflies
Ringed emerald	*Somatochlora albicincta*	Dragonflies and Damselflies
Riverine clubtail	*Stylurus amnicola*	Dragonflies and Damselflies
Seepage dancer	*Argia bipunctulata*	Dragonflies and Damselflies
Sparkling jewelwing	*Calopteryx dimidiata*	Dragonflies and Damselflies
American burying beetle	*Nicrophorus americanus*	Beetles
Eastern pinebarrens tiger beetle	*Cicindela abdominalis*	Beetles
New Jersey pine barrens tiger beetle	*Cicindela patruela consentanea*	Beetles
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	Beetles
A borer moth	*Papaipema aerata*	Butterflies and Moths
A geometrid moth	*Nemoria bifilata*	Butterflies and Moths
A noctuid moth	*Psaphida thaxteriana*	Butterflies and Moths

Non-SGCN – Extirpated from New York		
A tussock moth	*Orgyia detrita*	Butterflies and Moths
An underwing moth	*Catocala umbrosa*	Butterflies and Moths
Aweme borer moth	*Papaipema aweme*	Butterflies and Moths
Barrens metarranthis moth	*Metarranthis apicaria*	Butterflies and Moths
Black fungus moth	*Metalectra tantillus*	Butterflies and Moths
Bog elfin	*Callophrys lanoraieensis*	Butterflies and Moths
Brazilian skipper	*Calpodes ethlius*	Butterflies and Moths
Brick-red borer moth	*Papaipema marginidens*	Butterflies and Moths
Broad-lined catopyrrha	*Erastria coloraria*	Butterflies and Moths
Buchholz's gray	*Hypomecis buchholzaria*	Butterflies and Moths
Chestnut clearwing moth	*Synanthedon castaneae*	Butterflies and Moths
Coastal plain apamea moth	*Melanapamea mixta*	Butterflies and Moths
Culvers root borer	*Papaipema sciata*	Butterflies and Moths
Curve-lined looper moth	*Lambdina fervidaria*	Butterflies and Moths
Dark grey fishia moth	*Fishia enthea*	Butterflies and Moths
Dark stoneroot borer moth	*Papaipema duplicatus*	Butterflies and Moths
Dimorphic gray	*Tornos scolopacinarius*	Butterflies and Moths
Doll's merolonche	*Acronicta dolli*	Butterflies and Moths
Dot-lined white	*Artace cribraria*	Butterflies and Moths
Eastern arogos skipper	*Atrytone arogos arogos*	Butterflies and Moths
Golden borer moth	*Papaipema cerina*	Butterflies and Moths
Hairy artesta moth	*Sideridis artesta*	Butterflies and Moths
Heracleum stem borer moth	*Papaipema harrisii*	Butterflies and Moths
Maritime sunflower borer moth	*Papaipema maritima*	Butterflies and Moths
Ostrich fern borer moth	*Papaipema* sp. 2 nr. *Pterisii*	Butterflies and Moths
Phyllira tiger moth	*Grammia phyllira*	Butterflies and Moths
Pine devil	*Citheronia sepulcralis*	Butterflies and Moths
Precious underwing	*Catocala pretiosa pretiosa*	Butterflies and Moths
Quiet or sweet underwing	*Catocala dulciola*	Butterflies and Moths
Regal fritillary	*Speyeria idalia*	Butterflies and Moths
Seaside golden borer moth	*Papaipema duovata*	Butterflies and Moths
Silvery blue	*Glaucopsyche lygdamus lygdamus*	Butterflies and Moths
Sordid dart	*Euxoa adumbrata thanatologia*	Butterflies and Moths
Tawny crescent	*Phyciodes batesii batesii*	Butterflies and Moths
The consort underwing	*Catocala consors*	Butterflies and Moths
The little beggar	*Eubaphe meridiana*	Butterflies and Moths
Variable sallow	*Sericaglaea signata*	Butterflies and Moths

Non-SGCN – Extirpated from New York		
Woolly gray	*Lycia ypsilon*	Butterflies and Moths
Yellow stoneroot borer	*Papaipema astuta*	Butterflies and Moths
Fernald cuckoo bumble bee	*Bombus fernaldae*	Bees
Indiscriminate cuckoo bumble bee	*Bombus insularis*	Bees

Non-SGCN – Removed from SGCN list		
These species have been determined to be stable and secure and do not require management intervention over the next ten years to maintain their populations within New York. These include species that were evaluated because they were designated as SGCN in the CWCS, or were nominated for evaluation as SGCN but were determined to be secure.		
Common Name	**Scientific Name**	**Taxon**
American marten	*Martes americana*	Mammals
No. American river otter	*Lontra canadensis*	Mammals
Brant	*Branta bernicla*	Birds
Cooper's hawk	*Accipiter cooperii*	Birds
Dickcissel	*Spiza americana*	Birds
Dunlin	*Calidris alpina*	Birds
Osprey	*Pandion haliaetus*	Birds
Red-throated loon	*Gavia stellata*	Birds
Sharp-shinned hawk	*Accipiter striatus*	Birds
Willow flycatcher	*Empidonax traillii*	Birds
Common five-lined skink	*Plestiodon fasciatus*	Reptiles
Finescale dace	*Chrosomus neogaeus*	Freshwater Fish
Longhead darter	*Percina macrocephala*	Freshwater Fish
Streamline chub	*Erimystax dissimilis*	Freshwater Fish
Rainbow smelt	*Osmerus mordax*	Marine Fish
A mayfly	*Sparbarus maculatus*	Mayflies
Blue-tipped dancer	*Argia tibialis*	Dragonflies and Damselflies
Arrow clubtail	*Stylurus spiniceps*	Dragonflies and Damselflies
Barrens dagger moth	*Acronicta albarufa*	Butterflies and Moths
Bird dropping moth	*Cerma cora*	Butterflies and Moths
Gordia sphinx	*Sphinx gordius*	Butterflies and Moths
Toothed apharetra moth	*Sympistis dentata*	Butterflies and Moths
A noctuid moth	*Xestia rhaetics*	Butterflies and Moths
A noctuid moth	*Zale largera*	Butterflies and Moths

Non-SGCN - Never Present in New York		
Common Name	**Scientific Name**	**Taxon**
Shortjaw cisco	*Coregonus zenithicus*	Freshwater Fish
Bigeye thresher shark	*Alopias superciliosus*	Sharks, Skates, and Rays
Bonnethead shark	*Sphyrna tiburo*	Sharks, Skates, and Rays
Giant manta ray	*Manta birostris*	Sharks, Skates, and Rays
Hawksbill sea turtle	*Eretmochelys imbricata*	Sea turtles
Sheepnose	*Plethobasus cyphyus*	Freshwater Mollusks
Tubercled blossom	*Epioblasma torulosa*	Freshwater Mollusks
Roaring brook mayfly	*Epeorus frisoni*	Mayflies
A mayfly	*Heptagenia julia*	Mayflies
A mayfly	*Rhithrogena uhari*	Mayflies
Taper-tailed darner	*Gomphaeschna antilope*	Dragonflies and Damselflies
Puritan tiger beetle	*Cicindela puritana*	Beetles
Jersey jair underwing	*Catocala jair* ssp. 2	Butterflies and Moths
A noctuid moth	*Chytonix ruperti*	Butterflies and Moths
Coastal barrens buckmoth	*Hemileuca maia* ssp. 5	Butterflies and Moths
Lemmer's pinyon moth	*Lithophane lemmeri*	Butterflies and Moths

Appendix 2. Monitoring Programs

DEC and Conservation Partner Monitoring Programs					
Survey Name	Species	Guild	Habitat	Monitoring Target	Monitoring Type
Forest Inventory and Analysis			X	Forests	Habitat
Rotating Intensive Basin Surveys			X	Water quality monitoring	Habitat
Great Lakes Water Quality Survey			X	Water quality monitoring	Habitat
Citizen Statewide Lake Assessment Program			X	Water quality monitoring	Habitat
Lake Champlain Longterm Monitoring Program			X	Water quality monitoring	Habitat
Adirondack Long Term Monitoring Program			X	Water quality monitoring	Habitat
Ambient Air Quality Monitoring			X	Air quality	Habitat
Atmospheric Deposition Monitoring			X	Habitat quality	Habitat
Shellfish Biotoxin Monitoring			X	Habitat quality	Habitat
Long Island Sound Water Quality Monitoring			X	Water quality monitoring	Habitat
EPA Ocean Water Quality Monitoring			X	Water quality monitoring	Habitat
Hudson River Environmental Conditions Observing System			X	Water quality monitoring	Habitat
Ion Exclusion Chromotagraphy Water Quality Monitoring			X	Water quality monitoring	Habitat
NYC Parks Wetland Monitoring			X	Habitat quality	Habitat
Peconic Estuary Program USGS Water Quality Monitoring			X	Water quality monitoring	Habitat
Suffolk County Surface Water Quality Monitoring			X	Water quality monitoring	Habitat
USGS Gauging Stations & WQ Monitoring Stations			X	Water quality monitoring	Habitat
Submerged Aquatic Vegetation Long Term Monitoring			X	Habitat quality	Habitat
NY Natural Heritage Program	X		X	Rare SGCN	Species
Christmas Bird Count	X	X		Wintering birds	Species

DEC and Conservation Partner Monitoring Programs					
Breeding Bird Survey	X	X		Breeding birds	Species
Hellbender Monitoring	X		X	Eastern hellbender	Species
DEC herp monitoring program	X	X		Blanding's turtle, Chorus frog, Wood turtle, Bog turtle, Timber rattlesnake	Species
North American Amphibian Monitoring Program	X	X	X	Amphibian SGCN	Species
Amphibian and Reptile Database	X	X		Amphibian and reptile SGCN	Species
DEC Rare Fish Monitoring	X	X		Freshwater fish SGCN	Species
Bald eagle winter survey	X			Bald eagle	Species
Peregrine falcon survey	X			Peregrine falcon	Species
Woodcock survey	X			American woodcock	Species
Indiana bat survey	X			Indiana bat	Species
Marshbird surveys	X	X		American bittern, least bittern, pied-billed grebe, black rail, king rail	Species
Grassland bird monitoring	X	X		Grassland bird SGCN	Species
Wintering waterfowl surveys	X	X		Waterfowl SGCN	Species
Alewife Spawning Runs on Long Island	X			Alewife	Species
American Eel Young of Year Survey	X			American eel	Species
Atlantic Sturgeon Acoustic Monitoring	X			Atlantic sturgeon	Species
Blue Crab Monitoring	X			Blue crab	Species
Breeding Waterfowl Surveys	X	X		Waterfowl SGCN	Species
Horseshoe Crab Spawning Survey	X			Horseshoe crab	Species
Hudson Adult American Shad Survey	X			American shad	Species
Hudson Adult Atlantic Sturgeon Survey	X			Atlantic sturgeon	Species
Hudson Adult River Herring Survey	X			American shad, Alewife, Blueback herring	Species
Hudson Juvenile Atlantic Sturgeon Survey	X			Atlantic sturgeon	Species
Piping Plover Productivity Monitoring	X			Piping plover	Species
Shorebird survey	X	X		Shorebird SGCN	Species
Tiger Salamander Breeding Pond Surveys	X			Tiger salamander	Species

DEC and Conservation Partner Monitoring Programs					
Winter raptors	X	X		Short-eared owl, Northern harrier	Species
Bald Eagle nest surveys	X			Bald eagle	Species
Colonial waterbird monitoring	X			Colonial waterbird SGCN	Species
Common loon monitoring	X			Common loon	Species
Saltmarsh Habitat and Avian Research Program	X	X	X	Saltmarsh SGCN	Species
Common tern monitoring	X			Common tern	Species
Black tern surveys	X			Black tern	Species
Monitoring Avian Productivity and Survivorship Program	X	X		Avian SGCN	Species
Boreal bird surveys	X	X		Boreal Bird SGCN	Species
Mountain Birdwatch	X	X	X	Bicknell's thrush, Alpine forest bird SGCN	Species
Spruce grouse monitoring	X		X	Spruce grouse	Species
Golden winged warbler monitoring	X			Golden-winged warbler	Species
Forest raptor surveys	X	X		Forest raptor SGCN	Species
Bat hibernacula surveys	X	X		Bat SGCN	Species
Summer bat acoustic surveys	X	X		Bat SGCN	Species
Tree bat abundance surveys	X	X		Bat SGCN	Species
New England cottontail surveys	X		X	New England cottontail	Species
Moose surveys	X			Moose	Species
Great Lakes Area of Concern Monitoring	X		X	SGCN within the AOC	Both
Brookhaven National Laboratory Surveillance Monitoring	X	X	X	Forest Health, Birds, tiger salamanders, box turtles, odonates, small mammals, bats, invasive species	Both

USFWS National Wildlife Refuge Monitoring Programs			
Station Name	Survey Type	Survey Name	Start Year
Amagansett National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Amagansett National Wildlife Refuge	Monitoring to Inform Management	Ocean Shoreline Position	2011
Amagansett National Wildlife Refuge	Monitoring to Inform Management	Piping Plover Monitoring (census and productivity)	1988
Amagansett National Wildlife Refuge	Coop Baseline Monitoring	Seabeach amaranth Survey	1990
Conscience Point National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Elizabeth Alexandra Morton National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Elizabeth Alexandra Morton National Wildlife Refuge	Monitoring to Inform Management	Ocean Shoreline Position	2011
Elizabeth Alexandra Morton National Wildlife Refuge	Monitoring to Inform Management	Piping Plover Monitoring (census and productivity)	1988
Iroquois National Wildlife Refuge	Baseline Monitoring	American Woodcock Singing Grounds Survey	1985
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Audubon's Christmas Bird Count	1967
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Bat Monitoring	2012
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Black Tern Colony Survey NYSDEC Protocol	1995
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Bluebird and Tree Swallow Banding	1996
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Dove Banding	2010
Iroquois National Wildlife Refuge	Baseline Monitoring	Grassland Bird Survey R5 Grassland Bird Protocol	1998
Iroquois National Wildlife Refuge	Monitoring to Inform Management	Impoundment Vegetation Survey	2003
Iroquois National Wildlife Refuge	Inventory	Impoundment Bathymetry Inventory	2006
Iroquois National Wildlife Refuge	Coop Monitoring to Inform Management	Integrated Waterbird Management and Monitoring	2010
Iroquois National Wildlife Refuge	Baseline Monitoring	Invasive Species Mapping	2004
Iroquois National Wildlife Refuge	Inventory	Invertebrate Inventory	2013
Iroquois National Wildlife Refuge	Baseline Monitoring	Landbird Point Count R5 Landbird Protocol	1995
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Mid-Winter Bald Eagle Survey NYSDEC Protocol	1978
Iroquois National Wildlife Refuge	Baseline Monitoring	Muskrat House Survey	2013

USFWS National Wildlife Refuge Monitoring Programs			
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Purple Martin Banding	2010
Iroquois National Wildlife Refuge	Baseline Monitoring	Secretive Marshbird Survey	1999
Iroquois National Wildlife Refuge	Inventory	Seneca Pool Vegetation Inventory	2014
Iroquois National Wildlife Refuge	Baseline Monitoring	Shrubland Bird Point Count R5 Landbird Protocol	2005
Iroquois National Wildlife Refuge	Inventory	Small Mammal Inventory	2013
Iroquois National Wildlife Refuge	Baseline Monitoring	Tree-nesting Colonial Waterbird Survey	1982
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Vernal Pool Survey USGS Protocol	2002
Iroquois National Wildlife Refuge	Coop Baseline Monitoring	Waterfowl Banding	1965
Long Island National Wildlife Refuge Complex	Monitoring to Inform Management	Tern Survey	2009
Montezuma National Wildlife Refuge	Coop Inventory	Bat Acoustical Monitoring (NYSDEC Protocol)	2009
Montezuma National Wildlife Refuge	Coop Baseline Monitoring	American Black Duck Banding	2010
Montezuma National Wildlife Refuge	Monitoring to Inform Management	American Woodcock Singing Grounds Survey	2012
Montezuma National Wildlife Refuge	Coop Baseline Monitoring	American Woodcock Singing Grounds Survey Off Refuge	1993
Montezuma National Wildlife Refuge	Coop Baseline Monitoring	Audubon's Christmas Bird Count	1965
Montezuma National Wildlife Refuge	Coop Monitoring to Inform Management	Black and Common Tern Colony Survey (NYSDEC Protocol)	1982
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Impoundment Vegetation Survey (Integrated Waterbird Monitoring Protocol)	2011
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Population and Control Monitoring (Protocol in Progress)	1997
Montezuma National Wildlife Refuge	Coop Baseline Monitoring	Pre-season Duck Banding	1984
Montezuma National Wildlife Refuge	Inventory	Resident Bat Inventory	2012
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Secretive Marshbird Survey	2010
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Shorebird Area Counts (Integrated Waterbird Monitoring Protocol)	1997
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Vegetation Monitoring in Reforestation Areas (Protocol in Progress)	2008

USFWS National Wildlife Refuge Monitoring Programs			
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Vegetation Monitoring in Scrub/Shrub Habitats (Protocol to be Determined)	2011
Montezuma National Wildlife Refuge	Monitoring to Inform Management	Waterfowl Area Counts (Integrated Waterbird Monitoring Protocol)	1997
Montezuma National Wildlife Refuge	Coop Monitoring to Inform Management	White-tailed Deer Monitoring	2011
Montezuma National Wildlife Refuge	Coop Monitoring to Inform Management	White-tailed Deer Monitoring (USFS Protocol)	2010
Montezuma National Wildlife Refuge	Coop Monitoring to Inform Management	Winter Raptor Survey in Grasslands and Marshes (NYSDEC Protocol)	2009
Oyster Bay National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Oyster Bay National Wildlife Refuge	Baseline Monitoring	Mid-winter Waterfowl Survey	1991
Oyster Bay National Wildlife Refuge	Monitoring to Inform Management	Piping Plover Monitoring (census and productivity)	1988
Oyster Bay National Wildlife Refuge	Monitoring to Inform Management	Surface Elevation and Accretion Monitoring	2008
Seatuck National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Seatuck National Wildlife Refuge	Monitoring to Inform Management	Mosquito Sampling	2004
Seatuck National Wildlife Refuge	Monitoring to Inform Management	Ocean Shoreline Position	2011
Seatuck National Wildlife Refuge	Monitoring to Inform Management	White-tailed Deer Survey	2005
Shawangunk Grasslands National Wildlife Refuge	Monitoring to Inform Management	Grassland Bird Survey	2002
Target Rock National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Target Rock National Wildlife Refuge	Monitoring to Inform Management	Piping Plover Monitoring (census and productivity)	1988
Wertheim National Wildlife Refuge	Coop Baseline Monitoring	American Eel Survey	2000
Wertheim National Wildlife Refuge	Coop Baseline Monitoring	Bald Eagle Mid-Winter Survey	1986
Wertheim National Wildlife Refuge	Coop Baseline Monitoring	Forest Health Aerial Detection Survey	2004
Wertheim National Wildlife Refuge	Monitoring to Inform Management	Invasive Species Monitoring	2002
Wertheim National Wildlife Refuge	Monitoring to Inform Management	Mosquito Sampling	2004
Wertheim National Wildlife Refuge	Monitoring to Inform Management	Open Marsh Water Management Monitoring	2005

USFWS National Wildlife Refuge Monitoring Programs			
Wertheim National Wildlife Refuge	Inventory	Resident Bat Inventory	2013
Wertheim National Wildlife Refuge	Monitoring to Inform Management	Salt Marsh Integrity Assessment	2008
Wertheim National Wildlife Refuge	Coop Baseline Monitoring	Sandplain gerardia Monitoring	1985
Wertheim National Wildlife Refuge	Monitoring to Inform Management	Surface Elevation and Accretion Monitoring (SETs)	2008
Wertheim National Wildlife Refuge	Monitoring to Inform Management	White-tailed Deer Survey	2005

The Saratoga Sand Plains Wildlife Management Area (WMA) is a matrix of 700 acres of state lands on several separate parcels in the Towns of Wilton and Northumberland in Saratoga County. The WMA is associated with the Wilton Wildlife Preserve & Park Study Area and is located within a state-designated Priority Conservation Area and state and federally designated Karner blue butterfly recovery areas. DEC works closely with its partners—Wilton Wildlife Preserve and Park, The Nature Conservancy, Town of Wilton, Town of Northumberland and Saratoga County—to manage these lands.

(Photo: Jenny Murtaugh, NYSDEC)