New York State Species of Greatest Conservation Need Selection Process

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

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

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

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

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

Mammals of New York

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

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

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

Twenty-two of New York's mammal species have been designated SGCN. Six species–the Indiana bat, eastern cougar, gray wolf, finback whale, humpback, and northern right whales–are federally listed as endangered or threatened. Eleven species are state listed as endangered or threatened, and 3 are 'special concern' species[4] monitored by DEC.

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

[4] Legislation to afford protection to "Threatened" and "Special Concern" designated species in New York was signed by the governor on October 4, 2005.

Selection of the Mammal Species of Greatest Conservation Need

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

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

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

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

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

Birds of New York

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

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

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

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

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

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

Selection of the Bird Species of Greatest Conservation Need

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

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

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

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

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

Freshwater Fish of New York

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

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

Selection of the Freshwater Fish Species of Greatest Conservation Need

The freshwater fish species designated as those of greatest conservation need were chosen according to several criteria and by using the most recent data available from a variety of sources. Existing species lists such as the New York Natural Heritage database and the species listed as Northeast Species of Conservation Concern (Therres, 1999) were consulted but did not provide the only basis for the list. New York State fishery biologists used their most recent data and surveys. The New York Biological Surveys of 1926-1939 served as a baseline for comparison to more recent data. Changes in population were determined from these analyses and were used as goals to steer conservation measures developed through the Comprehensive Wildlife Survey Strategy.

Endangered and threatened species of fish were included as separate species unless they were extirpated. They were placed in the extirpated species group.

These were treated as a separate group because efforts would be aimed at re-introduction rather than conservation. Many of the species in need of conservation were described by D. Carlson (2000) and Smith (1985).
The following four criteria were used in addition to listing endangered and threatened fish. Species meeting any one or more of the criteria below were included:

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

Diadromous Fish of New York

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

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

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

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

Selection of Diadromous Fish Species of Greatest Conservation Need

The diadromous fish listed as SGCN were deemed as in need of conservation by DEC fishery staff based on trend data which suggests that most of the species are declining in numbers. American eel stocks in the Great Lakes and St. Lawrence River have crashed in the past 20 years (de la Fontaine et al., 2003). The marine district populations of returning juveniles are also thought to have declined due to

a targeted fishery for glass and yellow eels. Fish populations are threatened by dredge and development activities in spawning and nursery areas. The prevalence of other threats to fish populations; over-harvest, loss of access to historic spawning grounds, and climate change also necessitated conservation action.

Marine Fish of New York

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

Selection of Marine Fish Species of Greatest Conservation Need

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

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

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

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

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

Herpetofauna of New York

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

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

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

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

Selection of the Herpetofauna Species of Greatest Conservation Need

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

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

amphibians and reptiles are listed as SGCN, it is hoped that conservation actions taken for the listed species will benefit all the herpetofauna of New York.

Marine Mollusks of New York

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

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

Selection of Marine Mollusk Species of Greatest Conservation Need

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

Freshwater and Terrestrial Mollusks of New York

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

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

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

Selection of Freshwater and Terrestrial Mollusk Species of Greatest Conservation Need

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

Crustacea and Meristomata of New York

The crustacea and meristomata of New York have not been fully described, but they are abundant and widely distributed. Some of the marine species are well studied because of their economic importance to many of the northeastern states. New York State fisheries contributed about 150 million dollars to the economy in 1999 (Gall, 2002). It is estimated that 27 species of shrimp and crab and five species of crayfish inhabit New York waters (Daniels, 2004). Four horseshoe crab species are the only living members of the subclass meristomata worldwide, and one of those is found in New York's marine and estuarine waters. Hundreds of species make up the marine zooplankton group. Five crustacea groups and one meristomata are listed as SGCN, most of which are protected by harvest regulations by New York State or the federal government.

Selection of the Crustacea and Meristomata of Greatest Conservation Need

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

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

Dragonflies and Damselflies of New York

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

Selection of Dragonflies and Damselflies of Greatest Conservation Need

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

Mayflies and Stoneflies of New York

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

Selection of Mayflies and Stoneflies of Greatest Conservation Need

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

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

Other Terrestrial Insects of New York

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

Selection of Terrestrial Insects of Greatest Conservation Need

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

Lepidoptera of New York

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

Selection of Lepidoptera of Greatest Conservation Need

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

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Tables and Figures

Tables

Figures

None

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

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

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