Rhode Island Wildlife Action Plan

Chapter 1

Rhode Island's Fish and Wildlife

The Nature Conservancy
Protecting nature. Preserving life.

State of Rhode Island
Department of Environmental Management

THE UNIVERSITY OF RHODE ISLAND

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Introduction

Rhode Island's wildlife is remarkably diverse considering its status as the smallest and second-most densely populated state. From the highlands in the Northwest to the open waters of the Atlantic Ocean, Rhode Island has thousands of resident and migratory aquatic and terrestrial faunal species. Hosting almost 100 natural vegetative community types, the state's land and waterscapes support a broad spectrum of biodiversity, ranging from the rarest and most endangered, to the most common and abundant.

This chapter addresses Element 1 by describing the full array of Rhode Island's wildlife (defined in this plan as all animal species) and summarizing the best available sources of information on species abundance and distribution. It then presents the species of greatest conservation need (SGCN) as identified by Rhode Island's experts, partners, and stakeholders over a two-year input process. More detailed information on these species can be found in the Appendix (species fact sheets).

Regional Context

The Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTC), of the Northeast Association of Fish and Wildlife Agencies (NEAFWA), has identified regional species of greatest conservation need (RSGCN, Appendix 1c). A total of 1,260 species of seven major taxonomic groups (mammals, birds, reptiles, amphibians, fish, tiger beetles, and freshwater mussels) was evaluated by the NEFWDTC. Of these, almost 30% (367 species) were identified as RSGCN based on a species' conservation status and listing in State Wildlife Action Plans (WAPs), as well as the percentage of the species' United States (U.S.) range that occurs in the Northeast (see Table 1-1 for a breakdown of RSGCN by major taxonomic groups). The invertebrate list is incomplete and in progress. The RSGCN process is ongoing and continues to evaluate additional taxa. Only two major invertebrate groups (freshwater mussels and tiger beetles) are reviewed through the RSGCN process and included in this analysis. Interestingly, the development of the RSGCN list supports earlier findings that a significant percentage of the wildlife species in the Northeast are in urgent need of dedicated conservation attention, with Stein et al. (2000) and The Heinz Center for Science Economics and Environment (The Heinz Center 2002; 2008) suggesting that approximately 33% of animal species in the U.S. are at elevated risk for extinction.

The list of all northeastern WAP's SGCN (compiled by Whitlock 2006) included 87 mammals, 263 birds, 65 reptiles, 73 amphibians, 299 fish, 27 tiger beetles, and 101 freshwater mussel species and subspecies. These numbers represent a significant percentage of the total numbers of northeastern species in all seven of these taxonomic groups (Table 1-1). The large number of species included in these lists reflects the magnitude of the threats facing fish and wildlife species in the Northeast, as well as the commendable efforts of the individual northeastern states to ensure that their WAPs were comprehensive in their coverage of species in major taxonomic groups.

Major taxonomic groups with the highest percentage of RSGCN in the Northeast include amphibians (40%), reptiles (39%), and tiger beetles (39%) (Table 1-1). Threats to amphibians and reptiles from disease, water quality impairment, and habitat loss are well known and are discussed further in this

document. Tiger beetles are associated with early successional habitats or areas such as beaches that are prone to human disturbance, and thus are at elevated risk from human activities (Knisley and Schultz 1997). Of the 356 RSGCN analyzed in Table 1-1 (analysis excludes the 11 additional federally listed invertebrates not evaluated through the RSGCN process), approximately 16% are considered to be of high regional responsibility (meaning that they are found in 50% or more of the northeastern states) and high regional concern (based on the best available information about population status and trends and inclusion in northeastern states' WAPs). Tiger beetles have the highest percentage of species ranked high in both regional responsibility and high regional concern (21%). The next closest group, reptiles, had 8% of species in this category. Additionally, almost 30% of the RSGCN are listed under the Federal Endangered Species Act (ESA) as endangered, threatened or candidate species for listing). Mammals had the highest percentage of species with federal listing status, 27% of the total number of species occurring in the Northeast.

Table 1-1. Regional Species of Greatest Conservation Need: Summary Statistics

Taxonomic Group	Number of Species in Region[1]	Number of Species that are State SGCN[2]	Percent of Species that are State SGCN	Number of RSGCN[3]	Percent of species that are RSGCN	Number of High Responsibility, High Concern Species[3]	Percent of High Responsibility, High Concern Species	Number of Species with Federal Status[3]	Percent of Species with Federal Status
Mammals	128	87	68%	45	35%	8	6%	34	27%
Birds	387	263	68%	110	28%	12	3%	34	9%
Reptiles	74	65	88%	29	39%	6	8%	11	15%
Amphibians	91	73	80%	36	40%	3	3%	4	4%
Fish	441	299	68%	101	23%	16	4%	11	2%
Tiger Beetles	28	27	96%	11	39%	6	21%	2	7%
Freshwater Mussels	111	101	91%	23	21%	7	6%	4	4%
Other Federally listed invertebrates = 11									

Sources: NatureServe and NALCC
[1]From NEPARC website and the comprehensive lists of vertebrate species, tiger beetles, and freshwater mussels on the NatureServe Explorer website.
[2]From Whitlock (2006) comprehensive list of SGCN for all northeastern states
[3] From most recent version of RSGCN list, produced by NEFWDTC and partners
See Appendix 1c for a list of RSGCN

For vertebrates, the percentage of species identified as SGCN in one or more of the northeastern WAPs approaches 70% of the total number of vertebrate species that occur in the Northeast (Table 1-2). The percentages of tiger beetles and freshwater mussels that were identified as SGCN by one or more of the northeastern states are even higher. For tiger beetles, 27 of the 28 species that occur in the northeastern states were identified as SGCN in one or more of the original Comprehensive Wildlife Conservation Strategies (CWCSs) for the northeastern states. For freshwater mussels, 101 of the 111 northeastern species were listed as SGCN by one or more of the northeastern states in the original CWCSs.

USFWS

Northeastern Tiger Beetle-A Regional Species of Greatest Conservation Need

The Fish and Wildlife of Rhode Island

Birds are the most diverse vertebrate taxonomic group in the state with more than 430 species documented. Over 300 species of freshwater and saltwater fish have been recorded in the state's waters, and 92 mammals, 27 reptiles and 19 amphibians occur in the state. Invertebrates far outnumber vertebrate taxa and demonstrate high biotic diversity with thousands of species found across the state. Table 1-2 summarizes Rhode Island's wildlife diversity and provides standardized ranks that indicate abundance and status. Each of these taxonomic groups is discussed separately in the following pages. This chapter is intended as an overview of Rhode Island's wildlife and provides appropriate references to more specific information in the literature (see Appendix 1a). It is the intent of this document to compile, evaluate, and present summary status information along with the best sources for this information. In addition, more detailed narratives of each species or group of species have been developed for the first time in Rhode Island. These accounts address the status and distribution, threats and actions for each of these species/groups (WAP Elements 1-4). They also summarize the key conservation needs and actions for each species (see Appendix species fact sheets).

Table 1-2. Wildlife Diversity of Rhode Island - Species Status Ranks by Taxa

Taxa	Species found in RI	State listed RI DEM	Federally listed USFWS	S1 & S2 Ranked	S3 Ranked	G1 & G2 Ranked	GCN Species RI WAP 2015
Mammals	92	8	8	9	3	1	21
Birds	431	56	4	76	28	0	123
Reptiles	26	13	4				13
Amphibians	19	3		9	3	2	10
Fish	306	3	1	7	8	0	45
VERTEBRATES	**874**	**85**	**17**	**101**	**42**	**3**	**212**
Beetles	2209	11	2	11	2	1	35
Moths	1000	15		5	2		75
Butterflies	133	17		5	2		18
Odonates	130	16		16			23
Robber Flies	64						3
FW Mussels	8	5		4	1		6
INVERTEBRATES	**3,544***	**64**	**2**	**41**	**7**	**1**	**242**
TOTAL	**4,288**	**131**	**19**	**125**	**49**	**4**	**454****

* Total is only a fraction of the actual number of invertebrates found in Rhode Island. Many groups remain to be quantified including some with high diversity such as spiders, bees, ants, and myriad soil arthropods.

** For complete SGCN list see Appendix 1b.

Key

S1 Rank = Critically imperiled in the state
S2 Rank = Imperiled in the state
S3 Rank = Vulnerable to extirpation or extinction in the state
S4 Rank = Apparently Secure
S5 Rank = Secure or unknown (for invertebrates) are not shown.
G1 Rank = Critically imperiled across its entire range (i.e., globally)
G2 Rank = Imperiled across its entire range (i.e., globally)

Rhode Island Department of Environmental Management Division of Fisheries and Wildlife (RI DEM DFW) and its partners maintain datasets of the distributions of many of the state's fish and wildlife species including checklists of Rhode Island's vertebrates with the best available information on abundance, distribution, and status of species in Rhode Island, including those with low and declining populations. RI DEM DFW or its partners do not have a comprehensive list of invertebrate species, as many are yet to be documented or studied in the state; however, several insect groups have been the targets of comprehensive surveys in recent years.

Mammals

Forty-five species of mammals have been designated as RSGCN in the Northeast based on their current conservation status, the percentage of their overall distribution occurring within the region, the number of states that listed them as SGCN in their 2005 CWCSs, and in response to emerging issues and threats. Seven mammal species are considered to be of "high" or "very high" concern and were listed in a majority of northeastern WAPs; those occurring in Rhode Island are Eastern Small-footed Myotis, New England Cottontail, and American Water Shrew. These species are also considered "high" regional responsibility, as at least half of their range occurs in the Northeast.

Several taxonomic groups are well-represented among RSGCN, particularly bats with 14 species. One species, the Eastern Small-footed Myotis, is recognized as a high responsibility and high concern throughout the Northeast. Most of the northeastern species of bats are acutely threatened by white-nose syndrome (WNS), a fungal disease that alters the torpor cycle and metabolism of overwintering bats and leads to significant mortalities. A comprehensive inventory of bats was commenced in the summer of 2010 in order to determine if WNS is present in the state. As of January 2014 the disease had not been found in Rhode Island (C. Brown, pers. comm. 2014). Several species, however, that breed or migrate through Rhode Island would have been exposed to WNS while overwintering in caves and mines.

Rhode Island hosts 92 different species of mammals, at least 80 of which are indigenous or native to the state. This number includes the Eastern Mole, discovered in 2007 in Rhode Island (C. Brown pers. comm. 2014). August et al. (2001) provides a checklist of the state's mammals, while Kenney and Vigness-Raposa (2010) provide an update and analysis of existing data of marine mammals in the Narragansett Bay, Block Island Sound, Rhode Island Sound, and nearby waters. A few mammal species have recently established or reestablished breeding populations in the state (e.g., Coyote, Fisher, and Beaver), while others have been introduced with the aid of humans (e.g., House Mouse, feral dog and cat, Eastern Cottontail, and Black and Norway Rats). Sightings of Black Bear have become more common in Rhode Island as populations in neighboring Connecticut and Massachusetts continue to grow. However, the breeding status of Black Bear in Rhode Island remains unconfirmed (C. Brown pers. comm. 2014). Eight mammals are listed by Rhode Island as endangered, threatened, or species of concern, with three of these also listed federally as endangered (Table 1-1).

Some of Rhode Island's mammals are generalists and can be found in a variety of habitats. Others are specialists preferring a single habitat type and thus more susceptible to threats of development, deforestation, and other habitat conversions. Forest maturation has changed the compositional structure and age class of Rhode Island's forests from what it was 50 and more years ago so that some small mammals, such as the New England Cottontail, have declined as a result. Historically, hunting and trapping caused the decline of certain mammal populations (e.g., Beaver) but in recent decades most of

these species have recovered. Chapter 3 presents general threats and Chapter 4 presents the threats to individual species and habitats in detail, and provides actions to address these threats.

The RI DEM DFW and its partners monitor the abundance and distribution of several mammal populations in the state. Species that are hunted and trapped, including Coyote, Beaver, Fisher, and White-tailed Deer, are monitored through RI DEM DFW management programs. These programs establish annual hunting and trapping seasons, bag limits, and access restrictions through permits. Data on harvest of hunted and trapped species are collected annually (e.g., deer harvest information is available from 1977 to the present). In areas where a species (primarily White-tailed Deer) has become overabundant, RI DEM DFW coordinates with local communities to control populations and respond to nuisance complaints as needed.

RI DEM DFW maintains a database of small mammals (e.g., moles, mice, shrews, and voles) dating back to 2001, with records including relevant biological parameters such as species, sex, size, weight, location, habitat, and method of capture for each animal. The Block Island Meadow Vole, a subspecies of the more common Meadow Vole, is endemic to Block Island where it is found in idle agricultural fields, managed meadows or hay fields on the island. Due to its limited distribution, this vole is imperiled both in Rhode Island and globally and is identified as a RSGCN. Block Island is known for hosting a variety of rare and endangered species and The Nature Conservancy, RI DEM DFW and its partners have protected approximately 44% of the island for conservation (TNC 2014), thereby preserving habitat for the endemic Block Island Meadow Vole and other rare species.

USFWS

New England Cottontail

The New England Cottontail is a formerly widespread small mammal that is today considered a RSGCN based on documented evidence of population decline. This species has been identified as an SGCN in the majority of WAPs in the Northeast, indicating that a general state of concern exists throughout most of the region. The New England Cottontail has been the subject of substantial regional collaboration and coordination. Efforts include the development of regional survey and monitoring protocols for the species and the development of a comprehensive species restoration and conservation plan (Fuller and Tur 2012) that was officially adopted by the New England Cottontail Technical Committee (NEC Technical Committee) in November, 2012. Figure 1-1 shows the New England Cottontail Focus Areas for the Northeast.

In Rhode Island, preservation of New England Cottontail has been a management and research priority of the RI DEM DFW. Most recently, in 2011 a captive breeding program was initiated in cooperation with Rogers Williams Park Zoo, and in late 2012 15 New England Cottontails were released on Patience Island in Narragansett Bay (Tefft 2013). An additional encouraging development was the confirmation of at least three sites in the state currently occupied by New England Cottontail based on genetic testing of pellet samples during the winter of 2012-2013 (Tefft 2013). Also at the state level, a map of focus areas

for conducting management of New England Cottontails has been prepared for Rhode Island based on historic distribution and a variety of landscape features (Figure 1-2).

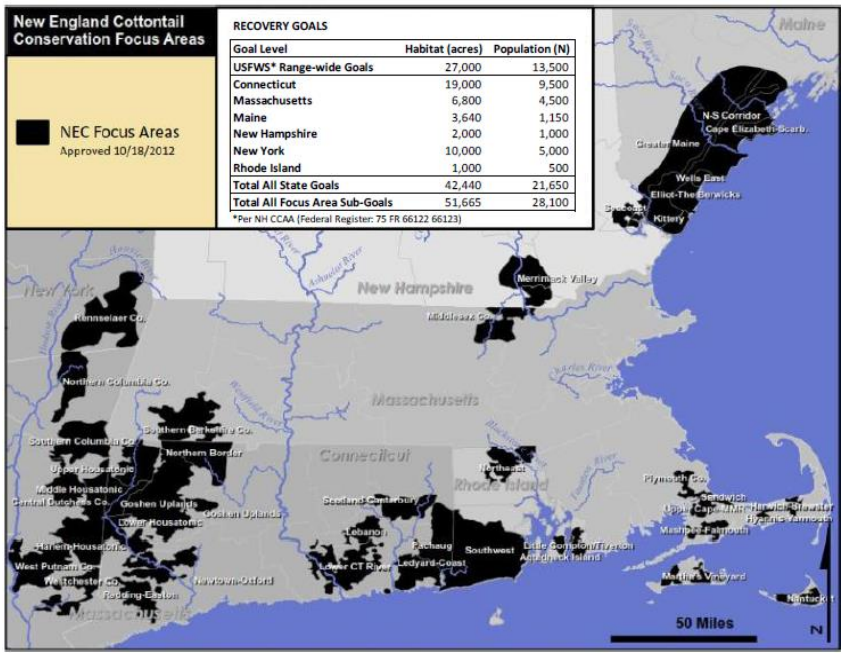

Figure 1-1. New England Cottontail Focus Areas. Source: Fuller and Tur 2012

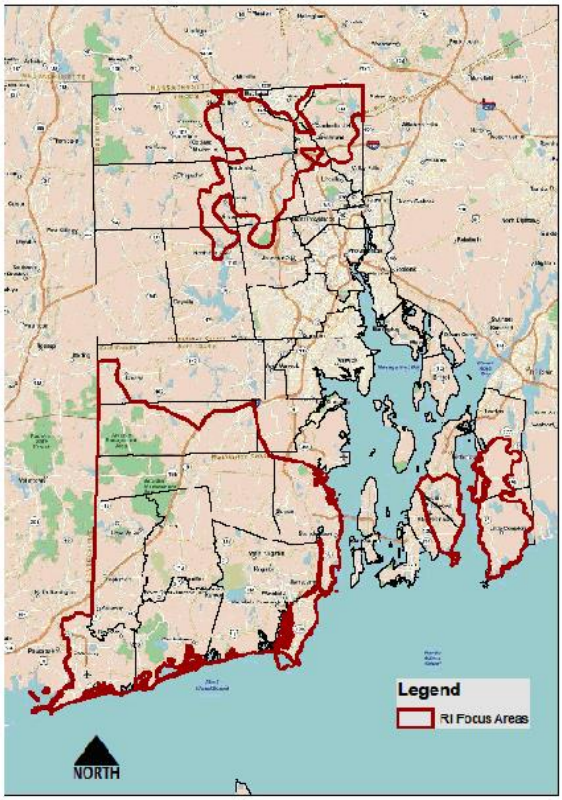

Figure 1-2. Rhode Island New England Cottontail Focus Areas 2012.
Source: NRCS 2012

Conservation of whales in the Northeast has been a significant concern since the depletion of local populations due to whaling in the mid-19th century. New potential threats include shipping activity, entanglement in fishing gear, and offshore energy development. Some northeastern whale species (e.g., Humpback, Fin) have shown signs of recovery, since a global whaling ban was imposed in 1985. In 1972 Canada stopped whaling and the U.S. passed the Marine Mammal Protection Act, that banned all taking of marine mammals or importing of marine mammal products. Right Whale populations were severely depleted in the 17th and 18th centuries. Sperm whaling increased in the 18th century, and was becoming less economically viable by the second half of the 19th century when the focus of the New England whaling industry shifted to Blue and Fin whales. This coincided with the development of more modern whaling developed by the Norwegians (R Kenney pers. comm. 2014). Other northeastern whales, such as the North Atlantic Right Whale, have recovered much more slowly from heavy harvest pressure. Whales are included on many state WAP SGCN lists. Multiple agencies have jurisdiction over the conservation of marine mammals, including state marine fisheries programs, National Oceanographic and Atmospheric Administration (NOAA) and the state wildlife agencies. Another important factor is that the range of a whale population is so large that the jurisdiction of any individual state comprises a very small proportion of that range.

Rhode Island has included five marine mammals as SGCN, including three whales, Harbor Porpoise, and Harbor Seal. Abundance and distribution data on whales in state waters are collected by RI DEM DFW, the University of Rhode Island (URI), National Marine Fisheries Service (NMFS), and other partners. There is a population of about 100 Harbor Seals and a lower number of Gray Seals that spend the winter at Block Island. The Mystic Aquarium Marine Mammal and Sea Turtle Stranding Department maintains a database on stranding events in southern New England. During the period 1990 to 2011 a total of 715 stranding events were documented in Rhode Island including four identified species of pinnipeds (seals) and 17 identified species of cetaceans (whales, dolphins and porpoises) (refer to Table 1-3).

Table 1-3. Number of Marine Mammal Strandings in Rhode Island, 1990-2011.

Marine Mammal Species	No. of Strandings
Gray Seal	97
Harbor Seal	172
Harp Seal	189
Hooded Seal	24
unidentified pinniped	46
Total Pinnipeds	528
Atlantic White-sided Dolphin	11
Blainville's Beaked Whale	1
Blue Whale	1
Bottlenose Dolphin	5
Common Dolphin	48
Dwarf Sperm Whale	2
Fin Whale	6
Harbor Porpoise	33
Humpback Whale	8
Long-finned Pilot Whale	11
Minke Whale	21
North Atlantic Right Whale	1
Pygmy Sperm Whale	3
Risso's Dolphin	4
Short-finned Pilot Whale	1

Marine Mammal Species	No. of Strandings
Sowerby's Beaked Whale	1
Striped Dolphin	9
unidentified cetacean	21
Total Cetaceans	**187**
Total Marine Mammals	**715**

Source: Adapted from Smith 2012

In 2005, RI DEM DFW published the *Rhode Island Large Whale Conservation Plan*, with a primary objective of working with commercial fishermen to address entanglements and mortalities in fixed gear. The 2009 report prepared in conjunction with this plan included the results of a fixed gear survey designed to assess the numbers and configurations of fishing gear used by Rhode Island fishermen that are likely to adversely impact endangered whales. Kenney and Vigness-Raposa (2010) summarized the existing data on marine mammals and sea turtles in Narragansett Bay, Block Island Sound, Rhode Island Sound, and nearby waters in the Rhode Island Ocean Special Area Management Plan.

Save the Bay, a non-governmental organization, and the Narragansett Bay National Estuarine Research Reserve (NBNERR) have monitored seal populations as part of their Bay Watchers program since 1993. NBNERR has prepared a protocol for long-term monitoring of Harbor Seals in Narragansett Bay (Raposa and Dapp 2009). An indication of the abundance of seals in the Narragansett Bay area is a count made on St. Patrick's Day in 2011 which documented a record figure of 569 seals at monitored haul-out sites.

Statewide, 21 species of Rhode Island's mammal species have been determined to be of SGCN (refer to Table 1-4). The process of identifying SGCN is discussed at the end of this chapter and Appendix 1b lists all SGCN, along with their abundance and distribution status. Appendix 1e summarizes all additions and deletions of vertebrates to the 2005 SGCN list.

Table 1-4. Mammal Species of Greatest Conservation Need of Rhode Island

SGCN Mammals (21)	
Common Name	**Species Name**
American Water Shrew	*Sorex (Otisorex) palustris*
Big Brown Bat	*Eptesicus fuscus*
Black Bear	*Ursus americanus*
Block Island Meadow Vole	*Microtus pennsylvanicus provectus*
Bobcat	*Lynx rufus*
Eastern Mole	*Scalopus aquaticus*
Eastern Red Bat	*Lasiurus borealis*
Eastern Small-footed Myotis	*Myotis leibii*
Fin Whale	*Balaenoptera physalus*
Harbor Porpoise	*Phocoena phocoena*
Harbor Seal	*Phoca vitulina*
Hoary Bat	*Lasiurus cinereus*
Humpback Whale	*Megaptera novaeangliae*
Little Brown Myotis	*Myotis lucifugus*
New England Cottontail	*Sylvilagus transitionalis*
North Atlantic Right Whale	*Eubalaena glacialis*

SGCN Mammals (21)	
Common Name	**Species Name**
Northern Long-eared Bat	*Myotis septentrionalis*
Silver-haired Bat	*Lasionycteris noctivagans*
Smoky Shrew	*Sorex (Otisorex) fumeus*
Southern Bog Lemming	*Synaptomys cooperi*
Tri-colored Bat	*Perimyotis subflavus*

Source: RI WAP Mammal Taxa Team 2014

Birds of the Northeast Region

Birds have received a great deal of research and conservation attention. Several national and regional frameworks have been developed to outline their conservation needs. In 1999, the NEFWDTC prepared species accounts and reviewed needed conservation actions for regional species of concern, which included 23 bird species. After the last round of CWCS development in 2005, a Northeast Synthesis (NEFWDTC 2013) was generated and included prioritized lists of RSGCN in the region. In this work, 110 species of birds were identified as RSGCN in the Northeast, based on conservation status, the percentage of their range included in the region, and the number of states that listed them as SGCN in their 2005 WAPs (refer to Table 1-5). Of these birds, 10 species were ranked by the NEFWDTC as "very high" concern and "high" responsibility for the Northeast. Each of these 10 species is emblematic of an important and vulnerable northeastern habitat, including coastal beaches, coastal islands, salt marshes, early successional habitats and unfragmented forests.

USFWS

Piping Plover

Thirty-five of the 110 RSGCN birds occur along the northeastern region's coast, either in salt marshes, beaches, dunes, or offshore islands. Throughout the Northeast, these habitats have been heavily altered by long-term human activities, including development and stabilization, pollution, marsh filling and draining, pesticide spraying, and recreational use. Such activities represent formidable threats to coastal species and their habitats. Piping Plover and Roseate Tern have been the subject of considerable conservation attention in the Northeast due to their listing under the ESA. This attention is also focused on the Red Knot which was proposed for listing in 2013.

Several other state, regional, and national programs and projects are measuring and tracking bird populations. Much of this effort is expended by "citizen scientists" who volunteer their observation skills to survey particular sites as part of nationwide projects. The Christmas Bird Count (CBC), which has been coordinated by the National Audubon Society for more than a century, is primarily a volunteer effort that provides consistent data on wintering bird populations throughout North America. The Breeding Bird Survey (BBS), coordinated by the U.S. Fish and Wildlife Service (USFWS), is another continent-wide program that is primarily conducted by volunteers and designed to monitor breeding birds. Since the BBS began in 1966, at least six different survey routes have been undertaken in Rhode Island. These surveys continued until the mid-1980s when increased development and traffic along survey routes reduced their

efficacy. The Block Island BBS route was later established to provide some useful data, but even this survey has also not been conducted for several years.

Other more specific national plans and initiatives delineate specific areas in Rhode Island as important for avian species or codify conservation needs for various avian groups. A regional bird conservation plan for southern New England was produced by Dettmers and Rosenberg (2000). Other plans cover more specific taxonomic groups and are mentioned in the appropriate species group narratives below and recommendations from these plans have been incorporated into this document where relevant. Specific conservation actions are incorporated by reference, and the relevant collaborators are identified as partners for implementing Rhode Island's WAP conservation actions where applicable.

Rhode Island Birds

Sources of information about the birds of Rhode Island, including accepted records of rare species, include Conway (1992), August et al. (2001), the Rhode Island Ornithological Club (2014), the Rhode Island Avian Records Committee, and R. L. Ferren (unpublished manuscript). Numerical tabulations derived from these sources are provisional because several recent reports remain under review by the Rhode Island Avian Records Committee (C. Raithel, pers. comm. 2014). Approximately 431 species of birds have been reported in Rhode Island. Of these, 416 species have been documented with a specimen or photograph; the remaining 15 species are considered hypothetical. These latter reports are likely valid, but are visual observations without documentation. Five taxa with known or suspected occurrence in Rhode Island are extinct; the Passenger Pigeon, Great Auk, Labrador Duck, Heath Hen and Eskimo Curlew.

The Rhode Island Natural Heritage Program (RINHP) was established in 1979 to catalogue the state's rare flora and fauna. While the RINHP is being re-configured as a joint project between RI DEM DFW, URI, The Nature Conservancy, and The Rhode Island Natural History Survey (RINHS), the rare species lists remain intact. The state currently recognizes 49 birds as endangered, threatened, or of concern, more than any other animal group.

The first standardized project to document the state's breeding avifauna resulted in the *Atlas of Breeding Birds in Rhode Island* (Enser 1992). This project found 164 species nesting in Rhode Island during the span of the study 1982-1987. Several species that were known to nest in the state earlier in the 20th century had disappeared long before the breeding bird atlas was created. These include the Henslow's Sparrow and the Golden-winged Warbler. The passage of more than 25 years has seen significant changes in the breeding status of several Rhode Island birds. Some, including the Cerulean Warbler, Northern Bobwhite, Vesper Sparrow, Gadwall, Blue-winged Teal, Cattle Egret, Sharp-shinned Hawk, Roseate Tern, and Cliff Swallow, have not been found nesting in the state for more than 10 years and may be extirpated. During the same period, several other species have either expanded their ranges in the state (e.g., Red-bellied Woodpecker, Pileated Woodpecker) or newly colonized it (e.g., Bald Eagle and Common Raven). Conducting a second breeding bird atlas is an obvious research need that would help to clarify these changes and develop current assessments of the state's nesting avifauna.

Within the RI DEM DFW, the W-23-R project has traditionally been responsible for monitoring certain vulnerable avian populations. This project has provided some baseline data on species of marshes, grasslands, and forest birds and colonial waterbirds. Much of these data were incorporated in the *Atlas of Breeding Birds in Rhode Island* and continue to be gathered. Despite recent work in qualifying many populations of Rhode Island nesting avifauna, the scope of work is much higher than the existing

personnel can complete, so that many datasets are outdated or cannot be maintained consistently. Annual surveys are presently conducted on colonial nesting birds (e.g., egrets, gulls, terns) and Piping Plover. Nesting Ospreys were also formerly monitored during this project but in recent years have been the purview of the Audubon Society of Rhode Island. During the past few years, most of the original data generated by the W-23-R project have been digitized and are maintained by RI DEM DFW for internal use. Such spatial files include colonial nesting waterbirds, Piping Plover and Least Tern, American Oystercatcher, and point counts of forest birds, marsh birds, and grassland birds.

Of the total bird diversity in the state, 123 species have been determined to be SGCN in Rhode Island (Table 1-6). The process of identifying SGCN is discussed at the end of this chapter and Appendix 1b lists all SGCN. The 2015 plan employed a different prioritization process than was used in 2005, which resulted in the removal of several species and the addition of others. In general, the 2015 list includes many more species found in Rhode Island only as migrants, including oceanic species and waterfowl. Another difference is how birds are presented in the 2015 WAP. Birds have been grouped into functional habitat or guild groupings to acknowledge commonalities and reduce redundancy. PIF has published a *North American Landbird Conservation Plan* (Rich et al. 2004) which identifies goals for species in these habitat groupings. Birds are presented here and in species fact sheets (in Appendix) in the following groups:

Marine Birds

Pelagic Birds

Pelagic birds were not included in the 2005 WAP, in part because they do not nest in state waters and because local populations vary temporally and spatially. However, such species are still at risk from a variety of threats, including loss of habitat or mortality from offshore wind turbines and oil spills, and as bycatch in fishing gear. As part of the *Rhode Island Ocean Special Area Management Plan,* Paton et al. (2010) systematically documented the status and distribution of pelagic species in Rhode Island waters.

Inshore Birds

The distinction between inshore species and pelagic birds is subtle, but in general inshore birds occur closer to shore and occupy habitats that are discrete features of the marine landscape such as shoals and vegetation beds. Issues affecting inshore species are similar to those for the pelagic group.
In 2009, the North American Bird Conservation Initiative identified threats to wintering habitats as one possible reason for the population declines of several species of sea ducks. Accordingly nine of these birds are included on the SGCN list. As part of the effort to understand the ecology of these birds, especially habitat selection of wintering populations, RI DEM DFW began a sea duck radio-tracking project in 2010 (Osenkowski 2011).

The Narragansett Bay Winter Waterfowl Survey, initiated in the winter of 2001-2002 and coordinated by the U.S. Environmental Protection Agency (EPA) Atlantic Ecology Division and the NBNERR, has been conducted annually through 2013. In 2013, 67 locations throughout Narragansett Bay were surveyed with more than 16,000 waterfowl representing 20 species tallied. This survey supplements aerial surveys conducted annually by USFWS and RI DEM DFW. CBCs also survey a large proportion of Rhode Island inshore marine habitat in December of each year.

Coastal Birds

The *North American Waterbird Conservation Plan* assessed the abundance and distribution of 210 waterbird species in North America and found that one-third of colonial nesting waterbirds are at risk of serious population declines. Eleven pelagic seabirds are imperiled, while seven wading birds and 36 pelagic and coastal seabirds are of high conservation concern. Only 17% of 166 colonial waterbird species are exhibiting apparent or biologically significant population increases, while another 15% of these species are lacking information to estimate population trends (Kushlan et al. 2002).

Gregory Breese, USFWS

Red Knot, listed as threatened under the ESA

Coastal habitats (i.e., beaches, dunes, salt marshes, and islands) support roughly one-third of the northeastern region's RSGCN birds. Some coastal species have been listed by the USFWS as endangered or threatened species. The status of the federally threatened Piping Plover and federally endangered Roseate Tern are addressed by existing recovery plans (USFWS 1996; USFWS 1998). In Rhode Island, nesting Piping Plovers have been monitored and managed for more than 30 years through the cooperative efforts of RI DEM DFW, The Nature Conservancy, and USFWS. Distribution and population status information has been compiled for these species by the USFWS at their refuges in southern Rhode Island with recommendations for conservation actions (USFWS 2014). The Red Knot, a migratory species in the region, has also been the subject of regional conservation measures and has recently been listed as threatened under the ESA (USFWS 2014).

Marine Island Birds

This category includes several species of herons, gulls and terns that tend to nest on uninhabited, predator-free islands. Some species in the 2005 CWCS which may no longer nest in the state were omitted from the 2015 version (e.g., Little Blue Heron and Cattle Egret). Double-crested Cormorant and Great Black-backed Gulls are also omitted because they have large regional populations and are usually considered to be threats rather than conservation priorities. Because these species co-occur with other species that are dealt with in more detail, their omission or inclusion does not appreciably affect the species-habitat nexus or the appropriate conservation actions for the colonial birds that were retained on the SGCN list.

By the end of the 19th century, populations of most colonial nesting birds (gulls, terns, herons and egrets) along the Atlantic coast had been decimated by unregulated hunting for eggs and feathers. The status of these species in Rhode Island prior to European settlement is conjectural, but by the time ornithological record-keeping began, some had not been seen in Rhode Island for many decades. Following the passage of the Migratory Bird Treaty Act, legal protection and aggressive conservation action allowed some populations to recover and recolonize the Northeast.

Rhode Island has a rich history of colonial waterbird monitoring. After the Herring Gull began to nest in the state in 1937, casual nest surveys were conducted by ornithologists such as Roland Clement, David Emerson and Robert Woodruff. Clement and Woodruff (1962) published a summary of the nesting status of gulls and terns in 1962. Many of the "southern" herons and egrets arrived later than the gulls, with

several species nesting in Rhode Island by the 1960s. With recognition that egrets were nesting on islands in Narragansett Bay casual surveys were first conducted by local ornithologists, with more consistent survey work beginning in 1977 by James Myers (RI DEM DFW) and Richard Ferren. Rhode Island's colonial nesting water birds have been annually monitored for more than 40 years by RI DEM DFW, with the 30-year period of 1960 to 1990 chronicled by Ferren and Myers (1998). This work deserves updating and reprinting. Additional monitoring of colonial birds has occurred since the 2005 RI WAP. The results varied annually and are summarized in the paragraphs below.

Gulls and terns nest on small islands, structures, and rooftops near tidewater, but the heron and egret colonies are primarily found on the larger uninhabited islands within Narragansett Bay and on Block Island. Many of these sites were formerly owned by the military and have subsequently been incorporated as conservation properties. Several of these sites, including Hope Island, now reside within the NBNERR. Colonial birds nest on the ground or in low trees and are sensitive to disturbance and predation, especially by mammals. Primary conservation activities for these species include consistent monitoring and efforts to reduce disturbance. Foraging habitats, usually salt marshes away from nesting sites, are also important habitat components that will be threatened by rising sea levels. Another impact suffered especially by terns was colony displacement by increasing gull populations, although more recently gulls have declined somewhat as landfills closed or more effective sanitation measures have been implemented. Herring Gulls have declined more rapidly than Black-backed Gulls. The Roseate Tern has not been documented as a nesting species in Rhode Island since the early 1980s. In addition to the ongoing threat from gulls, tern colonies and roosting areas are subject to risks such as oil spills and rising sea levels. Monitoring of Least Terns occurred during Piping Plover counts. Survey counts declined in 2011 from previous years (2003 to 2009). Common Tern numbers increased since 2009 with the largest population at Despair Island.

The Mid-Atlantic/New England Maritime Regional Working Group for Waterbirds (MANEM) is a regional partnership working to conserve waterbirds in the Northeast. This group has identified Important Waterbird Areas (IWA) in New England for seabirds, inland waterbirds, and coastal wading birds. Maps delineating IWAs in Rhode Island can be viewed at ***http://www.waterbirdconservation.org/manem.html.***

Beach Birds

Beaches are linear strips of specialized habitat that host a wide variety of plants and animals found nowhere else. Beaches also undergo a great deal of disturbance from a variety of recreational uses, including vehicular use and dog-walking. Increased populations of subsidized predators, such as skunks and raccoons, also threaten birds that attempt to nest in such habitats. Piping Plovers and Least Terns nest exclusively in coastal beach habitats and State Wildlife Grants (SWGs) have provided additional support for the protection of nest sites for these species, through fencing and exclosures, as well as public outreach and education on the impacts of recreation and predation.

Intertidal and Mudflat Birds

This category includes shorebirds that occur in Rhode Island primarily as migrants. The *U.S. Shorebird Conservation Plan* and the *Northern Atlantic Regional Shorebird Plan* assess the conservation needs of shorebirds, prioritize species for conservation, and outline specific conservation actions to maintain and improve the status of shorebirds and their habitats (Brown et al. 2001; Clark and Niles 2000). Several shorebird plans have also been developed that provide species-specific conservation actions including those for the American Oystercatcher (Schulte et al. 2007) and Red Knot (Niles et al. 2010).

Stephanie Koch-USFWS

American Oystercatcher Chicks

Populations of migratory shorebirds were decimated by unregulated market gunning during the 200 years after colonial settlement. By 1900, continental populations of many shorebird species were severely reduced and one of these, the Eskimo Curlew, was on the verge of extinction. With the passage of protective legislation in 1918, shorebird populations began to recover, although to this day they have not achieved their original numbers, and many populations have been declining once again in recent decades. Most shorebirds are long-distance migrants that depend on a variety of wetland habitat types for staging and foraging during their migration. Therefore, although the threat from hunting pressure has diminished, shorebirds are still vulnerable to numerous factors on their breeding and wintering grounds, as well as at their migration stopover sites (Brown et al. 2001).

In 1974, Manomet Bird Observatory initiated the International Shorebird Survey (ISS) which was the first attempt to survey shorebird populations by focusing on migratory stopover sites. There is limited information on population sizes and trends for most species of shorebirds in North America, but the available information suggests that 46% of the 72 species in North America are declining. Population trend estimates are uncertain for another 53% of the species; and only two species have populations that are apparently increasing (Brown et al. 2001). Recognition of the need for more systematic surveys of shorebirds to effectively track populations has led to the development of the *United States Shorebird Conservation Plan* and the Program for Regional and International Shorebird Monitoring (PRISM). These efforts are designed to estimate breeding population sizes and trends, spatial distribution and abundance at stopover sites, and to assess habitat use patterns for 72 species of shorebirds nesting in North America (Bart et al. 2002). More importantly, results from this research can be used to develop effective conservation strategies and action plans to help stabilize shorebird populations. Rhode Island is included within the *North Atlantic Regional Shorebird Plan* (Clark and Niles 2000).

In general, there are sufficient data to assess the seasonal phenology, spatial distribution, habitat use, and relative abundance of staging and breeding shorebird populations in Rhode Island. Richard Ferren (unpublished manuscript, *The Birds of Rhode Island*) summarized historical records up to 1995. Two sites are currently monitored by the ISS - Napatree Point and the Charlestown Breachway. In conjunction with the ISS, additional surveys have occurred at Napatree Point since 1980 (C. Raithel pers. comm. 2014) and the Field Notes of Rhode Island Birds have compiled many other shorebird records since the 1960s. Rhode Island does not have sufficient staging habitat to support large numbers of shorebird populations compared to adjacent areas in southern New England, such as Monomoy NWR in Massachusetts (Koch and Paton 2009), and mixed-species flocks of more than 1,000 birds at staging sites are unusual here. However, the needs of migratory shorebirds are obvious in the state because few places provide high-quality stopover habitat, partly because of past stabilization and development of the coastline. Even though coastal habitats are regulated by the Coastal Resources Management Council (CRMC), dredging projects, development, human disturbance, and more recently, rising sea levels threaten prime shorebird habitat. Rhode Island shorebirds need protection, as do the few remaining coastal habitats that can support them. Freshwater shorebirds would also benefit from periodic draw-downs of wildlife impoundments on state management areas (SMAs).

Wetland Birds

According to the *Northeast Regional Conservation Assessment* (Anderson and Olivero Sheldon 2011) there have been substantial changes, increases as well as declines, in wetland bird populations over the past 40 years. Species change is correlated with the degree of conversion in the buffer zone and with the density of nearby roads. Riparian wetlands have seen the most declines; while tidal marshes have seen the least. Some changes appear to be species-specific and may not be directly related to local wetland characteristics. The Black Duck Joint Venture (BDJV), a partnership established under the *North American Waterfowl Management Plan*, has brought together scientists, conservationists, and hunting organizations across this species' historic range to coordinate conservation efforts including monitoring, research, and communications. Based on the best science, the BDJV has established a species-wide population goal of 640,000 Black Ducks across both the Atlantic and Mississippi flyways. The conservation efforts to achieve this goal benefit other wetland and marsh species, such as the bitterns, rails, Marsh Wrens, herons, egrets, grebes, and shorebirds as freshwater marshes have been conserved in the region.

To the extent possible, all known and recent colonies for colonial nesting water birds are visited annually and surveyed using direct nest counts and longer distance visual surveys. Data from the years 2010 to 2012 for egrets, herons, and other colonial nesting birds were documented in the most recent progress reports. These reports showed that no Cattle Egrets were counted during both years. Great and Snowy Egrets were relatively stable in 2012 compared to the 2011 counts. Glossy Ibis counts indicated 135 pairs nesting in Rhode Island in 2012 but only at a single location, Dyer Island. Only one pair of Great Blue Heron was noted in 2012 and Black-crowned Night Heron was the lowest in decades (RI DEM 2012). Non-breeding population data are generally unavailable for most colonial waterbirds and regions, and thus an expanded population survey program is a research need for this avian guild (Kushlan et al. 2002).

Comparatively, the population status of waterfowl is better understood because many species are hunted, and the USFWS provides an annual assessment. The annual waterfowl report, along with RI DEM DFW survey data and supplemental data provided by other agencies, served as important resources for listing species of waterfowl as Rhode Island SGCN (RI DEM annual reports unpublished).

The Atlantic Coast Joint Venture (ACJV), a partnership of government agencies and conservation partners, has designated nine Waterfowl Focus Areas in Rhode Island where the conservation of waterfowl is particularly important. These areas include Hundred Acre Cove, Warren/Palmer River, Arnold Neck, Boyd Marsh, Hamilton Cove, two islands in Narragansett Bay, Fogland Point, Briggs Marsh, Pettaquamscutt Cove, and several coastal ponds along the southern coast (Figure 1-3).

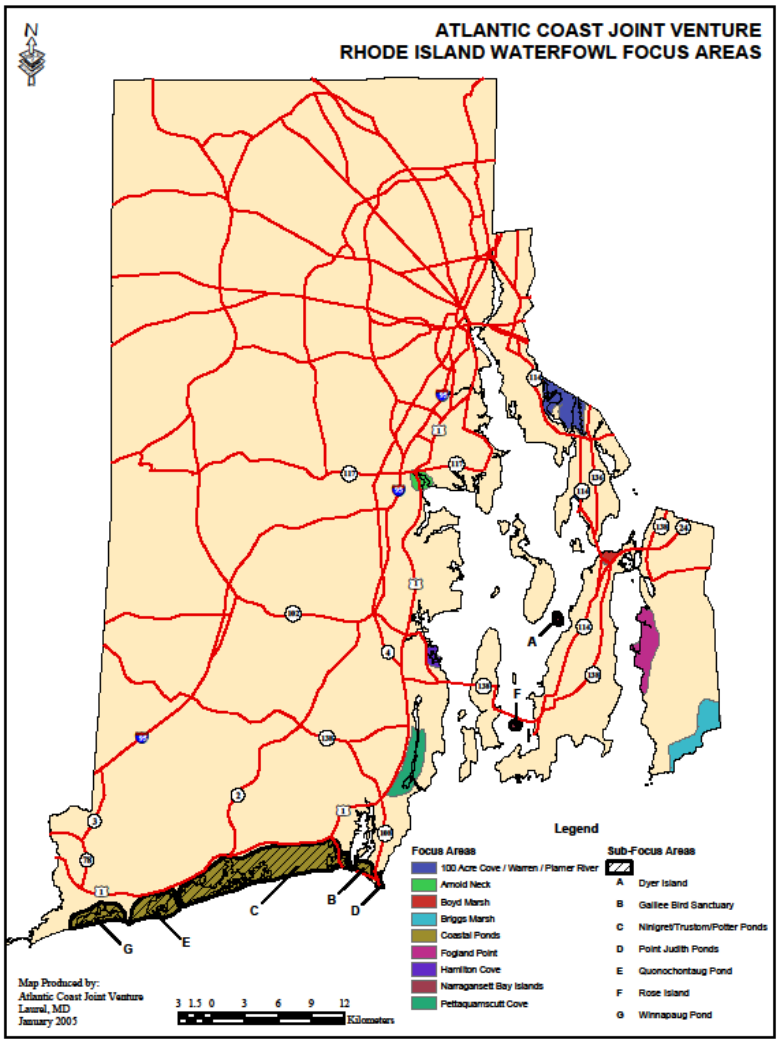

Figure 1-3. Atlantic Coast Joint Venture- Rhode Island Waterfowl Focus Areas
Source: ACJV Plan 2005

Salt Marsh Birds

Salt marshes are universally considered to be among the most important wildlife habitats in North America, and Rhode Island's contribution to the regional distribution and conservation of this habitat is significant. Partners in Flight (PIF) identified maritime marshes as the habitat harboring the largest number of high-priority species in the region, and accordingly the National Audubon Society Important Bird Areas (IBAs) program has designated 16 IBAs in Rhode Island (See: Table 1-5; Figure 1-4) that support Saltmarsh Sparrow and other priority species (National Audubon Society 2014). The Saltmarsh Sparrow is considered by PIF to be the species of highest conservation priority in this region because a significant proportion of the world's population of this species breeds in the coastal marshes of southern New England (Rosenberg and Dettmers 2000).

Table 1-5. National Audubon Society's Important Bird Areas in Rhode Island

Important Bird Area	County	Priority	IBA Criteria
Galilee Marshes	Washington	Global	D1,A1
Hundred Acre Cove	Bristol, Providence	Global	D1,A1
Marsh Meadows	Newport	Global	D1,A1
Maschaug Pond and Beach	Washington	Global	D1,A1
Ninigret Pond and Conservation Area	Washington	Global	D1,A1
Weekapaug/Quonochontaug	Washington	Global	D1,A1
Palmer River	Bristol	Global	D1,A1
Petttaquamscutt Cove	Washington	Global	D1,A1
Potowomot River	Kent	Global	D1,A1
Rumstick/Jacobs Point	Bristol	Global	D1,A1
Sachuest Point and Third Beach	Newport	Global	D1,A1
Seapowet Marsh Management Area	Newport	Global	D1,A1
Trustom Pond/Moonstone Beach	Washington	Global	D1,A1
Napatree Point/Sandy Point	Washington	State	D1
Prudence and Patience Islands	Newport	State	D1
Quicksand/Tunipus Pond	Newport	State	D1

IBA criteria codes indicate D1 – supports a species of state concern; A1 – supports a species of global concern. (Source: National Audubon Society 2014).

Many salt marsh systems have already been heavily degraded by past ditching, filling, and associated coastal development. Although salt marshes now receive regulatory protection in Rhode Island, unless additional conservation actions are taken to mitigate the impact of sea level rise on the high marsh, birds that breed in salt marshes will be negatively affected. In 2011, scientists from universities and non-profit organizations in the Northeast formed a research group made up of over 25 partners known as the Salt Marsh Habitat and Avian Research Program (SHARP). This group coordinates and conducts assessments of the region-wide population status of marsh birds and their habitat across the Northeast. Through bird surveys, banding and nest monitoring, SHARP focuses on the study of breeding marsh birds and their survival and productivity. In 2011 and 2012, scientists from URI and USFWS conducted Rhode Island research in cooperation with SHARP, with much of this work focused on the capture, banding, and nest monitoring of Saltmarsh Sparrows. Data from this research are being analyzed by researchers from the University of Connecticut, University of Delaware, and University of Maine to determine long-term survival probabilities. These studies will help determine how future changes in salt marsh habitat due to development and sea level rise could affect this sensitive bird species. A SHARP overview report for 2012 is available at *http://www.tidalmarshbirds.net/*.

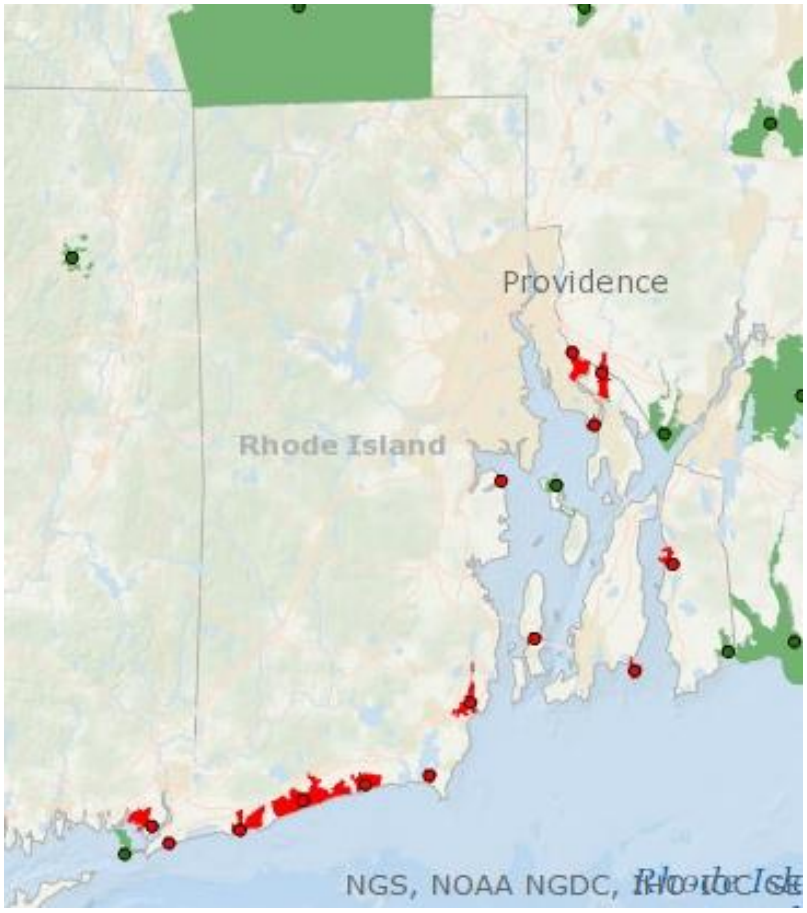

Figure 1-4. Rhode Island National Audubon Society Important Bird Areas
Source: National Audubon Society 2014

Freshwater Marsh Birds

Freshwater marshes are discrete and relatively uncommon habitats on the Rhode Island landscape. Several birds, including rails, Marsh Wrens, and bitterns prefer to nest in the thick emergent vegetation of such habitats. As with salt marshes, freshwater marshes receive some degree of regulatory protection in Rhode Island, but several issues still plague them, including contaminants and invasive species such as common reed (*Phragmites)* and purple loosestrife. Where urban areas exist near marshes, birds that attempt to use these areas can be affected by subsidized predators, domestic pets, and other human impacts.

Freshwater Pond Birds

Rhode Island has many ponds, many of which have been created by impounding rivers and streams. A few support dense and diverse populations of waterfowl and other birds, although most do not. Pond habitat quality has not been extensively studied in Rhode Island. It is likely that some part of their value to wildlife is due to the types and quantity of aquatic vegetation. Additional research and delineation of the ponds most important to waterfowl and other birds is needed.

Birds of Upland Habitats

Early Successional Habitat Birds

Birds associated with early successional communities, including grasslands, scrub-shrub habitats, and young forests, are well represented on the Northeast's RSGCN with 27 species listed. These include grassland obligates like Upland Sandpiper, Henslow's Sparrow, and Eastern Meadowlark; shrubland species such as Prairie Warbler and Brown Thrasher; and species like Eastern Whip-poor-will and American Woodcock that require a mix of seral stages to complete their life cycles. The amount and distribution of these habitat types declined significantly across the Northeast during the 20th century as abandoned farm fields matured into forests and human developments replaced many former old-field areas. Early successional habitats were not as widespread during the pre-settlement period when the landscapes of the Northeast were more extensively forested (refer to Chapter 2 for more detailed discussion of historic habitat distribution).

Grassland Birds

The *2009 State of the Birds* report concluded that grassland birds continue to be among the fastest and most consistently declining groups of birds in North America, with 55% showing significant declines (NABCI 2009). Grassland habitats in Rhode Island are primarily agricultural hayfields and pastures. According to the *Conservation Status of Fish, Wildlife, and Natural Habitats in the Northeast Landscape* (Anderson and Olivero Sheldon 2011), of the 22 bird species that preferentially breed in grasslands, fields and field edges, 17 have experienced persistent, widespread declines. These include Eastern Meadowlark, Field Sparrow, Northern Bobwhite, Ring-necked Pheasant, Brown Thrasher, Song Sparrow, Common Yellowthroat, Grasshopper Sparrow, Red-winged Blackbird, Killdeer, Savannah Sparrow, Golden-winged Warbler, Vesper Sparrow, Yellow-breasted Chat, Blue-winged Warbler, Prairie Warbler, and Bobolink. This trend probably reflects the expansion of these species' habitat during the period of widespread farming and pasturing followed by agricultural abandonment and a return of the land to forest.

USFWS

Prairie warbler-early successional and grassland species

PIF has identified the Grasshopper Sparrow and Bobolink as priority species for these habitats in southern New England (Dettmers and Rosenberg 2000; Rosenberg 2004) and both of these species have been selected as SGCN for Rhode Island (Table 1-6). The Upland Sandpiper is also on the PIF list but is not listed as an SGCN as it is believed to be extirpated as a nesting species in the state with no records since the mid-1980s. PIF has recommended doubling the state's populations of Grasshopper Sparrow. There are an estimated 130 breeding Bobolink in Rhode Island, and PIF has set a target population of 200 individuals as the state's contribution to the continental recovery of the species (Rosenberg 2004).

Grassland-nesting birds have been a priority for survey and conservation work since origination of the RINHP in 1979. Grassland birds have exhibited more dramatic population declines than most other avian guilds, and PIF classifies grassland birds among the top conservation priorities in the region (Rosenberg and Wells 2005). Based on BBS data, declining trends have been documented for at least 16 of 19 species of grassland specialists (Askins 1997). Askins (1997, 2000) provides an interesting summary of the historical ecology of grassland specialists in the region, and it is evident that many species of grassland birds occurred in eastern North America prior to European settlement, including the now extinct Heath

Hen (*Tympanuchus cupido cupido*). Grassland specialists thrived during the agricultural era from the mid-1800s to the early 1900s, but their populations crashed with the reversion of former farms to scrub lands and forests. The distribution of grasslands birds during the mid-1980s was summarized in the *Atlas of Breeding Birds in Rhode Island* (Enser 1992). From 1997 to 2000, Shriver et al. (2005) conducted point counts at 1,140 sites throughout New England and New York, including much of the remaining grassland habitat in Rhode Island (except high quality hayfields in Tiverton/Little Compton), where they detected three species (Bobolinks, Savannah Sparrows, and Eastern Meadowlarks). Data were also digitized and geo-referenced by RI DEM DFW.

Since 2000, large expanses of grassland habitat have been developed for commercial and residential purposes (e.g., West Greenwich Industrial Park). Large acreages of grassland have also been converted to turf or corn production which offers minimal nesting habitat and marginal wintering habitat. Airports were once significant refuges for many species but the risk of aircraft bird strikes has resulted in more frequent mowing and hazing or shooting of birds. In fact, aggressive bird remediation programs on many airports can create sink habitats in which birds are attracted to the habitat but reproductive success is poor, and thus viable populations are not sustained.

The historical pattern of grassland-obligate species has been that populations have cycled in relation to local and regional agricultural patterns. The Henslow's Sparrow was formerly a common resident of tall weedy fields along the south shore of Rhode Island, but had disappeared by 1960 following a dramatic retraction of their breeding range. The Vesper Sparrow is another species that required large acreages of field habitat (including potato farms) and was thought extirpated by 1980. It was subsequently relocated in 2-3 sites, but then completely disappeared around 1984 when these habitats were converted to turf farms. By the time the *Atlas of Breeding Birds in Rhode Island* (Enser 1992) was published, the Vesper Sparrow was no longer nesting in Rhode Island. Upland sandpipers were last detected at three to four sites in the mid-1980s. Several other grassland or early successional specialists including the Cliff Swallow and Sedge Wren have also disappeared as breeding species in Rhode Island.

Many grassland birds are area-sensitive and more than 500 acres of contiguous grasslands are typically needed to support a diverse grassland fauna (Vickery and Dunwiddie 1997) a figure which is extremely challenging to achieve in Rhode Island. The continued presence of grassland-obligate birds in the state will likely hinge on the ability to manage existing agricultural fields. These include croplands leased by RI DEM DFW. Promotion of hayfields and forage crops such as alfalfa, rather than row-crops or turf, would be necessary and mowing regimes would need to be scheduled to align with the nesting phonologies of target species (Vickery and Dunwiddie 1997).

Shrub/Scrub Birds

Shrublands and young forest habitats support nine birds identified as priority PIF species in southern New England: Northern Bobwhite, American Woodcock, Willow Flycatcher, Eastern Kingbird, Brown Thrasher, Blue-winged Warbler, Prairie Warbler, Eastern Towhee, and Field Sparrow (Rosenberg 2004). PIF has recommended increasing the populations for each of these species in Rhode Island, with specific target populations provided in the PIF plan (Rosenberg 2004). The Northern Bobwhite is the one species in this group that appears to have disappeared as a breeding species in Rhode Island (C. Raithel pers. comm. 2014).

The population status of the American Woodcock is assessed annually by the USFWS, and the following is a summation from the 2013 report. Both the Eastern and Central Management Regions for American Woodcock have a long-term (1966-2013) declining trend (-0.1% in the Eastern Region and -0.8% in the Central Region). The 2012 recruitment index for the U.S. portion of the Eastern Region was 1.9% less than the 2011 index and 0.8% greater than the long-term regional index. Recruitment in the Central Region was 0.8% greater than the 2011 index and 5.7% greater than the long-term regional index. The report noted that 2013 marked the tenth consecutive year that the 10-year trend estimate is not significant in the Eastern Region, and the third year that the 10-year trend estimate was not significant in the Central Region. URI and RI DEM DFW are cooperating on studies of the distribution and habitat requirements of American Woodcock in order to better understand where breeding populations occur, which habitats are preferred, and the quality of preferred habitat. As part of this research Buffum (2011) assessed the amount of shrubland habitat in Rhode Island.

According to the RSGCN list the only early successional species for which the Northeast has "high responsibility" is the Blue-winged Warbler, with 48% of the continental population in this region. Species-specific conservation initiatives for early successional birds include the *Woodcock Management Plan* (*http://timberdoodle.org/*), and National Bobwhite Quail Initiative. There are also ongoing state and regional efforts to manage early successional habitats for New England Cottontail, as described above, and such efforts will also benefit many early successional birds.

A small set of obligate shrub-nesting species is differentiated from those mentioned above because they utilize shrubby habitats associated with wetlands. Shrub swamps often develop along the margins of ponds and slow-moving rivers, and Beaver impoundments can convert forests to more transitional vegetation. Species typically found in these shrubby wetlands include Gray Catbird, Willow Flycatcher, and Eastern Kingbird. Two other birds, the Blackpoll Warbler and Tree Swallow, also utilize shrub/scrub habitat, but mostly along the coast. The Blackpoll Warbler does not nest in Rhode Island, rather is only found here during migration in both shrub and forest habitats. Tree Swallows do use shrublands along the coast to stage for migration, but nest throughout the state in various situations, including nest boxes.

Forest Birds

Along with many other species groups, forest birds have been considered in several regional and national plans and programs. The Northeast RSGCN Prioritization Framework, developed after 2005 WAPs, considered the Wood Thrush, Scarlet Tanager, and Cerulean Warbler to be high- responsibility species for the region. These and many other forest species are known to be sensitive to fragmentation and edge effects, thus making human activities such as roads and development important threats. According to the *Conservation Assessment* (Anderson and Olivero Sheldon 2011) there have been substantial changes, both increases and declines, in forest bird abundances over the past 40 years. Species abundance changes have been correlated with degree of fragmentation, with the road-fragmented oak-pine forests showing declines in 11 species and increases in 10 species.

In fragmented landscapes and/or small habitat patches, direct threats such as predation and Brown-headed Cowbird brood parasitism are higher, often rendering such habitats into ecological sinks. Emerging threats include changes in forest composition that may result from invasive insects, diseases and climate change. It is also important to note that forest birds have varying habitat requirements with some requiring older or younger seral stages, or different levels of structural diversity.

PIF has identified 18 woodland or forest birds as priority species for southern New England: Broad-winged Hawk, Black-billed Cuckoo, Whip-poor-will, Northern Flicker, Acadian Flycatcher, Great-crested Flycatcher, Wood Thrush, Yellow-throated Vireo, Blackburnian Warbler, Black-and-white Warbler, Worm-eating Warbler, Louisiana Waterthrush, Cerulean Warbler, Canada Warbler, Scarlet Tanager, Rose-breasted Grosbeak, Rusty Blackbird, and Baltimore Oriole (Rosenberg 2004). Most of these birds are listed as SGCN in Rhode Island; the Rusty Blackbird is the only one that does not nest in Rhode Island. Bird Conservation Research, Inc., a non-profit research group, has conducted forest bird surveys in eastern Connecticut and western Rhode Island, and in 2011 produced a land-planning atlas based on results to date. The atlas has been distributed at no cost to every town conservation commission within the research area (BCR 2011).

Other Bird Species of Greatest Conservation Need

Additional birds that do not align with discrete habitat categories are also listed as SGCN. These include Chimney Swifts which often utilize manmade structures for nesting. Table 1-6 includes the complete list of birds that are considered SGCN in Rhode Island. Appendix 1e summarizes all additions and deletions of vertebrates to the 2005 SGCN list.

Table 1-6. Bird Species of Greatest Conservation Need of Rhode Island

SGCN Birds (123)	
Common Name	**Species Name**
Acadian Flycatcher	*Empidonax virescens*
American Black Duck	*Anas rubripes*
American Kestrel	*Falco sparverius*
American Oystercatcher	*Haematopus palliatus*
American Redstart	*Setophaga ruticilla*
American Wigeon	*Anas americana*
American Woodcock	*Scolopax minor*
Atlantic Brant	*Branta bernicla*
Bald Eagle	*Haliaeetus leucocephalus*
Bank Swallow	*Riparia riparia*
Barn Owl	*Tyto alba*
Black Scoter	*Melanitta americana*
Black-and-white Warbler	*Mniotilta varia*
Black-bellied Plover	*Pluvialis squatarola*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Black-crowned Night Heron	*Nycticorax nycticorax*
Black-throated Blue Warbler	*Setophaga caerulescens*
Blackburnian Warbler	*Setophaga fusca*
Blackpoll Warbler	*Setophaga striata*
Blue-headed Vireo	*Vireo solitarius*
Blue-winged Warbler	*Vermivora cyanoptera*
Bobolink	*Dolichonyx oryzivorus*
Brown Thrasher	*Toxostoma rufum*
Bufflehead	*Bucephala albeola*
Canada Goose – Atlantic Population	*Branta canadensis*

SGCN Birds (123)	
Common Name	**Species Name**
Canada Goose – North Atlantic Pop.	*Branta canadensis*
Canada Warbler	*Cardellina canadensis*
Canvasback	*Aythya valisineria*
Cerulean Warbler	*Setophaga cerulea*
Chestnut-sided Warbler	*Setophaga pensylvanica*
Chimney Swift	*Chaetura pelagica*
Clapper Rail	*Rallus longirostris*
Common Eider	*Somateria mollissima*
Common Goldeneye	*Bucephala clangula*
Common Loon	*Gavia immer*
Common Tern	*Sterna hirundo*
Cory's Shearwater	*Calonectris diomedea*
Dunlin	*Calidris alpina*
Eastern Bluebird	*Sialia sialis*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Meadowlark	*Sturnella magna*
Eastern Towhee	*Pipilo erythrophthalmus*
Eastern Whip-poor-will	*Antrostomus vociferous*
Field Sparrow	*Spizella pusilla*
Glossy Ibis	*Plegadis falcinellus*
Grasshopper Sparrow	*Ammodramus savannarum*
Gray Catbird	*Dumetella carolinensis*
Great Crested Flycatcher	*Myiarchus crinitus*
Great Egret	*Ardea alba*
Great Shearwater	*Puffinus gravis*
Greater Scaup	*Aythya marila*
Greater Yellowlegs	*Tringa melanoleuca*
Hairy Woodpecker	*Picoides villosus*
Harlequin Duck	*Histrionicus histrionicus*
Herring Gull	*Larus argentatus*
Hooded Merganser	*Lophodytes cucullatus*
Hooded Warbler	*Setophaga citrina*
Horned Grebe	*Podiceps auritus*
Horned Lark	*Eremophila alpestris*
Indigo Bunting	*Passerina cyanea*
King Rail	*Rallus elegans*
Least Bittern	*Ixobrychus exilis*
Least Flycatcher	*Empidonax minimus*
Least Sandpiper	*Calidris minutilla*
Least Tern	*Sternula antillarum*
Lesser Scaup	*Aythya affinis*
Marsh Wren	*Cistothorus palustris*
Nashville Warbler	*Oreothlypis ruficapilla*

SGCN Birds (123)	
Common Name	**Species Name**
Nelson's Sparrow	*Ammodramus nelsoni*
Northern Flicker	*Colaptes auratus*
Northern Gannet	*Morus bassanus*
Northern Goshawk	*Accipiter gentilis*
Northern Harrier	*Circus cyaneus*
Northern Parula	*Setophaga americana*
Northern Pintail	*Anas acuta*
Northern Waterthrush	*Parkesia noveboracensis*
Osprey	*Pandion haliaetus*
Peregrine Falcon	*Falco peregrinus*
Pileated Woodpecker	*Dryocopus pileatus*
Pied-billed Grebe	*Podilymbus podiceps*
Piping Plover	*Charadrius melodus*
Prairie Warbler	*Setophaga discolor*
Prothonotary Warbler	*Protonotaria citrea*
Purple Finch	*Haemorhous purpureus*
Purple Sandpiper	*Calidris maritima*
Razorbill	*Alca torda*
Red Knot	*Calidris canutus*
Red-breasted Merganser	*Mergus serrator*
Red-throated Loon	*Gavia stellata*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Roseate Tern	*Sterna dougallii*
Ruddy Duck	*Oxyura jamaicensis*
Ruddy Turnstone	*Arenaria interpres*
Ruffed Grouse	*Bonasa umbellus*
Rusty Blackbird	*Euphagus carolinus*
Saltmarsh Sparrow	*Ammodramus caudacutus*
Sanderling	*Calidris alba*
Savannah Sparrow	*Passerculus sandwichensis*
Scarlet Tanager	*Piranga olivacea*
Seaside Sparrow	*Ammodramus maritimus*
Semipalmated Plover	*Charadrius semipalmatus*
Semipalmated Sandpiper	*Calidris pusilla*
Short-billed Dowitcher	*Limnodromus griseus*
Short-eared Owl	*Asio flammeus*
Snowy Egret	*Egretta thula*
Sora	*Porzana carolina*
Spotted Sandpiper	*Actitis macularia*
Surf Scoter	*Melanitta perspicillata*
Tree Swallow	*Tachycineta bicolor*
Veery	*Catharus fuscescens*
Virginia Rail	*Rallus limicola*

SGCN Birds (123)	
Common Name	**Species Name**
White-rumped Sandpiper	*Calidris fuscicollis*
White-winged Scoter	*Melanitta deglandi*
Willet	*Tringa semipalmata*
Willow Flycatcher	*Empidonax traillii*
Wilson's Snipe	*Gallinago delicata*
Wood Duck	*Aix sponsa*
Wood Thrush	*Hylocichla mustelina*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellow-breasted Chat	*Icteria virens*
Yellow-crowned Night Heron	*Nyctanassa violacea*
Yellow-rumped Warbler	*Setophaga coronata*
Yellow-throated Vireo	*Vireo flavifrons*

Source: RI WAP Bird Taxa Team

Reptiles and Amphibians

Global evidence documents widespread and local declines in reptile and amphibian populations and a need to identify the specific causes and impacts of these declines (Gibbons et al. 2000, LaRoe et al. 1995, USGS 1995). There is a recognized national and regional need for advocacy focused on conservation of amphibians and reptiles and the use of an ecosystem approach to incorporate species protection into existing management plans (NEPARC 2004, NEPARC 2009). An estimated 35% of amphibians that are dependent on aquatic habitats are rare or imperiled nationally (TNC 1996, Abell et al. 2000). LaRoe et al. (1995) found that 45% of the nation's turtle species are in need of conservation action, with many species experiencing significant population and distribution declines over the last century. Moreover, vernal pools, the habitat for many amphibian species and some reptile species, are declining in the Northeast (Calhoun and Klemens 2002).

A total of 45 reptile and amphibian species has occurred natively in Rhode Island. Of these, nine are listed by the state as endangered, threatened or species of concern and another four (the sea turtles) are federally listed (Table 1-1). August et al. (2001) and RI DEM DFW (2003a; 2003b) summarize the best available information on the state's herpetofauna. In Rhode Island, there is relatively good abundance and distribution data for amphibians and reptiles (Raithel unpublished) and locality data have been digitized and geo-referenced by RI DEM DFW for in-house use. Six reptiles are considered rare; 10 species are classified as common; and one species, the Timber Rattlesnake, is extirpated circa 1963 (August et al. 2001, RI DEM DFW 2003a). Four amphibians are categorized as rare and nine as common (August et al. 2001). Five reptiles are protected by regulation which prohibits the possession of these species at any time without a permit; these species are the Spotted Turtle, Wood Turtle, Northern Diamondback Terrapin, Eastern Box Turtle, and Timber Rattlesnake (RI DEM DFW 2003a; 2003b).

The northeastern RSGCN list includes 29 reptile species: 14 turtles, two lizards, and 13 snakes. Of these species, the Wood Turtle, Northern Diamondback Terrapin, and Northern Black Racer are Rhode Island species considered to be of high regional responsibility for management as well as high or very high regional conservation concern. These high-priority reptiles, along with many of the other reptilian RSGCN, are under threat from multiple sources, including habitat loss, habitat fragmentation, water pollution, habitat conversion to agriculture, and illegal harvest.

The RSGCN list for the Northeast includes 35 species of amphibians: of these 28 are salamanders, five are frogs and two are toads. Amphibian species in the Northeast are under many threats, including wetland loss, water pollution, groundwater contamination, exurban and suburban sprawl, increased habitat fragmentation from roads and new human developments, and exotic, non-native diseases.

Rhode Island species on the RSGCN list include the Eastern Box Turtle, the Eastern Hognose, and the Eastern Ribbon Snake. The Eastern Box Turtle appears to be declining in the state but surveys are needed to confirm its abundance and distribution. Accurate population assessments are also needed to determine the status of both the Eastern Ribbon and Eastern Hognose snakes. The Eastern Spadefoot, a state-endangered species in Rhode Island, is facing population declines and loss of habitat in the Northeast. The Northern Leopard Frog is also a regional species of concern that is exhibiting population declines in the Northeast, but is common elsewhere in the U.S.

The Wood Turtle has been the subject of recent regional conservation efforts sponsored by the Regional Conservation Needs (RCN) Grant Program and the Northeast Partners in Amphibian and Reptile Conservation (NEPARC) in response to evidence of population declines. A Wood Turtle Working Group was formed in 2009, and a status assessment and conservation planning process was completed for this species in 2013 (Jones et al. 2014). The Barrington Land Conservation Trust has monitored the state's only known nesting population of the Northern Diamondback Terrapin near Hundred Acre Cove in Barrington, where population estimates have increased annually during the five-year period from 2009-2013 (Sornborger 2013).

Four species of marine sea turtles are included on the RSGCN list (Loggerhead, Green, Leatherback, and Kemp's Ridley), all of which are protected under the ESA. Because of their broad distributions but significant range-wide declines, these species are considered to be low regional responsibility but of very high conservation concern. Sea turtles visit Rhode Island's estuarine and marine waters during the warmer months, and information about their distribution, abundance, migratory movements and population characteristics are collected by USFWS, NMFS and other partners to implement actions identified in the species' Federal Recovery Plans. The Mystic Aquarium documents strandings of sea turtles along the southern New England shore. A summary of these data for the period 1990-2011 for Rhode Island is shown in Table 1-7.

Table 1-7. Sea turtle Strandings in Rhode Island Waters for the Period 1990-2011

Species of Sea Turtle	No. of Strandings
Green Turtle	2
Kemp's Ridley	7
Leatherback	11
Loggerhead	48
unknown	3
Total Sea Turtles	**71**

Source: Mystic Aquarium in Smith 2012

Recently, as part of the *Rhode Island Ocean Special Area Management Plan*, Kenney and Vigness-Raposa (2010) summarized information on sea turtles in Rhode Island. Based on their analysis of existing

data, the authors concluded that the Atlantic Hawksbill is only of hypothetical occurrence in Rhode Island as there are no specimens or photographic records documenting its presence in the state.

Claudia Lombard-USFWS

Leatherback Sea Turtle is one of four RSGCN sea turtles

Approximately half (23 species) of Rhode Island's total herpetofauna are listed as SGCN (Table 1-8). The process of identifying SGCN is discussed at the end of this chapter, and the full list of Rhode Island SGCN is in Appendix 1b. Appendix 1e summarizes all additions and deletions of vertebrates to the 2005 SGCN list.

Table 1-8. Reptile and Amphibian Species of Greatest Conservation Need of Rhode Island

SGCN Herpetofauna (23)	
Common Name	**Species Name**
Reptiles (13)	
Atlantic Green Turtle	*Chelonia mydas mydas*
Common Ribbonsnake	*Thamnophis sauritus sauritus*
Eastern Hog-nosed Snake	*Heterodon platirhinos*
Eastern Ratsnake	*Pantherophis alleghaniensis*
Kemp's Ridley Turtle	*Lepidochelys kempii*
Leatherback Turtle	*Dermochelys coriacea*
Loggerhead Turtle	*Caretta caretta*
Northern Black Racer	*Coluber constrictor constrictor*
Northern Diamond-backed Terrapin	*Malaclemys terrapin terrapin*
Spotted Turtle	*Clemmys guttata*
Timber Rattlesnake	*Crotalus horridus*
Wood Turtle	*Glyptemys insculpta*
Eastern Box Turtle	*Terrapene carolina carolina*
Amphibians (10)	
Eastern Spadefoot	*Scaphiopus holbrookii*
Four-toed Salamander	*Hemidactylium scutatum*
Fowler's Toad	*Anaxyrus fowleri*
Marbled Salamander	*Ambystoma opacum*
Northern Dusky Salamander	*Desmognathus fuscus*
Northern Leopard Frog	*Lithobates pipiens*
Northern Spring Salamander	*Gyrinophilus porphyriticus porphyriticus*
Red-spotted Newt	*Notophthalmus viridescens viridescens*
Spotted Salamander	*Ambystoma maculatum*
Wood Frog	*Lithobates sylvaticus*

Source: RI WAP Herpetofauna Taxa Team 2014

Fish

One hundred and one fish species have been identified as RSGCN in the Northeast, making them one of the most numerous vertebrate groups listed. These fish taxa include representatives of all of the major fish families found in the Northeast, with certain families (Percidae, Cyprinidae, Salmonidae) particularly well represented. Associated habitats for these fish species span the full range of northeastern aquatic environments, including freshwater, estuarine, and marine systems. Migratory (both anadromous and catadromous) species as well as non-migratory species are represented. This list incorporates the best current knowledge about the conservation status of fish species in the Northeast, having been updated by the members of NEFWDTC using the American Fisheries Society's (AFS) 2013 list for the most recent taxonomic classification and nomenclature.

Human activities continue to impact aquatic systems across the Northeast, and fish populations face many threats. The recent AFS and United States Geological Survey (USGS) analysis (*http://www.actionbioscience.org/biodiversity/walsh.html*) (Walsh et al. 2009) describes the most significant threats to freshwater fish. Destruction or modification of habitat, which can result in loss of populations and reductions in species range, includes dam construction, stream channelization, mining, conversion of forests to agriculture, and urban and suburban development. Pollution from point- and non-point-source contaminants in run-off reduces water quality to the point where only highly tolerant fish species survive. Sedimentation of fine particulates can also smother bottom substrates, causing declines in bottom-dwelling species that require clean substrates and good water quality.

Introduction of non-native species, which may result in hybridization, competition, and predation, has also impacted native species. In the Northeast the Northern Snakehead (now established in the Potomac River), Rusty Crayfish, Fishhook Water Flea, and diatoms such as didymo, have the potential to alter freshwater aquatic systems for all species including fish RSGCN. Disease or parasitism such as whirling disease (introduced from Europe) has affected many wild and hatchery populations of trout and salmon species in the U.S. and Canada. Overharvesting for commercial, recreational, scientific, or educational purposes has also historically affected some species such as sturgeon.

Global climate change and associated changes in weather and rainfall patterns across the Northeast have the potential to alter water quality and quantity in many streams, lakes, and rivers, with resulting detrimental effects for many fish species. Climate change can also exacerbate the other threats listed above.

More than 300 fish species have been observed in Rhode Island's freshwater and marine habitats (Table 1-1). August et al. (2001) details the state's freshwater, estuarine and marine fishes. Libby (2013) provides current information and distribution maps of the inland fishes of Rhode Island; the result of surveys conducted at 377 localities (92 ponds and 285 stream segments) between 1993 and 2007. This statewide survey documented 72 species of fish, including those living entirely in freshwater, those regularly migrating between fresh and salt water to reproduce, and those that move between fresh and salt conditions but not for reproductive purposes (Libby 2013). Only two fish are currently listed by the state, the American Brook Lamprey and Atlantic Sturgeon, both as species of concern. The federally endangered Shortnose Sturgeon is also included on the Rhode Island list; however this species is believed to be extirpated from state waters.

From a taxonomic perspective, most of the fish RSGCN in the Northeast are small-bodied freshwater species in the families Percidae (darters and perches) and Cyprinidae (chubs and minnows), a pattern which holds true across North America. Rhode Island SGCN in this group include Bridle Shiner, Common Shiner, Blacknose Dace, and Longnose Dace. These smaller fish are primarily threatened by habitat alteration, including sedimentation, construction of dams and other barriers, and other forms of aquatic habitat destruction and contamination. Distribution maps for these species in Libby (2013) illustrate where they have been be found. In particular, distribution of the Blacknose Dace shows how this species is most abundant in the eastern extension of the Thames River watershed in western Rhode Island where land conversion has been minimal. Although present in five additional Rhode Island watersheds, most are represented by one or two populations.

USFWS

Eastern Brook Trout, a regional species of greatest conservation need

The RSGCN list also includes several of the more primitive living fishes, including six species of lamprey and three species of sturgeon. In Rhode Island, SGCN representatives in this group include American Brook Lamprey and Atlantic Sturgeon.

Several other fish on the regional and Rhode Island lists are popular with recreational or commercial anglers. These include Atlantic Salmon, American Shad, Blueback and Atlantic Herring, American Eel, and Brook Trout on the regional list. Rhode Island also adds Alewife and Bluefish. Several of these species have been the subject of intensive regional conservation efforts. These include habitat conservation work to benefit wild runs of Atlantic Salmon in Maine, dam removal and fish passage work designed to benefit shad and herring species throughout the mid-Atlantic, and the Eastern Brook Trout Joint Venture (EBTJV) efforts to restore habitat and increase connectivity for brook trout across the eastern United States. Rhode Island's contribution to these programs includes an American Shad restoration program – a cooperative effort of RI DEM DFW and the USFWS fish hatchery in North Attleboro, Massachusetts. Restocking of American Shad was commenced in 2009 (adults) and 2010 (fry) in the Pawcatuck River (Edwards 2012).

Of the species harvested for recreational and commercial purposes, most are imperiled for a variety of reasons beyond simple harvest management. Dams and habitat destruction have unquestionably played a significant role in the decline of Atlantic Salmon, herrings, and shads. Coordinated fisheries management efforts have not yet yielded recoveries of those stocks. In Maine, some genetic strains of Atlantic Salmon have reached the point where they are now federally listed as endangered. Non-native species have also played a role in the decline of harvested fish, most notably the advent of non-native Sea Lampreys which played an important role in the decline of Lake Trout in the Great Lakes beginning in the 1950s. In Rhode Island, small (12 in.) sea lampreys are occasionally found attached to adult American Shad returning to the Pawcatuck River to spawn. No spawning populations of Sea Lamprey have been found in Rhode Island, but are found in the neighboring states of Massachusetts and Connecticut (Libby 2013).

The majority of Rhode Island's fish diversity consists of saltwater species. This diversity attracts both commercial and recreational fishermen. For commercial fisheries, total landings volume over the period 2000 to 2010 were decidedly uneven, trending downward from 2006 to 2010 with landed value experiencing less fluctuation. Finfish and shellfish landings volume and landing value describe the

relative year-to-year change and resulting trends by these major species sub-groups. The volume of landings for all species of finfish and shellfish in 2000 was 36% higher than in 2010, while the unadjusted value of all species of finfish and shellfish in 2000 was 25% higher than 2010. When adjusted for inflation, the 2000 value in 2010 dollars is $101,474,041 which is 60% greater than 2010.

The proportion of shellfish to finfish landings between the two periods was dynamic with finfish decreasing 39.2 million pounds, which was 51% of the 2010 total landings. Shellfish decreased from 39.3 million pounds landed in 2000 to 34.5 million pounds in 2010. The overall value of shellfish landings declined relative to finfish with shellfish accounting for 67% of landings revenue in 2000 and 62% in 2010. There were similar fluctuations and changes in commercial fish landings (pounds) by species in 2000-2010, and in terms of species composition, commercial landings underwent substantial changes. The reasons for these changes come from an array of causal factors, including fishery management regulations, changes in biological stocks, market, economic conditions, and environmental conditions. Direct dockside value of commercial landings has fluctuated widely between a high of $86 million in 1999 and a low of $69 million in 2003. Landings of groundfish, shellfish, and lobster provide the mainstay of the industry. Rhode Island has exclusive management control for those species that spend their entire lives in state waters. The Atlantic States Marine Fisheries Commission (ASMFC) manages coastal (0-3 miles) inshore migratory species, and the New England Fisheries Management Council (NEFMC) and /or the Mid-Atlantic Fisheries Management Council (MAFMC) maintains jurisdiction from 3 to 200 miles off the coast.

RI DEM DFW and NMFS manage fish species found in Rhode Island's marine and estuarine waters. Most of the saltwater and estuarine fishery resources found in the state's waters are exhibiting population declines, while others are highly migratory and population data are limited. The state of Rhode Island continually reviews its fisheries management programs, identifying potential conservation actions to improve protection of the state's fisheries. In 2010, a recreational saltwater fishing license program was begun. By 2013, there were more than 41,000 licenses sold and over $180,000 deposited into a special license fund that supports actions to improve management of the marine fishery.

In the *2014 Sector Management Plan for the Finfish Fishery*, the Marine Fisheries Section of RI DEM DFW reports the stock status of several marine fish (RI DEM DFW 2013a). SGCN such as Atlantic Salmon, Monkfish, and Windowpane Flounder are classified as overfished by RI DEM DFW and/or NMFS (RI DEM DFW 2008). The Scup, Black Sea Bass, and the Atlantic Coast Striped Bass stocks are no longer considered overfished, and overfishing is not occurring. Likewise, the Summer Flounder was not overfished relative to an established biological reference point (NEFMC 2007). The stock status of Tautog indicated that the mortality rate of this species has increased since 2005 and the stock was found to be overfished in 2009. The main contributor to fishing mortality rates appears to be from recreational landings. Results, from 2011, show that Winter Flounder stock had been overfished, however, it is not currently being overfished. Reports indicate that non-restricted fish including Bluefish had not been overfished and that overfishing is not now occurring. Other non-restricted fish such as Menhaden and Cod have stock reports that show some overfishing has occurred and Cod overfishing is occurring. Detailed information on the most recent stock status information available for fish species important to Rhode Island can be found at *http://www.dem.ri.gov/pubs/regs/regs/fishwild/mpfinfsh.pdf* (RIDEM DFW Marine Fisheries Section, 2013a).

In addition, the NEFMC has developed Fishery Management Plans (FMP) for Atlantic Herring, Atlantic Salmon, Atlantic Sea Scallop, Monkfish, Red Crab, skates (e.g., Barndoor Skate, Thorny Skate), and Spiny Dogfish, as well as multispecies plans for 15 species of groundfish (e.g., Yellowtail Flounder, American Plaice and Silver, Red and Offshore Hake). FMPs are available online at *http://www.nefmc.org/*. The MAFMC has FMPs for Atlantic Mackerel, squid and Butterfish; Bluefish; Spiny Dogfish (joint with the NEFMC); Summer Flounder, Scup and Black Sea Bass; Surf Clam and Ocean Quahog; and Tilefish (available online at *http://www.mafmc.org/mid-atlantic/fmp/fmp.htm*). The ASMFC manages 22 species or groups of species for conservation, and has approved interstate FMPs for several of them (e.g., Horseshoe Crab and Striped Bass; available online at *http://www.asmfc.org/*). All of these regional FMPs assess the abundance and distribution for each species and describe conservation measures to address any threats to the fish stocks. Such conservation measures may include fishing closure areas or quotas. In accordance with stock reports and other information the RI DEM DFW Marine Fisheries Section annually amends the sector management plans for finfish, shellfish, and crustacean resources. The 2014 versions of these management plans are available at: *http://www.dem.ri.gov/programs/bnatres/fishwild/pn091813.htm*.

Freshwater fishing is a popular pastime in Rhode Island. The state periodically operates fish stocking programs for trout, Largemouth Bass, Northern Pike, and several anadromous species. These stocking programs maintain fish population levels in selected Rhode Island rivers and lakes and restore anadromous fish distribution to areas that have become restricted due to dams and other obstructions. The state's Trout Conservation Stamp Program, initiated in 2001, requires fishermen targeting trout, salmon and char in state waters to purchase a conservation stamp. Receipts from sales of stamps and stamp by-products are deposited into a special trout conservation fund that is used to acquire trout habitat and conduct the research needed to guide the management of trout habitat.

The EBTJV is a unique partnership of state and federal agencies, regional and local governments, businesses, conservation organizations, academia, scientific societies, and private citizens working toward the protection, restoration, and enhancement of Brook Trout populations and their habitats across their native range. The EBTJV reported on the condition of Rhode Island's Brook Trout population in 2013, noting that while the species are still present in most of the state's sub-watersheds, remaining populations are small and scattered. The Wood River is identified as the healthiest population of Brook Trout in the state (EBTJV 2006).

The presence of more than 520 dams on Rhode Island rivers and streams has reduced the historic range of several fish, particularly the anadromous species that migrate into freshwater for spawning. The Narragansett watershed is the most threatened of the state's watersheds in terms of surface waters impounded by dams (EPA 2002). Restoration of these migratory routes is underway in many locations through dam removal and the construction of fish ladders. Abundance and distribution of adult American Shad and River Herring are monitored at fish ladders annually by RI DEM DFW. In 2013, work was completed at the Kenyon Mill Dam on the Pawcatuck River. It was the third and final project to enable fish to once again swim the entire, 34-mile length of the river, from Worden Pond in South Kingstown to Little Narragansett Bay and Rhode Island Sound off Westerly. The three projects had been conducted through a cooperative effort involving the Wood-Pawcatuck Watershed Association, NOAA, Rhode Island Coastal Resources Management Project, The Nature Conservancy, RI DEM DFW, USFWS, and Restore America's Estuaries. RI DEM DFW now has funding to improve fish passage downstream at

dams that have fish ladders but are not passing as many fish as would be possible if dams were removed or modified. In addition, TNC, USFWS, NOAA, RI DEM, Wood-Pawcatuck Watershed Association (WPWA) are currently working on removing White Rock Dam on the Pawcatuck River.

Monitoring data for Rhode Island's fisheries are widespread but concentrate on species that are commercially or recreationally valuable. The RI DEM DFW has monitoring databases for recreationally important finfish stocks in coastal waters (1979 to present). These include the aforementioned adult American Shad and River Herring at various fish ladders, juvenile American Shad and River Herring (1986 to present), finfish in coastal ponds (1993 to present), juvenile finfish (1986-present), pelagic game fish targeted by the gillnet fishery (2000 to present), and Largemouth Bass in several ponds (RI DEM DFW unpublished). The state and its partners (e.g., EPA, USGS) also conduct fish pathology and community sampling analyses as part of water quality monitoring programs.

Of the total fish diversity in the state, 45 species are determined to be SGCN (Table 1-9). Distribution data are insufficient to accurately map many of these species, and collection of status and life history information has been recognized as a research need. The process of identifying SGCN is discussed at the end of this chapter and Appendix 1b provides a full list of SGCN in Rhode Island. Appendix 1e summarizes all additions and deletions of vertebrates to the 2005 SGCN list.

Table 1-9. Fish Species of Greatest Conservation Need of Rhode Island

SGCN Fish (45)	
Common Name	**Species Name**
Alewife	*Alosa pseudoharengus*
American Brook Lamprey	*Lampetra appendix*
American Eel	*Anguilla rostrata*
American Sand Lance	*Ammodytes americanus*
American Shad	*Alosa sapidissima*
Atlantic Cod	*Gaddus morhua*
Atlantic Herring	*Clupea harengus*
Atlantic Menhaden	*Brevoortia tyrannus*
Atlantic Salmon	*Salmo salar*
Atlantic Silverside	*Menidia menidia*
Atlantic Sturgeon	*Acipenser oxyrinchus*
Atlantic Tomcod	*Microgadus tomcod*
Bay Anchovy	*Anchoa mitchilli*
Black Sea Bass	*Centropristis striata*
Blacknose Dace	*Rhinichthys atratulus*
Blueback Herring	*Alosa aestivalis*
Bluefish	*Pomatomus saltatrix*
Bridle Shiner	*Notropis bifrenatus*
Brook Trout	*Salvelinus fontinalis*
Butterfish	*Poronotus triacanthus*
Common Shiner	*Luxilus cornutus*
Grubby Sculpin	*Myoxocephalus aenaeus*
Hogchoker	*Trinectes maculatus*

SGCN Fish (45)	
Common Name	**Species Name**
Inland Silverside	*Menidia beryllina*
Lined Seahorse	*Hippocampus erectus*
Little Tunny	*Euthynnus alletteratus*
Mummichog	*Fundulus heteroclitus*
Northern Sea Robin	*Prionotus carolinus*
Oyster Toadfish	*Opsanus tau*
Pollock	*Pollathius virens*
Rainbow Smelt	*Osmerus mordax*
Rainwater Killifish	*Lucania parva*
Redbreast Sunfish	*Lepomis auritus*
Sand Tiger	*Carcharias taurus*
Sheepshead Minnow	*Cyprinodon variegatus*
Skates (Sp.)	*Raja* spp.
Spiny Dogfish	*Squalus acanthias*
Spotfin Killifish	*Fundulus luciae*
Sticklebacks	*Gasterosteus spp*
Striped Killifish	*Fundulus majalis*
Tautog	*Tautoga onitis*
Weakfish	*Cynoscion regalis*
White Perch	*Morone americana*
Windowpane	*Scophthalmus aquosus*
Winter Flounder	*Pseudopleuronectes americanus*

Source: RI WAP Fish Taxa Team 2014

Invertebrates

The RSGCN invertebrate list is an incomplete and evolving list that currently includes the federally listed invertebrates as well as representatives of two major invertebrate taxa, the tiger beetles (Order Coleoptera, Family Cicindelidae) and freshwater mussels (Order Unionoidea, Families Margaritiferidae and Unionidae). These taxa are listed and discussed separately in sections that follow, along with other groups including butterflies and moths (Lepidoptera), dragonflies and damselflies (Odonata) and pollinators.

Almost 400 invertebrate species (terrestrial and fresh water) are presently tracked in the Rhode Island Natural Heritage Database, with 56 of those species listed by the state as endangered, threatened, or species of concern (RI DEM DFW 2014). However, these figures represent a small fraction of the state's invertebrate fauna. Insects are a diverse group that includes a number of species highly sensitive to perturbations in their habitats and selected species often serve as environmental indicators. There are more than 163,000 species of insects in the U.S. and Canada, including 14,000 moths and butterflies (Lepidoptera) but much of this incredible diversity is not yet understood. Highly specialized relationships between insects and host plants can render some insects highly vulnerable to extinction should the host decline. It is presumed, for example, that at least two species of moths have become extinct due to the loss of the American chestnut (Dunn 2005).

Sikes (2004) provides a checklist of Rhode Island's beetles based on current field surveys and museum specimen records spanning more than 150 years. This volume documents 2,209 beetle species in Rhode

Island, and provides recommendations for species of conservation concern (37 species). It also identifies 62 species known only from Rhode Island, and another 192 species that are not native to North America.

Tiger Beetles

Tiger beetles are a group of highly active, predatory beetles that have been the focus of conservation biologists for many years because of their vulnerability to habitat loss. The RSGCN list includes 11 tiger beetle taxa, encompassing over half of the tiger beetle fauna in the Northeast.

Several tiger beetles on the RSGCN list are known to be in decline range-wide and thus may merit regional conservation attention. One of these is *Cicindela patruela*, a pine barrens and ridge-top barrens species that has been lost from many historical sites in the northeastern states, including Rhode Island. Certain guilds of tiger beetles are known to be at elevated risk for extirpation or even extinction, especially those associated with ocean beaches where population declines have been documented for many species. One member of this group is the federally listed Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis)* which was last documented in Rhode Island in 1978.

Fourteen species of tiger beetles have been documented in Rhode Island (Enser 1998), including two considered to be extirpated, *C. patruela* and *C. dorsalis*. Of the remaining 12 species only three or four are considered secure. Most tiger beetle populations are localized in patches of habitat and have declined as these specialized beaches and barrens have diminished. Some species have adopted abandoned sand and gravel extraction sites as alternative habitats.

Adult tiger beetles are active diurnal predators that occupy open habitats such as sandy flats, rocky ledges, sandy and gravelly beaches, dunes, and inland sand barrens. Tiger beetles depend on habitats that are maintained by disturbance, but excessive or chronic disturbance such as by uncontrolled vehicle use or other forms of trampling can kill larvae and render areas unviable. Two SGCN are confined to inland sand dunes and barrens that tend to occur where soils are deep and sandy, especially in the glacial deposits within Washington and Kent Counties. The open sandy flats were formerly created by fire or other scarification processes, but are now severely at risk because of ongoing fire suppression and revegetation. Inland sand dunes are also favored by off road vehicle (ORV) users and many sites are at risk or have already been lost though illegal vehicle use.

On the coast the previously mentioned Northeastern Beach Tiger Beetle (*C. dorsalis*) is presently listed by the USFWS as a threatened species, but is extirpated from Rhode Island. Barrier beaches face many of the same threats as inland sand barrens, except that coastal beaches are more widespread and have associated endangered and threatened species such as Piping Plover that also warrant conservation attention. Nevertheless, whereas Piping Plovers leave the beaches and migrate for the winter, tiger beetles spend their entire lives on-site and are vulnerable to vehicular use at all seasons. Tiger beetles of coastal habitats also face uncertain futures as their habitats are altered by the impacts of climate change. Beaches and dunes will likely be battered by stronger storms, and rising sea level may result in migration of habitats inland. Tiger beetles could be largely unaffected by these processes if the disturbances provide new habitat opportunities.

Silphid Beetles

Beetles of the family Silphidae have also received attention in Rhode Island because of the state's importance in preserving the American Burying Beetle (*Nicrophorus amerianus*), a species listed as federally endangered in 1989. RI DEM DFW, The Nature Conservancy, and USFWS annually monitor the population of this beetle on Block Island and provide management recommendations. Surveys showed a decline in this beetle from 2007 with a slight recovery in 2011 (RI DEM DFW 2012b). Silphid beetles have been surveyed throughout the state since 1989 and distributions and status have been defined for the seven species of *Nicrophorus* beetles found in Rhode Island (C. Raithel pers. comm. 2014).

USFWS

American Burying Beetle, federally listed as endangered in 1989

Butterflies, Moths, and Skippers

Several important regional trends concerning butterflies, moths and skippers are apparent in the list of lepidopteran SGCN in the Northeast. Among butterflies two families predominate, the skippers (family Hesperiidae) and the blues, coppers, and elfins (family Lycaenidae). The latter family includes the well known Karner Blue Butterfly (*Lycaeides melissa samuelis*), a federally endangered species that occurred historically from Wisconsin east to New Hampshire.

Pavulaan and Gregg (2007) have amended and updated the checklist of Rhode Island's butterflies, documenting 104 species in the state and another 29 of rare or hypothetical occurrence. This number includes two butterflies, the Persius Duskywing and Regal Fritillary, not recorded in Rhode Island for more than 20 years and believed to be extirpated (C. Raithel pers. comm. 2014).

Butterflies of the families Hesperiidae and Lycaenidae occur in large numbers on the regional and state SGCN lists because many species in these families are small-bodied, relatively weak fliers with very specific host plant requirements, or they have other narrow ecological specializations such as association with specific vegetation communities. In addition, the larvae of many species of Lycaenidae participate in symbiotic relationships with ants, so that both the larval host plant and suitable ant partners must be available in order for the species to thrive. In Rhode Island, examples of these butterflies and their host plants include Bog Copper (cranberries), Frosted Elfin (Wild Lupine and Wild Indigo), and Hoary Elfin (Bearberry).

The Regal Fritillary (*Speyeria idalia*) is a regionally rare and globally declining butterfly associated with remnant grassland and prairie habitats in the eastern and central U.S. Eastern populations of this butterfly have crashed in recent decades. A succession of losses during the 1990s along the offshore islands of southern New England, including Block Island, eventually resulted in extirpation of the species from this part of the region. The only remaining populations of this butterfly in the Northeast occur at sites in Pennsylvania and Virginia.

Beginning in the 1990's, researchers have documented a steady decline in Monarch Butterfly (*Danaus plexippus*) numbers. A primary threat to the Monarch Butterfly is a decline in populations of milkweed, the primary food plant required by caterpillars. The decline in milkweed is partially due to the reduction

of open habitats, but in the Midwest losses are mostly due to the dramatic increase in use of the herbicide Roundup (glyphosphate) which has been made possible by the mass-planting of genetically modified herbicide resistant corn and soy. In addition, the widespread use of systemic insecticides such as neonicotinoids within the breeding range of the Monarch poses a considerable threat, illegal logging of fir forests in Mexico has reduced wintering habitat, and extreme weather events in the eastern U.S. may be negatively impacting Monarchs.

Andrew MacLachlin-USFWS

Monarch butterfly on goldenrod at Ninigret Conservation Area

In recognition of the decline in Monarch Butterflies, the Monarch Joint Venture (MJV) was initiated in December 2008 as a partnership of federal agencies, state agencies, non-governmental organizations, and academic programs working together to protect the Monarch and its annual, long-distance migration. Guided by the North American Monarch Conservation Plan (2008), the MJV is taking a science-based approach to addressing monarch conservation issues. The MJV promotes Monarchs as a flagship species whose conservation will sustain habitats for pollinators and other plants and animals. For more information about MJV: *http://www.monarchjointventure.org/.*

Surveys of Rhode Island moths have been ongoing for several decades, including those conducted by Mark Mello at the Lloyd Center for Environmental Studies in Dartmouth, Massachusetts, the RINHS Bioblitz events (2000-2013), and other cooperators. More than 1000 species of moths have been documented in southern New England, with some groups receiving greater attention than others. Groups commonly represented in SGCN lists include *Papaipema* moths, sphinx or hawk moths, and giant silkworm moths. The larvae of moths in the genus *Papaipema* (family Noctuidae) bore into the stems and tubers of plants and many are specific to a particular species of plant. In Rhode Island, an example of this relationship is the Pitcher Plant Borer (*Papaipema appassionata*). The family of sphinx or hawk moths (family Sphingidae) includes several well-known agricultural pests as well as several rare and declining species. Certain hawk moths are diurnally active and many species can be important pollinators of flowers with long, tubular corollas.

Giant silkworm moths (family Saturniidae) are among the most colorful and spectacular species of Lepidoptera in the Northeast, and several of the largest and most beautiful species have recently declined across the Northeast. These declines have been attributed to increased spraying of chemicals for mosquito and other pest control and to increased anthropogenic light pollution, which disrupts the normal nocturnal flight patterns of these insects. The Buck Moth (*Hemileuca maia*) is a diurnal silkworm moth closely associated with Scrub Oak that primarily occurs in Pitch Pine areas in Rhode Island where this oak often dominates the understory. The Buck Moth has experienced noticeable declines in the Northeast which is partially attributed to the loss and conversion of suitable barrens habitat, and to the broadcast spraying of insecticides for control of pest insects.

Other Insect Groups

The Odonata (dragonflies and damselflies) is another insect group receiving attention in recent years with the completion of the *Rhode Island Odonate Atlas* in 2000. The atlas provides the documentation and distributional data for the 130 species found during the survey period (Brown 2014). Twenty-three

odonates are included as SGCN. The robber flies (Diptera: Asilidae) have also received survey attention from 2003 to present with 65 species documented and three identified as SGCN in Rhode Island.

Considerable concern has been expressed about the conservation status and population trends of native pollinators across North America. Available evidence indicates that certain pollinator species have been declining in the U.S., and flower-visiting insects account for 50% of all known insect extinctions (NRCS 2007). Reduced pollinator populations can result in decreased pollination of plant species that require pollinators for fertilization and reproduction. As a result, the plants corresponding to each pollinator could face population declines or even increased threat of extinction (NRCS 2007).

Declines in pollinator populations can be traced to many causes, such as intensive agricultural practices, use of certain pesticides, and habitat loss and degradation. Some species such as bumblebees and honeybees have experienced declines as a result of the spread of pathogens and disease from commercially produced colonies (NRCS 2007). Climate change is also expected to pose additional challenges to pollinator populations. Impacts range from disruption of migratory paths of pollinators such as hummingbirds and bats, to decoupling of plant-pollinator interactions when plants and pollinators respond differently to climate cues.

Most pollinator species are invertebrates, mostly insects. Major pollinator groups in the Northeast include social and solitary bees, as well as many flies, beetles, butterflies, and moths. The Xerces Society has published a *Red List of Native Bees in Decline* that includes two species of bumblebees found in Rhode Island, the Rusty-patched Bumblebee (*Bombus affinis*) and the Yellow-banded Bumblebee (*Bombus terricola*). Both are listed as "imperiled" or at a high risk of extinction due to their very restricted range, few populations, steep population declines, or other factors (Xerces Society 2014). The Heinz Center (2013) has prepared guidance for incorporating information about the conservation of animal pollinators into WAPs, and this document is referenced in Chapter 4.

Freshwater Mussels

Many aquatic invertebrates are habitat specialists with limited distributions and declining populations. Nationally and regionally, many freshwater mussel species are in danger of extinction (Williams et al. 1993). An estimated 67% of freshwater mussel species and 65% of freshwater crayfish are rare or imperiled nationally (Abell et al. 2000). Of the 297 freshwater mussel species found in the U.S., almost 72% have become endangered, threatened, or species of concern in the last 50 years (LaRoe et al. 1995). Ten species of freshwater mussels have become extinct in North America within the last century (Abell et al. 2000).

Chris Raithel

Ligumia nasuta-Eastern Pondmussel, a rare freshwater mussel found in Rhode Island

Raithel and Hartenstine (2006) document the status and distribution of the eight freshwater mussel species found in Rhode Island, identifying four species considered rare and high conservation priorities: *Lampsilis radiata*, *Ligumia nasuta*, *Margaritifera margaritifera*, and *Strophitus undulata*.

Marine Invertebrates

Marine invertebrates of commercial or recreational interest, such as lobsters, crabs, clams, and oysters, are collaboratively managed by RI DEM divisions in an effort to maintain healthy, sustainable populations. The state maintains faunal databases on lobster populations in Narragansett Bay (1991 to present), and lobster larval settlement (1990 to present).

There have been two very distinct peaks in commercial landings of quahogs in Rhode Island since 1947. The first occurred in 1955 followed by a rapid decline until 1974 and then a second peak in 1985. Landings reached an all-time low in 2009 but there has been an increase in both landings and catch per unit effort since then. In 2012, landings totaled 3,158 metric tons (6.96 million pounds), which is a 39% increase from 2011 levels. According to the Standard Atlantic Fisheries Information System (SAFIS) reporting system, 85% of the landings were harvested from Greenwich Bay, Conditional Areas A & B, and the West Passage of Narragansett Bay. Most of the quahogs landed by count are littlenecks (64%), followed by top-necks (23%), chowders (10%) and cherrystones (3%) (RI DEM DFW 2013b).

Commercial landings of Soft-Shell Clams in Rhode Island showed an increasing trend from the early 1980s until 2007 but have declined in recent years. Soft-Shell Clams were down 77% statewide in 2012 when compared to 2011. In a departure from recent years the majority of landings came from the coastal ponds, comprising 65% of the landings statewide. The harvest in the upper portions of Narragansett Bay was down to only 3% of the landings observed in 2011 (RI DEM DFW 2013b).

A commercial fishery for whelks has existed in Rhode Island for many years; however, until September 2009 it was not regulated or the subject of a stock assessment. There are two species commonly landed in Rhode Island, the Channeled (*Busycotypus canaliculatus)* and Knobbed Whelk (*Busycon carica*). According to NMFS statistics, Rhode Island whelk landings totaled 85,000 pounds of meat weight in 1950 and increased over time to a peak in 1986 at 347,000 pounds. After several years of high landings the fishery declined rapidly from 1994 to 2003, when reported landings were less than 2,200 pounds. Since 2006, whelk landings by species have been monitored through the SAFIS reporting system, which captures landings from both state and federally permitted fishers. From 2006 to 2011 commercial whelk landings averaged 545,921 pounds and are almost exclusively (96%) Channeled Whelk (RI DEM DFW 2013b).

Oyster landings have decreased since the late 1990s. In 2012, 248,000 wild oysters (43,163 pounds) were landed in Rhode Island. To put this number in perspective, the aquaculture industry in Rhode Island (50 farms) sold 4.3 million oysters in 2012. Therefore only 5% of the oysters from Rhode Island are from wild harvest. According to local researchers studying oyster populations within Narragansett Bay, the effects of disease, environmental conditions, poor sets of new recruits, and fishing pressure are all responsible for the sharp decline in abundance levels (RI DEM DFW 2013b).

Horseshoe Crabs in Rhode Island were found to be over-fished and at low abundance in the first RI DEM DFW assessment (Gibson and Olszewski 2001). Analysis of data through early 2013 shows a continuing trend of low abundance. An updated Horseshoe Crab stock assessment is currently being conducted. A commercial quota system with additional seasonal harvest restrictions and possession limits is being proposed to better distribute the annual catch among multiple user groups and gear types (RI DEM DFW 2013c).

Researchers with URI have monitored benthic fauna in Narragansett Bay (1999-present) and phytoplankton diversity near Fox Island (1950s-present). Save The Bay and NBNERR have monitored Horseshoe Crab populations, including spawning data, as part of their Bay Watchers program from 1993 to present. NBNERR also conducts additional long-term monitoring programs (Raposa and Durant 2011), including a survey of benthic fauna around Prudence Island in Narragansett Bay, in order to develop metrics for analyzing the condition of species populations.

Of the total invertebrate diversity in the state, 242 species have been determined to be SGCN (Table 1-10). The process of identifying SGCN is discussed at the end of this chapter and Appendix 1b provides a full list of SGCN. Appendix 1f summarizes all additions and deletions of invertebrates to the 2005 SGCN list.

Table 1-10. Invertebrate Species of Greatest Conservation Need of Rhode Island

SGCN Invertebrates (242)	
Common Name	**Species Name**
Annelids (9)	
Bamboo Worm	*Clymenella torquata*
Blood Worm	*Glycera dibranchiata*
Clam Worm	*Alitta virens*
Cone Worm	*Pectinaria gouldii*
Coral Worm	*Dodecaceria coralii*
Parchment Tube Worm	*Spiochaetopterus costarum oculatus*
Parchment Worm	*Chaetopterus variopedatus*
Red Gilled Worm	*Marphysa belli*
Tube Worm	*Diopatra cuprea*
Arthropods (189)	
Beetles (35)	
9-Spotted Lady Beetle	*Coccinella novemnotata*
American Burying Beetle	*Nicrophorus americanus*
Big Sand Tiger Beetle	*Cicindela formosa generosa*
Bombardier Beetle	*Brachinus cyanipennis*
Caterpillar Hunter	*Calosoma wilcoxi*
Common Claybank Tiger Beetle	*Cicindela limbalis*
Cow Path Tiger Beetle	*Cicindela purpurea purpurea*
Dung Beetle	*Copris fricator*
Dung Beetle	*Dichotomius carolinus*
Eastern Red-bellied Tiger Beetle	*Cicindela rufiventris rufiventris*
Eastern Snail Eater	*Scaphinotus elevatus*
Elderberry Borer	*Desmocerus palliatus*
False Mealworm Beetle	*Alobates morio*
Festive Tiger Beetle	*Cicindela scutellaris rugifrons*
Flea Beetle	*Phyllotreta chalybeipennis*
Goldsmith Beetle	*Cotalpa lanigera*
Ground Beetle	*Agonum darlingtoni*
Ground Beetle	*Bembidion confusum*
Ground Beetle	*Bembidion semicinctum*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Ground Beetle	*Calathus ingratus*
Ground Beetle	*Geopinus incrassatus*
Ground Beetle	*Omophron tesselatum*
Hairy-necked Tiger Beetle	*Cicindela hirticollis rhodensis*
Hister Beetle	*Spilodiscus arcuatus*
Langriid Beetle	*Anaedus brunneus*
Margined Tiger Beetle	*Cicindela marginata*
Northeast Beach Tiger Beetle	*Cicindela dorsalis dorsalis*
Oblique-lined Tiger Beetle	*Cicindela tranquebarica tranquebarica*
Predaceous Diving Beetle	*Cybister fimbriolatus*
Round Worm & Slug Hunter	*Carabus vinctus*
Seed-eating Ground Beetle	*Amara chalcea*
Serrate Shoulder Slug Hunter	*Carabus serratus*
Sylvan Worm & Slug Hunter	*Carabus sylvosus*
Tumblebug	*Canthon pilularius*
Vigilant Tumblebug	*Canthon vigilans*
Butterflies, Moths, and Skippers (93)	
Acadian Hairstreak	*Satyrium acadicum*
Achemon Sphinx	*Eumorpha achemon*
American Brindle Moth	*Lithomoia germana*
Angus's Datana	*Datana angusii*
Aphrodite Fritillary	*Speyeria aphrodite*
Barrens Chaetaglaea	*Chaetaglaea tremula*
Barrens Xylotype	*Xylotype capax*
Bay Underwing	*Catocala badia*
Benjamin's Abagrotis	*Abagrotis nefascia benjamini*
Big Poplar Sphinx	*Pachysphinx modesta*
Black Dash	*Euphyes conspicua*
Black-dotted Ruddy Moth	*Ilexia intractata*
Blueberry Sallow	*Sympistis dentata*
Bog Copper	*Lycaena epixanthe*
Bog Oligia	*Oligia minuscula*
Bog Tiger Moth	*Grammia speciosa*
Bridgham's Brocade	*Oligia bridghami*
Bronze Copper	*Lycaena hyllus*
Cecropia Moth	*Hyalophora cecropia*
Chain Fern Borer Moth	*Papaipema stenocelis*
Chalky Wave Moth	*Scopula purata*
Charming Underwing	*Catocala blandula*
Chokeberry Underwing	*Catocala crataegi*
Coastal Swamp Metarranthis	*Metarranthis pilosaria*
Cobweb Skipper	*Hesperia metea*
Contracted Datana	*Datana contracta*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Curved Halter Moth	*Capis curvata*
Dart Moth	*Leucania extincta*
Drunk Apamea Moth	*Apamea inebriata*
Dune Noctuid Moth	*Sympistis riparia*
Dusted Skipper	*Atrytonopsis hianna*
Eastern Buck Moth	*Hemileuca maia*
Edward's Hairstreak	*Satyrium edwardsii*
Four-spotted Speranza Moth	*Speranza coortaria*
Fragile Dagger Moth	*Acronicta fragilis*
Fringed Dart	*Eucoptocnemis fimbriaris*
Frosted Elfin	*Callophrys irus*
German Cousin	*Sideridis congermana*
Gray Spring Zale	*Zale submediana*
Hanham's Owlet	*Phalaenostola hanhami*
Henry's Elfin	*Callophrys henrici*
Hermit Sphinx	*Sphinx eremitus*
Hessel's Hairstreak	*Callophrys hesseli*
Hickory Hairstreak	*Satyrium caryaevorum*
Hoary Elfin	*Callophrys polios*
Holly Sallow	*Metaxaglaea violacea*
Hydrangea Sphinx	*Darapsa versicolor*
Included Cordgrass Borer Moth	*Photedes includens*
Joyful Holomelina Moth	*Virbia laeta*
Laurel Sphinx	*Sphinx kalmiae*
Little Virgin Tiger Moth	*Grammia virguncula*
Lost Sallow Moth	*Eupsilia devia*
Louisiana Owlet Moth	*Macrochilo louisiana*
Marooning Moth	*Sideridis maryx*
Meadow Fritillary	*Boloria bellona*
Monarch Butterfly	*Danaus plexippus*
Noctuid Moth	*Hyperstrotia flaviguttata*
Noctuid Moth	*Psaphida thaxterianus*
Olive Hairstreak	*Callophrys gryneus*
Pale Green Pinion Moth	*Lithophane viridipallens*
Persius Duskywing	*Erynnis persius*
Pine Barrens Zale	*Zale lunifera*
Pine Barrens Zanclognatha	*Zanclognatha martha*
Pink-border Yellow	*Phytometra rhodarialis*
Pink Star Moth	*Derrima stellata*
Pink Streak Moth	*Dargida rubripennis*
Pitcher Plant Borer	*Papaipema appassionata*
Pitcher Plant Moth	*Exyra fax*
Polished Dart Moth	*Euxoa perpolita*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Promethia Silkmoth	*Callosamia promethea*
Purple Plagodis Moth	*Plagodis kuetzingi*
Scarlet-winged Lichen Moth	*Hypoprepia miniata*
Scrub Euchlaena Moth	*Euchlaena madusaria*
Sharp Angle Shades Moth	*Conservula anodonta*
Sharp-lined Powder Moth	*Eufidonia discospilata*
Short-lined Chocolate	*Argyrostrotis anilis*
Silver-bordered Fritillary	*Boloria selene*
Sleepy Duskywing	*Erynnis brizo*
Spotted Dartmoth	*Agrotis stigmosa*
Spotted Datana	*Datana perspicua*
Sulphur Angle Moth	*Speranza sulphurea*
Thaxter's Pinon Moth	*Lithophane thaxteri*
Triton Daggermoth	*Acronicta tritona*
Tufted Sedge Moth	*Hypocoena inquinata*
Tulip Tree Silkworm	*Callosamia angulifera*
Twin-dotted Macrochilo Moth	*Macrochilo hypocritalis*
Underwing Moth	*Catocala* n. sp.
Unexpected Cycnia	*Cycnia inopinatus*
Venus Flytrap Cutworm	*Hemipachnobia subporphyrea*
Violet Dart Moth	*Euxoa violaris*
Waved Sphinx	*Ceratomia undulosa*
Wild Cherry Sphinx	*Sphinx drupiferarum*
Black-eyed Zale	*Zale curema*
Dragonflies and Damselflies (23)	
American Rubyspot	*Hetaerina americana*
Arrow Clubtail	*Stylurus spiniceps*
Arrowhead Spiketail	*Cordulegaster obliqua*
Backwater Bluet	*Enallagma weewa*
Brook Snaketail	*Ophiogomphus aspersus*
Comet Darner	*Anax longipes*
Common Sanddragon	*Progomphus obscurus*
Coppery Emerald	*Somatochlora georgiana*
Crimson-ringed Whiteface	*Leucorrhinia glacialis*
Delta-spotted Spiketail	*Cordulegaster diastatops*
Lyre-tipped Spreadwing	*Lestes unguiculatus*
Maine Snaketail	*Ophiogomphus mainensis*
Mustached Clubtail	*Gomphus adelphus*
Pine Barrens Bluet	*Enallagma recurvatum*
Ringed Boghaunter	*Williamsonia lintneri*
Scarlet Bluet	*Enallagma pictum*
Southern Pygmy Clubtail	*Lanthus vernalis*
Southern Sprite	*Nehalennia integricollis*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Spine-crowned Clubtail	*Gomphus abbreviatus*
Taper-tailed Darner	*Gomphaeschna antilope*
Twin-spotted Spiketail	*Cordulegaster maculata*
Umber Shadowdragon	*Neurocordulia obsoleta*
Zebra Clubtail	*Stylurus scudderi*
Mayflies (2)	
Mayflies (Little Maryatts)	*Epeorus* sp.
Small Minnow Mayflies	*Heterocloeon* sp.
Stoneflies (4)	
Giant Stonefly	*Attaneuria ruralis*
Golden Stoneflies	*Paragnetina* sp.
Sallflies (Green Stoneflies)	*Haploperla* sp.
Yellow Stoneflies	*Eccoptura xanthenes*
True Flies (4)	
Watersnipe Flies	*Atherix* spp.
Bee-like Robber Fly	*Laphria champlainii*
Robber Fly	*Pogonosoma dorsatum*
Robber Fly	*Stichopogon argenteus*
Wasps, Ants, and Bees (2)	
Rusty-patched Bumble Bee	*Bombus affinis*
Yellow-banded Bumble Bee	*Bombus terricola*
Crustaceans (26)	
American Lobster	*Homarus americanus*
Atlantic Marsh Fiddler Crab	*Uca pugnax*
American Marsh Hopper	*Ochestia grillus*
Amphipod	*Gammarus faciatus*
Amphipod	*Gammarus lawrencianus*
Amphipod	*Gammarus tigrinus*
Amphipod	*Hyale plumulosa*
Atlantic Mud Crab	*Panopeus herbstii*
Atlantic Sand Fiddler Crab	*Uca pugilator*
Banded Marsh Hopper	*Uholorchestia uhleri*
Blue Crab	*Callinectes sapidus*
Coastal Mud Shrimp	*Upogebia affinis*
Digging Amphipod	*Haustorius canadensis*
Flatback Mud Crab	*Eurypanopeus depressus*
Harris Mud Crab	*Rhithropanopeus harrisii*
Jonah Crab	*Cancer borealis*
Lady Crab	*Ovalipes ocellatus*
Longnose Spider Crab	*Libinia dubia*
Mantis Shrimp	*Squilla empusa*
Portly Spider Crab	*Libinia emarginata*
Purple Marsh Crab	*Sesarma reticulatum*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Red-jointed Fiddler Crab	*Uca minax*
Rock Crab	*Cancer irroiatus*
Sand Burrower	*Amphiporeia virginiana*
Sevenspine Bay Shrimp	*Crangon septemspinosa*
Tube-dwelling Amphipod	*Ampelisca* spp.
Chelicerates (1)	
Atlantic Horseshoe Crab	*Limulus polyphemus*
Cnidarians (4)	
American Tube-dwelling Anemone	*Ceriantheopsis americana*
Burrowing Anemone	*Actinothoe modesta*
Burrowing Anemone	*Edwardsia elegans*
Northern Star Coral	*Astrangia poculata*
Echinoderms (5)	
Common Sand Dollar	*Echinarachnius parma*
Common Sea Star	*Asterias forbesi*
Green Sea Urchin	*Strongylocentrotus droebachiensis*
Hairy Sea Cucumber	*Sclerodactyla briareus*
Short-spined Brittle Star	*Ophioderma brevispinum*
Molluscs (34)	
Alewife Floater	*Anodonta implicata*
Atlantic Mud Piddock	*Barnea truncata*
Atlantic Surf Clam	*Spisula solida*
Bay Quahog	*Mercenaria mercenaria*
Bay Scallop	*Argopecten irradians*
Blue Mussel	*Mytilus edulis*
Channeled Whelk	*Busycon canaliculatus*
Dwarf Balloon Aeolis	*Eubranchus exigus*
Eastern Emerald Elysia	*Elysia chlorotica*
Eastern Oyster	*Crassostrea virginica*
Eastern Pearlshell	*Margaritifera margaritifera*
Eastern Pond Mussel	*Ligumia nasuta*
False Angelwing	*Petricolaria pholadiformis*
Golden Ambersnail	*Succinea wilsoni*
Knobbed Whelk	*Busycon carica*
Lampmussel	*Lampsilis radiata*
Longfin Inshore Squid	*Loligo pealeii*
Marsh Snail	*Melampus bidentatus*
Modest Alderia	*Alderia modesta*
Morton's Eggcockle	*Laevicardium mortoni*
Mouse Ear Marsh Snail	*Ovatella myosotis*
Northern Horse Mussel	*Modiolus modiolus*
Northern Lacuna	*Lacuna vincta*
Nudibranch	*Elysia catulus*

SGCN Invertebrates (242)	
Common Name	**Species Name**
Nudibranch	*Tergipes tergipes*
Ocean Quahog	*Arctica islandica*
Painted Balloon Worm	*Eubranchus pallidus*
Razor Clam	*Ensis directus*
Ribbed Mussel	*Geukensia demissa*
Sea Scallop	*Placopecten magellanicus*
Soft-shell Clam	*Mya arenaria*
Squawfoot	*Strophitus undulatus*
Striped Nudibranch	*Cratena pilata*
Triangle Floater	*Alasmidonta undulata*

Source: RI WAP Invertebrate Taxa Team

Plants

Plants comprise a significant proportion of any area's biodiversity, but this large taxon is not directly eligible for SWGs and has therefore been less represented in WAPs. This WAP applies the Northeast Terrestrial Habitat Classification System (NETHCS) (Gawler 2008) using plants to define habitats, together with the *Northeast Habitat Guides* (Anderson et al. 2013) which provides a list of representative plant species and a list of rare plants for each habitat type, as is done here and in Chapter 4. Therefore plants are included here as candidates for SGCN, and are listed in each key habitat profile. Further Chapter 4 recommends a conservation action to establish a plant taxa team to identify plant SGCN in the next revision using a process consistent with the other taxa.

An assessment of plant populations is important information to consider when determining the condition of the habitats in which these plants are found. This information is presented in Chapter 2 in the context of key habitats. For example, brackish marshes are a rare community type along the coast of Rhode Island. They have been slowly degraded by a variety of intrusions, and according to many predictions are highly vulnerable to climate change related impacts, including stronger storms and rising sea level. Brackish marshes constitute the habitat for a well-defined flora that includes many plant species found in no other community that have been the targets of inventory and monitoring efforts of the RINHP since 1978.

The New England Plant Conservation Program (NEPCoP) recently published the second edition of *Flora Conservanda*: *New England*, which lists plants in need of conservation (NEPCoP 2012). The list includes plants growing in New England that are globally rare, regionally rare, and locally rare. It also lists plants that are considered historic to New England (though they may exist elsewhere in the U.S. or world) and other plants whose status in the region is yet undetermined but are believed to be rare.

Originally published in 1996, *Flora Conservanda* has been updated for 2012 based on research accumulated over the intervening 15 years including taxonomic studies and field research by professionals and volunteers. Species have been added to the list based on their rarity in the wild, while others have been removed because they are now known to be more common than previously understood or taxonomic understanding of the species has changed so that the species is no longer considered rare in New England. Of the more than 500 species listed for New England, 60 are found in Rhode Island. At the state level, the Rhode Island Task Force of the New England Plant Conservation Program is currently

updating the *Rare Plants of Rhode Island,* identifying over 50 additions to the list since the last update in 2007, seven of which are believed to be extirpated after not being located in roughly 20 years. The *Rare Plants* list now includes 388 species, or roughly one quarter of Rhode Island's native flora (See Appendix 1b).

A subset of the *Rare Plants of Rhode Island* should be considered as SGCN in this state based on the inclusion of these plants in Division 1 and 2 of *Flora Conservanda* (Table 1-11). Division 1 includes globally rare taxa (G1, G2 and G3) occurring in New England, and Division 2 includes plants currently known in New England from >20 sites. Three Division 2 plants are represented by populations only found in Rhode Island.

Three plants are federally listed. Sandplain Gerardia (*Agalinis acuta*) is federally endangered and is currently known from one Rhode Island site; however, this plant has also been introduced to a second location under a cooperative project by RIDEM DFW and the Audubon Society of Rhode Island. The Small Whorled Pogonia (*Isotria medeoloides*) and Seabeach Amaranth (*Amaranthus pumilus*), both listed as federally threatened, are historically known from Rhode Island with no populations currently known in the state.

The threats to plants are similar to those affecting animals, especially in community types that have limited distributions in the state, such as bogs and other small freshwater wetlands, pitch pine barrens, and tidal marshes. Fragmentation of forest habitats has only recently emerged as an issue affecting plants because many species thought to be secure in isolated fragments eventually succumb to these impacts (Flinn and Vellend 2005). Herbaceous understory species represent the majority of plant diversity in forests and in Rhode Island that diversity is slowly being diminished by the gradual loss of species, a phenomenon that has been well documented by more than 30 years of monitoring through the combined efforts of The Nature Conservancy, RINHP, RINHS, and many individual collaborators and surveyors affiliated with NEPCoP.

Table 1-11. Plant Species of Greatest Conservation Need in Rhode Island

SGCN Plants (64)	
Common Name	**Species Name**
Annual Sea-purslane	*Sesuvium maritimum*
Bayard's Adder's-mouth	*Malaxis bayardii*
Bent Sedge	*Carex styloflexa*
Big Cordgrass	*Spartina cynosuroides*
Bindweed	*Cuscuta indecora*
Bitter Panic-grass	*Panicum amarum* ssp. *amarum*
Bog Clubmoss	*Lycopodiella alopecuroides*
Bushy Rockrose	*Crocanthemum dumosum*
Collin's Sedge	*Carex collinsii*
Creeping St. John's-wort	*Hypericum adpressum*
Cut-leaved Water-milfoil	*Myriophyllum pinnatum*
Elatine	*Elatine americana*
Few-flowered Nutsedge	*Scleria pauciflora* var. *caroliniana*
Ginseng	*Panax quinquefolius*
Golden Club	*Orontium aquaticum*
Herbaceous Sea Blite	*Suaeda maritima* ssp. *richii*
Horsetail Spikerush	*Eleocharis equisetoides*

SGCN Plants (64)	
Common Name	**Species Name**
Inundated Beaked Rush	*Rhynchospora inundata*
Lion's-foot Rattlesnake-root	*Nabulus serpentarius*
Lizard's-tail	*Saururus cernuus*
Long's Bulrush	*Scirpus longii*
Long-bracted Tick-trefoil	*Desmodium cuspidatum*
Macgregor's Ryegrass	*Elymus macgregori*
Maryland Golden Aster	*Chrysopsis mariana*
Missouri Mustard	*Boechera missouriensis*
Mitchell's Sedge	*Carex mitchelliana*
Mountain Spleenwort	*Asplenium montanum*
Nantucket Shadbush	*Amelanchier nantucketensis*
New England Blazing Star	*Liatris novae-angliae*
New England Boneset	*Eupatorium novae-angliae*
New England Bulrush	*Bolboschoenus novae-angliae*
Pink Tickseed	*Coreopsis rosea*
Plymouth Gentian	*Sabatia kennedyana*
Purple Needlegrass	*Aristida purpurascens*
Robust Spikerush	*Eleocharis rostellata*
Rotala	*Rotala ramosior*
Sandplain Gerardia	*Agalinis acuta*
Sclerolepis	*Sclerolepis uniflora*
Sea Pink	*Sabatia stellaris*
Seabeach Amaranth	*Amaranthus pumilus*
Seabeach Knotweed	*Polygonum glaucum*
Seaside Grass	*Leptochloa fusca* ssp. *fasicularis*
Sessile-leaved Tick-trefoil	*Desmodium sessilifolium*
Shrubby Loosestife	*Ludwigia sphaerocarpa*
Shrubby Poplar	*Populus heterophylla*
Sickle-leaved Golden Aster	*Pityopsis falcata*
Slender Beadgrass	*Paspalum setaceum* var. *psammophilum*
Small Whorled Pogonia	*Isotria medeoloides*
Small-flowered Buttercup	*Ranunculus micranthus*
Subulated Bladderwort	*Utricularia subulata*
Swamp Bulrush	*Schoenoplectus etuberculatus*
Thread-leaved Arrowhead	*Sagittaria teres*
Three-angled Spikesedge	*Eleocharis tricostata*
Torrey's Beaked Rush	*Rhynchospora torreyana*
Variable sedge	*Carex polymorpha*
Violet Wood-sorrel	*Oxalis violacea*
Walter's Sedge	*Carex striata*
Water-plantain Crowfoot	*Ranunculus ambigens*
Whip Nutsedge	*Scleria triglomerata*
White-edged Sedge	*Carex debilis*
Wild Coffee	*Triosteum perfoliatum*
Yellow Flax	*Linum medium* ssp. *texanum*
Yellow Thistle	*Cirsium horridulum* var. *horridulum*
Yellow-fringed Orchid	*Platanthera cilliaris*

Identifying Species of Greatest Conservation Need

Identifying "species of greatest conservation need" required a method to select species based on their relative vulnerabilities. After identifying potential criteria in the northeastern region, drawing on WAPs around the U.S., and reviewing the approaches used by other conservation organizations, the Northeast Lexicon was developed through a list of common considerations, encompassing the range of criteria used by states in the northeastern region. The Northeast Lexicon is a set of common terminology developed by the states within the Northeast to facilitate interstate collaboration for SGCN. In addition, the identification of SGCN was guided by the *Best Practices for State Wildlife Action Plans* manual (AFWA 2012). Established lists, generated externally using a range of conservation assessment procedures, helped to define the inclusion of an SGCN. These listings include:

1. Federal Legal Listing – species occurring in the state that are federally listed or candidates for listing
2. Regional SGCN – species occurring in state that are regional SGCN
3. State Legal Listing – species listed with a legal designation
4. State Natural Heritage Programs – species ranked S1-S3
5. Regional or Species Group Conservation Prioritization including:
    a. PIF
    b. Bird Conservation Regions
    c. NMFS
    d. AFS
    e. Atlantic Fish Habitat Partnership
    f. Forest Management Plans
    g. other recognized status assessments for other taxa
6. International Union for Conservation of Nature (IUCN) Red List – global ranks for species occurring in state

Three foundational considerations were used to explain the inclusion of a species or why other species are not included. These considerations are:

1. Abundance and Trend – population status and trends for a species
2. Threat – the number, immediacy, extent, and/or reversibility of known threats
3. State Key Habitat – the relative importance of state habitat to the species, compared to habitat outside the state

In accordance with these foundational considerations, a set of criteria were selected regionally for the Northeast Lexicon and adopted by the RI SGCN process. They are:

- Criteria 1-3: Threatened and Endangered species status (federal and state) implies sufficient documentation of species vulnerability and warrants inclusion on the state SGCN list, provided the species rely on habitat within the state. Likewise, species included on the regional SGCN list have already been screened and vetted within the northeast region.
- Criteria 4-5: State Natural Heritage Programs provide state-specific data, including abundance and trend, to assess species population stability. The national Best Practices for WAPs recommends the NatureServe conservation status assessment methodology (described below), used in State Heritage Programs, as a standardized method for assessing extinction/extirpation risk among states. Abundance and trend information and species-specific assessment tools may also be included in the screening criteria for SGCN through established independent assessment programs, such as Partners in Flight.
- Criteria 6: Global rankings can highlight species vulnerability and/or importance from the broadest possible perspective.

- Criteria 7: While abundance and trend data may be lacking for some species, this information is typically the foundation for identifying vulnerable species.
- Criteria 8: Threat severity is a factor in predicting vulnerability especially when species do not yet exhibit impacts. The national Best Practices for WAPs recommends that immediacy and magnitude of threats be considered in the process of assessing species' conservation needs.
- Criteria 9: National Best Practices for WAPs encourage the consideration of the importance of state habitat in determining SGCN.

The process for identification of SGCN in Rhode Island began with an evaluation of the previous 2005 SGCN list. This list of SGCN was then evaluated using the Northeast Lexicon criteria, as it confirmed and enhanced the original Rhode Island WAP SGCN selection criteria. Additional research and compilation of the best available quantitative and qualitative information on all species in the state confirmed these species status and the SGCN selection criteria. RI DEM DFW information along with data and assessments from a wide range of government agencies, academia, NGO's, and private individuals were compiled and reviewed (i.e. IUCN, PIF, AFS, etc.). Data sources were detailed in the preceding sections of this chapter for each taxa and assessment. The full array of wildlife and SGCN assessments were compiled and reviewed, resulting in Rhode Island's dataset of all potential SGCN.

With assistance from internal and external experts most knowledgeable of the status of particular taxa in Rhode Island, the Rhode Island WAP Taxa Teams (together referred to as the Technical Team) then reviewed the dataset. The teams applied the selection criteria outlined above, with species meeting one of these criteria considered eligible for SGCN status. The Technical Team consisted of more than 40 taxa team experts broken down into the five major taxa groups: mammals, birds, herpetofauna, fish, and invertebrates. These teams of experts developed recommendations for any changes in the 2005 SGCN list, utilizing the criteria listed as well as the best available scientific quantitative and qualitative information. The Scientific Review Team (comprised of 125+ interested conservation organizations) provided further input and recommendations for the SGCN list inclusion.

Once species were selected as SGCN, a consensus and conscious decision by the teams was made not to rank the species, but instead to rank the actions that address species, their habitats, and their threats. Thus, a more inclusive approach was taken, following the intent of the SWG program to "keep common species common." Special efforts were made to determine those species thought to be "representative" or "focal" or "indicators" of a guild or group of species. This approach provided further selection and groupings of species by habitat or guild, with only certain species listed as SGCN to represent these groupings. This was particularly helpful with bird and marine fish species, as their mobility and use of multiple habitats required identification of "focal primary and secondary habitats." In this way, conservation actions developed for these focal species also provide for the diverse suite of other species that also utilize these habitats but were not chosen to be listed as SGCN. This explains why some species listed in the 2005 CWCS, and even some RSGCN were not listed as SGCN in the current document. They are included and addressed by habitat or guild suites or groupings of species for which their actions and threats are captured by these groupings.

Table 1-12. Criteria for Selecting Species of Greatest Conservation Need in Rhode Island

Criteria
Endangered, threatened and candidate species (federal or state)
Imperiled species (globally rare)
Declining species
Endemic species
Disjunct species
Vulnerable species
Species with small, localized "at-risk" populations
Species with limited dispersal
Species with fragmented or isolated populations
Species of special, or conservation, concern
Focal species (keystone species, wide-ranging species, species with specific needs)
Indicator species
"Responsibility" species (i.e., species that have their center of range within a state)
Concentration areas (.e.g., migratory stopover sites, bat roosts/maternity sites)

Species groupings were developed and lists were further refined with input from staff and stakeholder experts to produce an inclusive SGCN list for each group covering mammals, birds, reptiles and amphibians, fish and invertebrates. The overlap of species priorities among partner programs (USFWS, USFS, The Nature Conservancy, RINHP, NatureServe, PIF, PARC, AFS, etc.), stakeholders, experts and agencies alike indicated significant agreement on most SGCN. This included:

Special Status Species

- Federally listed threatened and endangered animals
- State-listed threatened and endangered animals
- Wildlife species listed as In Need of Conservation
- RINHP tracked and watch list animal species
- Northeast wildlife species of regional conservation concern
- The Nature Conservancy ecoregional target species
- Responsibility species (those for which Rhode Island supports the core populations)
- Endemic species

Recognized Bird Priorities

- PIF and all bird conservation priority species
- USFWS migratory birds of management concern
- Colonial waterbirds
- Forest interior breeding birds
- Shrubland successional breeding birds
- Grassland breeding birds
- Shorebirds with significant migratory concentrations
- Marshland breeding birds

Other Terrestrial Species Groups

- Reptiles and amphibians at risk
- Bats at risk
- Small mammals at risk
- Invertebrates at risk

Aquatic Species Groups

- Aquatic invertebrates at risk
- Freshwater fish at risk
- AFS species of concern
- Depleted anadromous fish
- Depleted marine invertebrates
- Sensitive aquatic species

A resulting draft list of SGCN was developed by the technical team after significant consultation and coordination efforts among experts. Several workshops were held to solicit additional input and feedback on the SGCN list as well as key habitat lists. Stakeholder input was incorporated through the review of the Scientific Review Team. The proposed SGCN list was refined and again posted on the website for final review, then adopted as SGCN targets for which habitat, threats, and actions were identified during the remainder of this WAP development.

The resulting list of Rhode Island SGCN includes 454 species, 212 vertebrates, and 242 invertebrates (refer to Figure 1-5 for breakdown by major taxonomic group). The total is 91 greater than the 2005 SGCN list which is a result of the collective addition of 182 species, and deletion of 91 (See Table 1-13). The majority of additions are within several invertebrate groups that reflects the greater level of inventory and assessment of species within this group that has occurred during the past decade spurred by recommendations in the 2005 plan. As well, a larger number of moths, butterflies, and bees have been identified as SGCN based on recent concerns regarding the decline and importance of pollinators.

In general, the primary vertebrate groups (mammals, birds, reptiles and amphibians) include an equal number of additions and deletions with resulting totals relatively comparable between the 2005 and 2015 lists. Appendix 1e and 1f summarize all additions and deletions of vertebrates and invertebrates respectively to the 2005 SGCN list. These Appendices also provide a key with reasons for the addition or deletion. Additions are primarily due to recent identification of new threats that were not evident in 2005. For example, the advent of WNS has spurred the listing of all bats known to occur in Rhode Island. Deletions result from two primary reasons, the first being determinations that 2005 listed species are not as rare or restricted as previously thought; and, that breeding populations (especially birds) are no longer present in Rhode Island. The Atlantic hawksbill is the single reptile removed from the list based on determination that no acceptable record for this species is known for Rhode Island.

Table 1-13. Comparison of 2005 and 2015 Rhode Island Species of Greatest Needs Lists

Faunal Group	2005 List	2015 List	No. Added	No. Deleted
Mammals	23	22	4	5
Birds	129	123	30	36
Reptiles	12	13	2	1
Amphibians	9	10	1	0
Fish	34	45	21	10
Beetles	37	34	1	4
Butterflies & Moths	65	93	51	23
Odonates	23	23	1	1
Other Insects	0	12	12	0
Freshwater Molluscs	7	6	0	1
Annelids	0	9	9	0
Crustaceans	11	26	16	1
Other Marine Invertebrates	22	38	31	9
Totals	372	454	182	91

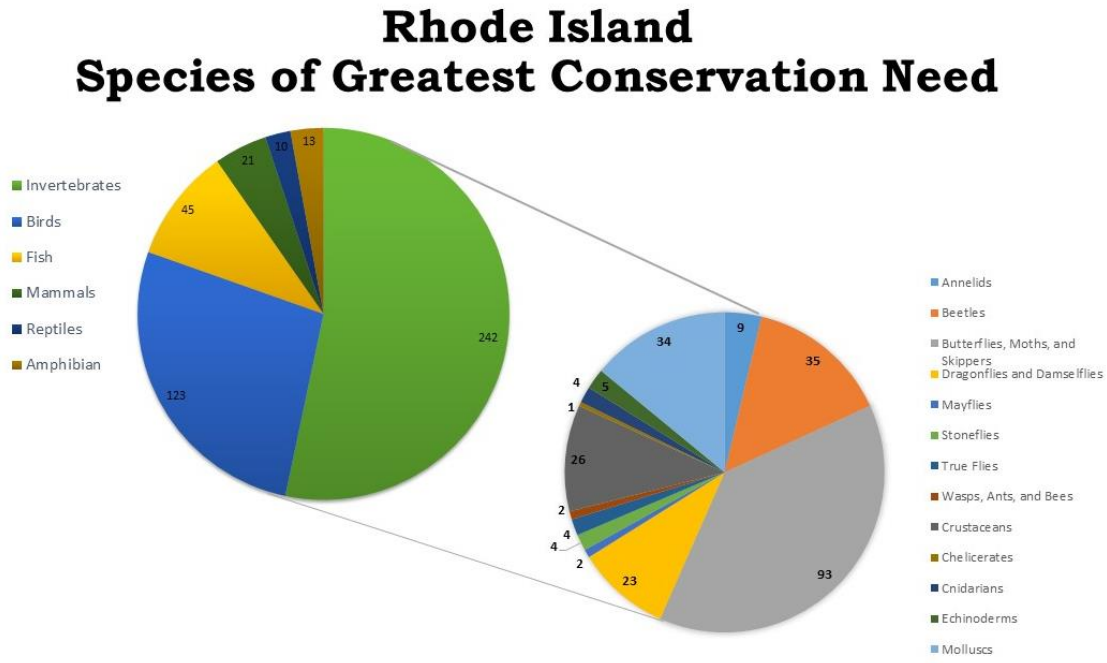

Figure 1-5. Rhode Island Species of Greatest Conservation Need by Taxonomic Group

Wildlife Resource Value and Public Use

Rhode Island's fish and wildlife resources provide a varied and renewable source of economic value and quality of life to the state and nation. Migrating and wintering waterfowl, neo-tropical migrant, butterflies, dragonflies, fish, and rare plants attract residents and eco-tourists to five USFWS wildlife refuges, 24 SMAs, 22 preserves of The Nature Conservancy, and 15 Audubon Society of Rhode Island wildlife

refuges for wildlife observation opportunities. Rhode Island's State Comprehensive Outdoor Recreation Plan (SCORP) identifies those SMAs that provide fishing and hunting opportunities (RI DEM 2003b).

In 2011, a total of 503,000 residents and non-residents participated in wildlife-associated recreation in Rhode Island, spending $348 million on fishing, hunting and wildlife watching (US USFWS 2011). Approximately 308,000 (60%) of these individuals reported wildlife watching as one of their activities, spending about $200 million to do so in Rhode Island.

USFWS estimates that 201,000 people enjoy birdwatching in Rhode Island (USFWS 2011). Most (95%) of these birdwatchers are residents of Rhode Island who are primarily "around-the-home observers," or "feeder watchers." The Rhode Island coastline presents a wide variety of habitats and opportunities for out-of-state birders, and it is estimated that more than 40,000 birders visit the state annually (USFWS 2011).

RI DEM maintains 30 parks and management areas that draw six million visitors each year, generating $1.7 billion in revenues to the state's economy (RI DEM 2003a). In a survey of visitor preferences, most people rated protecting Narragansett Bay, protecting watersheds, providing state beaches and state parks, and providing natural habitats for wildlife and plants as very important and as RI DEM's top priorities (RI DEM 2003b).

According to the USFWS (2011) 20,000 hunters (residents and non-residents) spent approximately $18 million on hunting-related activities in Rhode Island in 2011. The RI DEM DFW administers annual hunting programs for White-tailed Deer, Wild Turkey, small game and furbearers (e.g., rabbits, squirrels, foxes, Eastern Coyote, and Beaver), upland and migratory game birds (e.g., American Woodcock, Ring-necked Pheasant, Bobwhite Quail, Ruffed Grouse) and waterfowl. During the same year, an estimated 175,000 anglers, about 45% of them residents, spent more than $130 million in Rhode Island.

Wildlife is part of the culture of Rhode Island and wildlife recreation is a cornerstone of its conservation ethic and natural resource management. Whether fishing, hunting, watching wildlife, or feeding backyard birds, Rhode Islanders derive many hours of enjoyment from wildlife-related recreation. Rhode Island's wildlife and natural habitats contribute on many levels to the quality of life experienced by residents and visitors alike. More than half a century ago, Aldo Leopold characterized the value of wildlife to society:

> *Some have attempted to justify wildlife conservation in terms of meat, others in terms of personal pleasure, others in terms of cash, and still others in the interest of science, education, agriculture, art, public health, and even military preparedness. But few have so far clearly realized and expressed the whole truth; namely that all these things are but factors in a broad social value, and that wildlife is a social asset* (Leopold 1953).

Efforts to estimate the true value of wildlife in monetary terms, as with most natural resources, have met with limited success and significant information gaps and research needs remain (Costanza et al. 1997, De Groot 1994, Pimentel et al. 1997, Wilson and Carpenter 1999, World Bank 1995). It is likewise impossible to put a precise dollar value on forests that replenish oxygen and cleanse the air, wetlands that clear toxic elements from the water and absorb runoff, or wildlife species that control agricultural pests, disperse seed, recycle nutrients, or pollinate plants. In many ways the role they play in our lives would have to be considered priceless. The contributions that wildlife and wild places make to the quality of life in the Rhode Island cannot be fully measured or quantified.

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