Description of the Basin

The Southeast Lake Ontario Basin covers 4.3 million acres of land and an additional portion of the New York waters of Lake Ontario from Rochester to just south of Stony Point at the mouth of Stony Creek. The basin sits within the Great Lakes Plain ecosystem and has five sub-watersheds, the largest of which is the Finger Lakes sub-watershed. The basin encompasses all or part of 19 counties. There are several distinctive regions within the basin; Lake Ontario and its shoreline, the Finger Lakes region, the Tug Hill region, and the Syracuse metro area.

According to the U.S. Environmental Protection Agency's (EPA) Multi-Resolution Land Cover (MRLC) data, the basin's lands are 47% forested. The forest cover is primarily deciduous forest, with some mixed forest and evergreen stands. The remainder of the land cover is dominated by agricultural uses. Row crops cover 24% of the basin and pasture and hay lands cover another 16% of the basin. A complete listing of the land cover types is found in Table 1. Wetlands, especially freshwater emergent marshes are also a major feature of this basin, although this is not accurately reflected by the MRLC data. In Oswego County, wetlands comprise as much as 20% of the land area.

There are several prominent lakes in the basin and water comprises 5% of the land cover outside of Lake Ontario. The basin includes the major Finger Lakes (Canandaigua, Keuka, Seneca, Cayuga, and Owasco), Oneida Lake, and Onondaga Lake. The two major rivers in the basin are the Oswego River that runs from Onondaga County to Lake Ontario, and the Salmon River that runs across the lower Tug Hill area. The basin also contains sections of the New York State Barge Canal system. The Erie Canal section runs east-west across the upper third of the basin, with other major sections incorporating parts of the Oswego and Oneida Rivers, Seneca River, and other smaller feeder canals around the Finger Lakes.

The largest urban areas in the basin are the city of Syracuse, and the eastern half of the city of Rochester. There are several smaller cities including Oswego, Auburn, Ithaca, and the western part of Rome. There are about 1.7 million people living in the basin, about 45% of which live in and around Syracuse. The population of the basin has been decreasing steadily over the past decade and the decline is expected to continue according to the U.S. Census Bureau. The total percentage of developed land in the basin other than agriculture is 5%. This includes developed parklands and golf courses.

There are numerous state protected lands in the basin, owned and managed by both DEC and OPRHP. Lists of these lands can be found in Tables 6 through 8.

Eastern Finger Lakes Region

This portion of the basin has been shaped by scouring and melting of the Pleistocene Era ice sheet. The dominant landscape features left by the glacial action are the Finger Lakes and the series of glacial drumlins that dot the central New York landscape. The Finger Lakes are long, narrow, and deep with maximum depths over 900 feet. Generally the eastern and western slopes surrounding the lakes are steep, with low lying valleys at the north and south ends of the lakes. The

lakes are generally cold and very oligotrophic, though some of the lakes support warm water fisheries in shallower sections at the northern and southern ends.

The micro-climates and steep slopes of the lake valleys support a healthy wine grape-growing industry. There are about 90 wineries in the Finger Lakes region and over 10,400 acres of vineyard. The steep slopes cause cold air to sink away from the hillside vines. The adjacent lake waters buffer the air temperatures in spring and fall, effectively lengthening the grape growing season. Native New York, European, and hybrid grape varieties are all grown in the area. Wine production in the area dates back to the 1820s.

The Finger Lakes are a source of drinking water to several municipalities and a major recreational resource for the central New York area. Both of these uses rely on good water quality in the lakes and their tributaries. Four of the lakes, Canandaigua, Cayuga, Keuka, and Seneca, are home to state parks.

The lands between the lake valleys are mixed agricultural lands interspersed with deciduous forest and occasional patches of woody wetlands. Finger Lakes National Forest sits between the southern ends of Seneca and Cayuga Lakes, and encompasses approximately 16,000 acres of deciduous and mixed forest (7,500 acres), grassland (6,000 acres) and shrubland (2,500 acres). It is the only national forest in New York State. The National Forest had its origins in extensive farm abandonment in New York from 1890 through the Great Depression. Between 1938 and 1941, over 100 farms were purchased in the area now in the National Forest. Because this was done on a willing-seller, willing-buyer basis, the resulting Federal ownership resembled a patchwork quilt. This was especially true in the Seneca County end of the Forest, where soils were more productive, and some families elected to stay. This ownership pattern still exists today. Much of the federal land that is now part of the National Forest was planted with conifers to stabilize the soils of the abandoned farms. However, extensive areas of the federal lands are still managed as grasslands.

Lake Ontario and the Lake Plain

Lake Ontario has a total surface area of over 7,500 mi2 and a maximum depth of over 800 feet. About 1,700 mi2 of Lake Ontario is included in the Southeast Lake Ontario basin. There are several bays along the southern lake shore including Irondequoit Bay, Sodus Bay, Little Sodus Bay, Port Bay, and Mexico Bay. Most of the sheltered areas along the lake shore have emergent wetlands within them, some of which are within the Lakeshore Marshes Wildlife Management Area. Sodus Bay has a barrier beach and extensive submerged aquatic vegetation beds and is designated a Significant Coastal Fish and Wildlife Habitat by the New York Department of State. Irondequoit Bay is a popular recreation area.

The eastern shore of Lake Ontario features a 17-mile long barrier beach of Great Lakes dunes and a globally significant complex of pond, marshes, and fens that harbors numerous rare and endangered plant and animal species. This barrier system contains the largest and most extensive freshwater sand dune formations in New York State. Extensive emergent wetlands, including Deer Creek Marsh, Lakeview Marsh and North and South Sandy Ponds, occur behind this dune formation. Each of these wetland areas are at least 3,300 acres in size and are designated Significant Coastal Fish and Wildlife Habitat. Of the 17 miles of beach that constitute the shore, more than eight miles are in protected ownership of

New York State and The Nature Conservancy. This area has always posed a management challenge because the sandy beaches are a natural magnet for thousands of summer visitors who help sustain a lively and very important tourism economy in the area. It is located approximately mid-way between Rochester and Syracuse just north of the NYS Thruway.

The Montezuma Wetlands Complex, close to 36,000 acres in total, sits about midway between Syracuse and Rochester, and is one of the largest marsh complexes in the state. This area includes the federally-owned Montezuma National Wildlife Refuge, the state-owned Northern Montezuma Wildlife Management Area (including the former Howlands Island WMA), lands owned by conservation groups, and private property. The wetlands complex is one of the most significant stopover and foraging locations for waterfowl and shorebirds in upstate New York, regularly hosting 1,000 or more individuals of dozens of species. There is also a large cerulean warbler breeding population. Cerulean warblers are locally abundant in New York but regionally rare throughout the Northeast. The refuge and wetlands complex have important grasslands within them that are being managed for grassland breeding birds. The Seneca River once meandered through the marsh area, and diverse habitats with submerged aquatic plants supported a unique fish community that was a relict of the post-glacial refugia.

Syracuse Metro Area

The city of Syracuse is the largest population center in the basin, home to nearly 150,000 people. While the entire population of the City of Rochester (at over 219,000 residents) is larger than Syracuse, only about half the city sits within the basin boundary. The Syracuse metro area is also home to some of the most affected and most unique resources in the basin.

Onondaga Lake is situated at the northwest portion of the city and borders the suburban communities of Lakeland, Solvay, and Liverpool. The 4.6 mile^2 lake was once claimed to be the most polluted body of water in the United States due to unregulated industrial discharge from the early 20th century to the late 1980s. The principal industrial pollutants were mercury and ionic salts derived from the Allied Chemical Company on the lake shore. DEC and EPA recently signed the *Record of Decision for the Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site* that outlines the proposed cleanup method for the past industrial discharges to the lake. The lake also receives nutrient and ammonia discharges from the Onondaga County sewage treatment plant that discharges to the lake. Upgrades to the sewage treatment plant have resulted in reduction of the ammonia and nutrient levels in the lake. Discharges from industrial effluent have also been greatly reduced. Recovery of the lake has begun and there are now reproducing fish populations there.

The Syracuse Metro area is also home to Oneida Lake, the largest inland lake in the state. Unlike the Finger Lakes, Oneida Lake is quite shallow and nutrient rich. The lake provides habitat for a highly productive warm water fishery, migratory and resident waterfowl, various SGCN, and is a valuable recreational resource in the state. The lake has islands, shoals, and marshes that provide valuable nesting and nursery habitat for many aquatic and semi-aquatic species. The lake historically supported Atlantic salmon, lake sturgeon, and American eel populations and is home to a DEC fish hatchery. The Oneida Hatchery rearing

program is focused on walleye, and includes egg collections from Oneida Lake and stocking of millions of walleye fry and fingerlings. Experimental culture of rare or threatened fishes, such as lake sturgeon and paddlefish, also occurs here. The hatchery-reared lake sturgeon have supported a strong recovery of these fish in Oneida Lake.

Just north of Oneida Lake is a section of mixed forest and woody wetlands. To the south, between the lake and the city of Syracuse is the 3,787 acre Cicero Swamp. The swamp is supplied with seasonal flooding from Chittenango Creek and is home to several rare species including Eastern massasauga rattlesnakes, one of only two known populations in the state. Portions of the swamp are managed by DEC for wildlife and recreation in the Cicero Swamp Wildlife Management Area (WMA).

East of Oneida Lake, in the city of Rome, is the Rome Sand Plains, a complex of wetlands and forested uplands occurring on lake sediments (generally sands) of the former glacial Lake Iroquois. The sand plains are part of a complex of glacial dunes that extend west from Rome toward Lake Ontario. A series of wind-formed sand dunes are interspersed with interdunal wetlands; these relict dunes (which formed not long after the post glacial draining of Lake Iroquois) are now vegetated with forest cover, including patches of pitch pine-heath barrens. DEC has partnered with a coalition of public and private partners (The Rome Sand Plains Management Team) to protect the Rome Sand Plains. Additional recognition of the importance of this site comes through The Nature Conservancy's Great Lakes Ecoregional planning process which identifies the Rome Sand Plains as a priority portfolio site.

Tug Hill Area

The Tug Hill area sits east of Lake Ontario and west of the Adirondack Mountains in north central New York. The central portion of Tug Hill is a sandstone bedrock plateau at 1,300 to 1,900 feet elevation. Surrounding the plateau is a transition zone of siltstone and shale bedrock that slopes down to the Great Lakes Plain. The entire area is overlain by glacial till soils. The central plateau area is heavily forested dominated by beech-maple mesic forests, mixed deciduous/coniferous forests, and northern successional hardwoods. The forests of this area are largely working forests with large unfragmented tracts (but including stands of various ages) in both public and private ownership.

The Tug Hill area is one of the most intact landscapes in the state with over 4,000 miles of rivers and streams and complex drainage patterns. Major streams include the East and West Branches of Fish Creek and the Salmon River. The Central Tug Hill Forest has been included in several publications produced for the New York State Tug Hill Commission. It is thought to have one of the largest roadless blocks in the state at 121,000 acres (New York Natural Heritage Program, 2005). The level of landscape alteration increases with proximity to the Syracuse Metro area. The headwater streams of the plateau are generally intact, with high-quality cold water streams. Slimy sculpin is an indicator of stream integrity and has been reported in several Tug Hill streams, the Oneida River, and Oswego River. Lake effect snowfall, often exceeding amounts received anywhere east of the Rocky Mountains, provides more than half the annual stream flow to the Tug Hill area and results in large seasonal fluctuation in stream flows. This also results in some of the highest amounts of acid deposition, especially nitrogen compounds, in the

country. There are numerous dams on streams that flow from the plateau across the transition zone to the Lake Plain. Examples of these dams created the Salmon River reservoir and the East Branch of Fish Creek's Rome Reservoir for hydropower production; recent licensing of these dams established minimum stream flow requirements to protect and restore aquatic habitats in the basin.

The land in the transition zone shifts from forest cover to agriculture, mostly pasture and hay lands, out toward the Lake Plain. There is a DEC fish hatchery on the Salmon River that takes advantage of the high flows and water quality to grow several Pacific salmon species for stocking in the lake and tributaries. Steelhead, coho salmon, and chinook salmon ascend streams to the hatchery and are processed for propagation. Atlantic salmon have been re-introduced to provide a presence of this formerly native species in the eastern Lake Ontario basin.

Critical Habitats of the Basin and the Species That Use Them

The Southeast Lake Ontario Basin is currently home to at least 129 Species of Greatest Conservation Need (SGCN) (Table 2) representing 24% of the total SGCN statewide (Table 3). Another 49 SGCN are thought to be extirpated from the basin at this time (Table 4).

There are several species of particular note in the Southeast Lake Ontario Basin. The basin is home to the only globally known population of Chittenango ovate amber snail in Chittenango Falls State Park. There is also a wintering population of Indiana Bats in Jamesville. Both of these species are federally-listed as endangered. One of the best known locations in New York for Eastern massasauga rattlesnake (a candidate for federal listing) is Cicero Swamp near Syracuse. Bog turtle, federally-listed as threatened, occurs in a number of locations in this basin. The only known location for bog buckmoth is at Selkirk Fen near Deer Creek Marsh. The last recorded nesting by piping plovers in upstate New York (federally-listed as endangered) was on the barrier beaches near Deer Creek Marsh in 1984. At one time, Atlantic salmon had the largest inland (and landlocked) population here in New York, and it had resident as well as migratory components from Lake Ontario into the Oswego sub-watershed. It has been sustained with a hatchery-raised strain from Maine stocked in Cayuga Lake and Point Rock Creek.

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

Each of these systems and subsystems are further refined into a habitat category in the SGCN species database and can be viewed in the Taxa Reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity, but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. The aquatic System-Subsystem classes that are listed as critical to species in Southeastern Lake Ontario Basin are listed in Table 11. The terrestrial System-Subsystem classes are listed in Table 12. These critical habitats are not a comprehensive listing of all habitat associations found in the basin, rather it is a subset of habitats deemed critical to SGCN that occur in the basin.

The terrestrial open upland system-subsystem association includes several habitats in the basin that support 45 SGCN. Grasslands, lakeside beaches, and cliffs and open talus are all part of this association. Although the MRLC mapping

project did not find any natural grassland cover types in this basin, the 39% land cover of hay and pasture lands and row crops fill some of the same ecological functions. There are also sandplain grasslands found near Rome. Grasslands provide critical nesting habitat for grassland birds, foraging areas for raptors, and habitat for many species of butterflies and adult odonates. Not all areas of the basin are important and appropriate for conservation of grassland species. U.S. Department of Agriculture (USDA) Farm Bill programs, DEC's Landowner Incentive Program, and Audubon New York's Important Bird Areas program have all identified and designated certain priority "focus areas" for grassland birds in this basin, making them eligible for agricultural subsidies and conservation incentives. These include areas around the Finger Lakes and Montezuma that have been designated as "Grassland Wildlife Zones" or as "Grassland Related Biodiversity and Significant Ecological Communities" by the USDA.

Forested lands in the basin support at least 38 SGCN. Forests provide critical breeding habitat for deciduous/mixed forest breeding birds, early successional forest/shrubland birds, and forest breeding raptors. Of the forest breeding birds in this basin, Cerulean warbler is notable because it is a candidate for federal listing as a Threatened species, although numbers in New York have been stable or increasing. Vernal pool salamanders and several other species of amphibians also use forests and the wetlands in them to breed and forage as adults. Indiana bats breed and roost in mature trees during the summer months, but specific locations are unknown.

The large number of lakes and streams and high annual precipitation in the basin support many wetlands. Many of the lakes have emergent wetlands at their fringes and there are extensive wooded wetlands in the Tug Hill region and in the Cicero Swamp. Nearly all of the large bays along the shore of Lake Ontario support extensive emergent wetlands and the Montezuma wetlands complex is a wetland area of statewide significance. These wetlands provide some of the best and most extensive habitat for freshwater marsh-nesting birds and are critical for many turtle and amphibian SGCN. Bog turtles have been documented at a number of locations in this basin, comprising a population in New York that is second only to that found in the Hudson Valley. Calcareous fens are rare, largely open, minerotropic peatlands, typically with a high pH (6.0-8.0). These unique communities are used by several SGCN, including bog buckmoth, bog turtle, and at least one rare odonate species. Cicero Swamp has a large section of peat bog that provides critical habitat for Eastern massasauga rattlesnakes. At least 30 SGCN in the basin are dependent on the palustrine mineral soil wetland association.

The unique barrier beaches and dunes on Lake Ontario, as well as seasonal mudflats and certain agricultural lands in the basin, provide critical habitat for migrating shorebirds.

Aquatic habitats in this basin have diverse habitat features, including warm and cold water, still and flowing waters, and an extreme range of water depths. Collectively, aquatic habitats are critical to more than 40 SGCN in the basin. A wide variety of animals from birds to fish to insects are found in the open waters of lakes in the basin. The lakes have several distinct zones based on water depth and temperature. Some species like brook trout are dependent on cold water temperatures and high water quality, while turtles require warmer water. Riverine

habitats in the basin also collectively support about 40 SGCN and have warm water, cold water and depth distinctions like lakes. A number of highly specialized fish species, such as sticklebacks and whitefishes, occur in the Finger Lakes and Lake Ontario.

Overall Trends in the Basin

The basin has been dramatically altered by human activities since the late 18th century. Agriculture and timber industry resulted in the clearing of forests across much of the basin. In 1900, 90% of the land in the basin was used for agriculture, contrasted with just 40% today. Damming of streams and rivers to power mills and generate electricity degraded habitat for fish and mussels in the basin. These effects were compounded by creation of the barge canal system in the mid-19th century that altered the hydrology of wetlands and aquatic habitats in the Oswego River, Montezuma wetlands, Seneca River, Clyde River and connections to Rochester. The industrial centers in Syracuse, Rome, and Rochester discharged toxic substances into many lakes in the basin, with very high levels discharged into Onondaga Lake and Lake Ontario.

While the basin has suffered continuing effects of industrial pollution, the overall situation is improving. Onondaga Lake, once declared the most polluted lake in North America, has been designated an inactive hazardous waste site under the "Superfund" program. Discharges from the Onondaga County sewage treatment plant have been improved by infrastructure upgrades through the 1996 Clean Water/Clean Air Bond Act. Industrial waste discharges from Allied Chemical and its successor corporations have ceased. A proposed cleanup plan for the lake has been released by DEC.

Decline of the insecticide DDT and its metabolites in Canandaigua Lake were sufficient to lift fish consumption advisories, though polychlorinated biphenyl (PCB) contamination remains a problem. Many of the Finger Lakes and Oneida Lake have or are in the process of creating watershed management plans to reduce point and nonpoint discharges to the lakes. However, in the case of Oneida Lake, phosphorus levels have been substantially reduced, and further reductions could adversely affect the productive warm water fishery. Tissue concentrations of persistent toxics in Lake Ontario fauna have been declining, except for mercury, which remains high.

The spread of zebra mussels throughout the Great Lakes and connected waters has been ongoing since zebra mussels were first reported from the area in the late 1980s. Quagga mussels, round goby and other aquatic invaders are literally poised at the threshold of the inland waterways of this basin. The discovery of a single Chinese mitten crab in the St. Lawrence River estuary (downstream from New York) highlights the potential for new introductions through international shipping traffic, live food imports, and recreational boating.

Dramatic changes in the Lake Ontario fish community have been underway for several decades and several species are extirpated or extinct. The predator fish community has been supplemented with major programs stocking salmonids, but these species have also been affected by changes in water quality and forage species, which are related in part to effects of zebra mussels in the lake ecosystem and phosphorus reductions in the lake, which have resulted in lower productivity and a return to oligotrophic status.

This basin is not the most diverse in the state relative to SGCN, but it forms an important landscape link with the Northeast Lake Ontario Basin and Southwest

Lake Ontario Basin. Of SGCN found in the Southeast Lake Ontario Basin, 35% are in decline and 45% are of unknown status (Table 3). These do not include 49 SGCN thought to be extirpated from this basin (Table 4).

The human population in the basin has declined steadily over the past 10 years according to the U.S. Census Bureau. The population of the City of Syracuse alone declined just over 10% between 1990 and 2000. This trend is expected to continue into the next decade. Unfortunately, the decline in population has not slowed the rate of habitat loss due to human development. A publication by the Brookings Institution (Pendall, 2003) found that over 100,000 acres became urbanized in Central New York between 1982 and 1997, even though there was a loss of 6,500 residents in the same time period.

Threats

Habitat Loss and Degradation

Habitat loss due to development was the most commonly listed threat to SGCN in the Southeast Lake Ontario Basin. This is not surprising since nearly half the land in the basin has been altered by human activity (Table 1). This threat is more prevalent in urban and expanding suburban areas of the basin, like the Syracuse Metro area, eastern Rochester and its suburbs, the city of Rome, Ithaca, and others. This threat was the most frequently listed for both terrestrial and aquatic species. This threat includes hardening of the landscape with buildings and roads, but can also include activities like land clearing and wetland draining for agriculture and mining. While wetland drainage for agriculture is not presently occurring to a large extent in the basin, the effects of past drainage (on large and small scales) are still an issue. Pasture and hay lands provide a surrogate for natural grasslands in the Lake Plains, and when managed with the needs of wildlife in mind, these agricultural uses may be very beneficial to grassland wildlife. However, when agricultural management activities like mowing of hayfields occurs at the wrong time of year, grassland nesting species may be disturbed or killed. Management of remaining natural areas and appropriate altered landscapes is essential to stabilize declining populations of SGCN in the basin.

Fragmentation of remaining habitat is also a significant threat to terrestrial species. The overall human population of the Southeast Lake Ontario Basin has not increased significantly in the last 50 years and projections to 2021 show that this trend will remain unchanged (Demographia, 2005). At first glance this would appear to indicate no increase in development threats in this basin. However, the humans in the watershed are, in fact, developing more and more of the landscape, creating a "sprawl" effect unrelated to population growth. According to the Brookings Institution's Center on Urban and Metropolitan Policy (Pendall, 2003), overall human population increased slightly in the Rochester and Finger Lakes region between 1982 and 1997 by 56,570. In the same period, 50,000 acres of land became urbanized and population density dropped by 14% to 4.2 persons per acre. The result is increased fragmentation of habitats by residential and commercial developments, roads and other infrastructure and a decrease in the size of contiguous habitat blocks and interior habitats. The development of roads and utility rights-of-way can directly affect the number of species that can utilize certain habitat types. Hardening of the landscape is also resulting in increased runoff and nonpoint source pollution into lakes and rivers in the basin. Better land use planning and management of population growth can help reduce this effect.

In addition to direct loss of habitats by conversion to other land uses or fragmentation, natural ecological succession is a constant force contributing to loss of grasslands, shrublands and early successional forest. Where grasslands remain, intensive agricultural practices (e.g., early or frequent mowing of hayfields) have a major effect on use of those habitats by SGCN. On the other hand, a reduction in forest management activities has resulted in less habitat for early successional wildlife species. Sustainable forestry programs, including some

even-aged management (i.e., clear cuts in appropriate locations), would benefit many SGCN in this basin.

Energy developments of various kinds pose a significant threat to many aquatic and migratory fish and wildlife species in this basin. The past damming of rivers and streams for hydropower has had a lasting effect on aquatic habitats throughout the basin. Large power plants that use Lake Ontario for cooling water withdraw and discharge large volumes of warmer water that can affect aquatic species and associated water birds. The potential for wind energy development near Lake Ontario or elsewhere poses an unknown future risk to migratory birds and bats in this region. Recent developments in use of biofuels for energy could stimulate major changes in agriculture in this basin, with potential effects on many terrestrial wildlife species.

Water level fluctuations and management directly affect the suitability of wetlands as habitat for many fish and wildlife species. For example, management of Lake Ontario water regimes (to regulate flows for navigation in the St. Lawrence Seaway) have diminished habitat quality for marsh-nesting birds, warm water fish and other species, whereas intensive wetland management at Montezuma has created outstanding habitat to meet the seasonal needs of a diversity of nesting and migratory bird species.

Human disturbance can also be a form of habitat degradation, depending on the nature of the activity, the time of year, and sensitivity of species. Heavy recreational use of the Lake Ontario beaches probably precludes re-colonization by piping plovers, and water craft use of certain wetlands may cause black terns to abandon critical nesting areas.

Contaminants and Degradation of Water Quality

Southeast Lake Ontario Basin is a study in contrasts. Some of the cleanest and most unfragmented habitats in the state are found in the Tug Hill region of the basin, and less than 100 miles away is one of the most polluted areas in the state, Onondaga Lake. There is toxic contamination in other lakes in the basin including Lake Ontario, Cayuga Lake, and Seneca Lake. Chloride contamination from road salts is a concern in some of the smaller lakes. The nature of the contamination depends on the land uses surrounding the lakes and the discharges to the lakes and their tributaries. Several of the lakes and many tributary streams receive discharge from sewage treatment plants in the basin. Those discharges contain nutrients, heavy metals, and endocrine disrupting compounds. Low dissolved oxygen levels are a continuing problem for aquatic species in Onondaga Lake and Seneca River, due in part to phosphorus loading from the county sewage treatment plant. Although reduced nutrient loading is generally desirable, there are exceptions. For example, phosphorus levels in Oneida Lake have already been reduced to a level (20 ppb) where further reductions are not recommended by the Oneida Lake Watershed Management Plan.

Some persistent toxins are identified in the Lake Ontario Management Plan as impairments to reproduction and survival of several SGCN. For example, PCBs, dioxin, and DDT compounds can negatively affect reproduction and survival of bald eagles and other fish-eating birds. Mercury is also found in sport fish tissues in Lake Ontario at levels high enough to cause concern for those and other species in the basin. Levels of all of these persistent toxins in the fish communities of Lake

Ontario have been dropping since the 1970s, except for mercury. Fish tissue testing for mercury has revealed no statistically significant trend. According to the Lake Ontario Management plan there is no indication that current PCB, dioxin and DDT levels in the open water of the lake are degrading fish populations, but the toxins are still causing negative effects on piscivorus wildlife.

Pesticide use on agricultural lands is of concern to herpetofauna, insects, mussels and freshwater crustacea. Agricultural pesticides are generally non-specific in their action, meaning that they can kill off benign and beneficial invertebrate species as well as the target pests. Agriculture in New York depends on healthy populations of pollinating insects to produce fruit and vegetables. Amphibians are particularly susceptible to pesticides and other toxins. The emergence of West Nile Virus in the past few years and the persistence of Eastern Equine Encephalitis in central New York have led to widespread pesticide use in the control of mosquitoes in many wetland areas including Cicero Swamp. The use of these insecticides can be toxic to amphibians and deplete their natural food sources as a secondary effect. Use of lampricides in tributary streams can affect resident amphibians, such as mudpuppies, if protocols to minimize non-target mortality are not followed.

Acid deposition is another form of contamination affecting SGCN in this basin. Although generally thought of as an Adirondack problem, Tug Hill receives very high amounts of nitrogen as a result of the heavy lake effect snowfalls that carry emissions from Midwestern states and provinces. This deposition can affect the basic soil and water characteristics, and plant communities upon which fish and wildlife depend.

Exotic, Invasive and Overabundant Species

There are several invasive plants and animals of concern in this basin, both aquatic and terrestrial. For example, sea lampreys are an invasive species that historically contributed to the collapse of a number of native fish stocks, including lake trout and lake whitefish. Many of the aquatic invasive species have been introduced into Lake Ontario by ballast water from international shipping. Zebra and quagga mussels are native to the Baltic Sea and have severely compromised native mussel species in many of the lakes and streams of the basin. Round gobies are a known vector for type E botulism that infects and kills common loons and lake sturgeon along the shore of Lake Ontario. The canal system that connects the Finger Lakes, Great Lakes and the Mohawk sub-watershed enhances the spread of aquatic invasive species. Zebra mussels have invaded most of the larger lakes in the basin. Invasive aquatic animal species, including fish species, can be introduced via inadvertent stocking and disposal of live bait by anglers. Mute swan is a non-native species that has recently colonized several locations around Lake Ontario, including Irondequoit Bay. Mute swans can affect aquatic plant communities and may displace native fish and wildlife species, including several SGCN.

Some native species can become problematic to SGCN, too. Double-crested cormorants on Lake Ontario and Oneida Lake have rebounded after near extinction due to DDT contamination in the mid-20th century. Large numbers of cormorants on these lakes can have significant effects on other colonial bird species (including SGCN) and game fish populations in the basin. Ongoing management of cormorants on Oneida Lake and eastern Lake Ontario has helped

to mitigate these effects. Beaver are common throughout the Southeast Lake Ontario basin, and have created or enhanced habitat for many wetland wildlife species. However, the impoundment of small streams could adversely affect aquatic SGCN in some drainages.

Aquatic plant invaders have serious consequences for SGCN, too. Purple loosestrife and common reed have become established throughout the basin, altering wetland habitats and affecting wetland dependent species. Dense stands of common reed at Oneida and Onondaga Lake have diminished what was once prime waterfowl habitat. Biological control of purple loosestrife (using leaf-eating beetles) in this and other basins has shown promise for reducing the spread and effects of this invasive plant species in the Lake Plains region. Eurasian water milfoil is a submerged aquatic plant that forms dense beds in nutrient enriched waters. The invasion by milfoil is associated with the decline of pugnose shiner in Wisconsin and recommended as an avenue of investigation for New York populations (Carlson, 2004). In many bodies of water across the state, water chestnut grows thick enough to block light and reduce the levels of dissolved oxygen in the water column.

Terrestrial invasive plants in the basin alter vegetational composition of common habitats and reduce food sources for SGCN. Species of particular concern in this basin include Japanese knotweed, garlic mustard, glossy buckthorn, and black swallowwort. Seeds of these plants can be transported via wind, vehicles, shoes, outdoor clothing, and pets.

Priority Issues in the Basin

Priority issues have been discussed above.

Vision, Goals and Objectives for the Basin

Vision

The Southeast Lake Ontario Basin will be part of a landscape where a balance exists between economic growth needs of the region and effective wildlife management on public and private lands. Land management will be conducted with the best available information to ensure the long-term conservation (or restoration) of SGCN and other wildlife in the basin.

Public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on SGCN within the basin in a format that can easily be shared among natural resource managers and disseminated to the public to raise awareness of the issues facing species of concern and their habitats.

The result of these efforts will be healthier and secure animal populations, habitats, and communities. Loss of SGCN to extirpation will be slowed or halted. Species that currently are common will remain common and populations of threatened/endangered/special concern species will improve to the point where they can eventually be de-listed.

Goals and Objectives

- Establish a conservation framework within the SELO Basin through which public and private stakeholders (including local government, Native Americans, and private landowners) interested in wildlife conservation can work cooperatively towards the management, enhancement, and protection of biodiversity in the Basin.

- Ensure that no at-risk (threatened/endangered) species becomes extirpated from the Basin, and seek opportunities to restore extirpated species where feasible.

- Manage animals, habitats, and land use practices to produce long-term benefits for species of conservation concern.

- Maintain knowledge of species and their habitats in sufficient detail to recognize long-term population shifts.

- Fill “data gaps” for those species where population status, distribution, and habitat needs are unknown.

- Identify, manage, protect, maintain, and restore habitat/natural communities over as broad a spatial scale as possible. Work to keep large forest, wetland, and grassland complexes unfragmented, and to restore fragmented habitats where feasible to increase patch size and connectivity.

- Work with land managers to incorporate wildlife-based objectives into traditional land management activities such as forestry and agriculture that still allow these activities to be economically sustainable.

- Strengthen existing relationships between water quality and wildlife management planning programs in the basin and create new ones.

- Develop a "stepped down", more targeted plan for the Basin that expands upon the recommendations made here. This plan may focus on specific species and habitats, where and when management actions will occur, who will execute those actions, and how they will be implemented "on the ground".

Priority Strategies/Actions for Basin-wide Implementation

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

Data Collection Recommendations

GENERAL

- Current information on distribution, abundance, life history, minimum viable population size, and habitat requirements is needed to implement effective management actions for many SGCN in this basin. Even in areas under protective public ownership, such as state parks and DEC lands, knowledge of the array of species and resources in the land unit is incomplete. In many cases, parks are bought for non-natural resource needs, but become default reservoirs for natural resources. By filling information gaps for SGCN, land managers can make informed decisions on how best to balance recreation and natural resource needs on public lands.

- Continue and expand collection of information on the concentration of persistent toxic substances in SGCN and their habitats in the basin, especially for wetland and aquatic species, such as piscivorous birds. Sampling of indicator species, such as snapping turtles (or their eggs), may be most cost-effective for monitoring trends in contaminant levels. Any new or expanded contaminant monitoring should be coordinated with ongoing sampling by DEC, DOH and others, e.g., resident species of Onondaga Lake are already sampled as part of the hazardous waste remediation program there.

- Continue monitoring for Type E Botulism in birds and fish found along the entire Lake Ontario shoreline. While direct management of the disease is not currently possible, effects of the disease on these populations of fish and wildlife have implications for other management decisions related to harvest limitations, habitat protection and restoration, etc.

- Due to the extensive wetland acreage, this basin should be a high priority region for establishing long-term monitoring programs for marsh-nesting birds, aquatic herps and wetland-associated invertebrates.

- Monitor effects of water level controls on wetland and aquatic species habitats adjoining Lake Ontario, Oneida Lake and the Finger Lakes. Particular issues to monitor include :
  - The effects of human-influenced water level controls on freshwater marsh nesting birds, especially black tern, least bittern, and pied-billed grebe;
  - Relationship of water level controls to distribution of invasive species, including purple loosestrife; and

- The effects of water level controls on habitat suitability for various turtles (especially Blanding's turtle, Bog turtle, spiny softshell and spotted turtle) and salamanders (especially blue-spotted and Jefferson).

❖ Sentinel monitoring of aquatic invasive species such as zebra mussels, round goby, Eurasian water milfoil, and others should be undertaken among the interconnected waters of the Finger Lakes and Erie Canal system. Early detection may allow managers to reduce the effects of aquatic invaders or treat early invasions. Priority should be placed on waters that are currently supporting SGCN like lake sturgeon, pugnose shiner, and Elktoe mussels that are known to be acutely affected by these invasive species.

❖ Comprehensive water quality monitoring in lakes and streams should be implemented in priority water bodies that have potential habitat for aquatic SGCN. An excellent example is Onondaga County's Ambient Monitoring Plan, which includes nutrients, dissolved oxygen, bacteria counts, as well as plankton, macroinvertebrates, macrophytes and extensive fish studies at all life stages.

❖ Monitor data collected from ongoing fish population and harvest surveys to detect changes in species composition or other environmental conditions in the basin.

❖ Conduct research to assess the effects of wheeled off-road vehicle use on wildlife SGCN in the Tug Hill region.

DATA COLLECTION RECOMMENDATIONS FOR SGCN

❖ Document and monitor massasauga and timber rattlesnake populations at known or historic locations in the Southeast Lake Ontario Basin, and identify specific threats to existing populations. For massasauga, determine upland/wetland habitat requirements ratio, population size and trends, predator-prey relationships, and reproductive success.

❖ Support research and management activities within the basin as outlined in established recovery or management plans for common tern and piping plover.

❖ Continue to monitor the population of Chittenango ovate amber snail and the introduced competitor, *Succinea sp. B*, in Chittenango Falls State Park. Determine microhabitat preferences of the two species as recommended by the federal recovery plan.

❖ Create an inventory of freshwater marsh bird nesting and migratory stopover areas in the basin as part of a statewide survey effort. Document important habitat characteristics to guide restoration efforts at historic sites no longer used.

❖ Survey Jamesville Quarry in Onondaga County for Indiana bats on an annual basis during fall swarm, fall entry, and spring emergence to monitor population status. Conduct marking studies of Indiana bats using the quarry

as hibernacula to identify habitats used during summer maternity period and migration.

- Sample portions of Lake Ontario in the basin for ninespine stickleback and blackchin shiner and develop preferred habitat profiles for each to support restoration planning. Sample inlets to Cayuga and Seneca Lakes that have harbored fish SGCN, such as pugnose shiner, and assess unique habitat features needing protection.

- Continue to evaluate success rate of hatchery stocking programs of lake sturgeon in Oneida and Cayuga lakes. Include genetic components in the evaluation as recommended by Pyatskowski in 1998.

- Survey known sites from the NYS Herpetile Atlas for reptile and amphibian SGCN, especially bog turtle (a federally-listed species), as well as Western chorus frog, blue spotted and Jefferson's salamanders, Blanding's turtle, wood turtle, spotted turtle, spiny softshell and eastern ribbon snake. Determine basic ecological parameters, including population size and reproductive status, preferred food items, preferred habitat parameters, etc to assess viability of local populations.

- Survey potential habitats in the basin for bog buckmoth. Determine preferred pupation habitat and rates of loss to development, food sources, and population dynamics.

- Monitor grassland bird populations and habitat use in designated focus areas for conservation of these species.

- Maintain current information on distribution and abundance of cerulean warblers in the basin, especially in the Finger Lakes region.

- Document migration corridors, stopovers and concentration areas for migratory birds (including any SGCN) and bats in the SELO basin to help assess potential effects of future wind energy development.

Planning Recommendations

- Develop a comprehensive plan for management of public lands (State Forest lands, WMAs, State Parks, etc.) in the basin to best conserve viable populations of SGCN in the SELO basin.

- Identify specific and appropriate focus areas for grassland bird conservation in the basin, where it would not conflict with efforts to protect large forest blocks. The entire lake plain area, including Southeast Lake Ontario supports grassland breeding birds in large, but shrinking numbers. The decline of farming in the region and concomitant reforestation, as well as changes to more intensive agriculture in areas that remain farmed, have lead to significant declines and has serious implications for maintaining viable populations of grassland birds. Grassland management plans need to be created collaboratively with all agencies with responsibility over grassland species and habitat. For example, NRCS, DEC, OPRHP, USFWS, Farm Bureaus and other interested non-governmental organizations should be consulted during the creation of these plans.

- The decline of terrestrial open uplands is intertwined with the fate of not only grassland breeding birds, but also early successional forest breeding birds, forest breeding birds, and deciduous/mixed forest breeding birds. The effective management of all these species in the basin requires careful planning for the best mix of grassland, forest, and transitional habitats to set and meet realistic goals for as many species as possible. There are many SGCN other than birds that depend on these habitats, and their habitat needs must be included in these planning efforts.

- Planning in conjunction with data collection is needed to identify the best candidate sites for restoration of lake sturgeon to suitable habitat in the basin and in Lake Ontario. Feasibility of restoring various forage fish species should be assessed also.

- Water level management in lakes, the canal system and at numerous dams in the basin require careful planning to maintain appropriate flow volume and temperature for a variety of SGCN. Water levels and volume affect floodplain wetlands, emergent wetland structure and extent, and thermal stresses for cold water fishes. Opportunities to enhance habitat for SGCN need to be incorporated into international plans for future management of water levels in the Great Lakes and St. Lawrence River.

- Examine dams appropriate for removal or bypass to support spawning runs of Atlantic salmon, lake sturgeon, and other migratory fish in this basin.

- Update the federal recovery plan to guide establishment of additional populations of Chittenango ovate amber snail.

- Develop a management plan, including population goals, for common tern in the basin.

- Assess feasibility of restoring nesting piping plovers to the eastern Lake Ontario shoreline, and develop an action plan for implementation, as appropriate.

- Assess feasibility of restoring Karner blue butterfly to the Rome Sand Plains, in accordance with the federal recovery plan for this species. Develop an action plan for implementation, as appropriate.

- Develop a conservation plan to increase cerulean warbler populations in the Finger Lakes and Lake Plains portions of this basin.

- Develop a plan to maintain or expand habitat for American woodcock and other bird SGCN associated with early successional forests and shrublands.

Land Protection Recommendations

- Easement acquisitions by DEC or other land conservation organizations (e.g., local land trusts) are recommended for conservation of private agricultural lands that are suitable for management of grassland dependent SGCN in designated focus areas. Fee acquisition (from willing sellers only), may be more appropriate for parcels adjacent to existing public lands.

- Conservation easements or other management incentives are recommended for private working forest lands (of various ages and composition) that support SGCN in the basin, especially in the Tug Hill and Finger Lakes highlands. Easements should include not only timber harvest areas, but woodland vernal pools as well. Easements or acquisition to reduce habitat fragmentation are encouraged.

- Easement acquisitions are recommended for riparian habitat to buffer stream and lake habitats that are home to elktoe mussels and other aquatic SGCN from nutrients and sediment loading. Priority should be given to buffer zones along tributaries with the greatest potential to support natural fish reproduction.

- Acquire core habitats for cerulean warblers in the basin, and secure conservation of adjacent lands that can be managed to provide additional habitat for this species.

- Acquire known critical habitats for bog turtles in the basin, in accordance with the federal recovery plan for this species.

- There are several acquisition parcels in the 2002 Open Space Plan recommendations for DEC Regions 6, 7, and 8 that support the needs of SGCN in this basin:
  - Northern Montezuma Wetlands marsh property additions
  - Irondequoit Bay woods, wetlands and bluffs
  - Catharine Valley Complex: Horseheads Marsh parcels, Rock Cabin Road cliff parcels, and Queen Catharine wetland parcels
  - Junius Ponds complex
  - Dresden Flats portion of the Keuka Lake floodplain
  - Tug Hill core forests & headwater streams
  - Rome Sand Plains expansion
  - North shore of Oneida Lake wetland parcels in Toad Harbor and Big Bay swamps
  - Salmon River corridor parcels that protect water quality for SGCN

- Identify additional acquisition targets for SGCN and incorporate those in periodic updates (e.g., 2005, 2008) of the Open Space Plan. Low land prices and a declining human population in this basin may create favorable economic opportunities for acquiring conservation lands.

- A proposed new 3 million acre Forest Legacy Area in the Finger Lakes/Northern Plateau region of central and western New York would protect the forest resources and water quality of the Finger Lakes and upper Susquehanna River watersheds through property easements and acquisition.

Management and Restoration Recommendations

- Restrict and manage human access to Jamesville Quarry (by gating) to prevent damage or disturbance of Indiana bat hibernacula.

- Restrict and manage human access (at appropriate times of the year) to minimize disturbance and taking of massasauga rattlesnakes in critical habitat areas at Cicero Swamp. Compatible public uses of the area should continue.

- Implement applicable management recommendations in the federal recovery plan for the Prairie Peninsula/Lake Plain population of bog turtle.

- Promote proper and reduced use of toxic pesticides and fertilizers in and adjacent to known critical habitats for freshwater wetland amphibians and lake/river reptiles.

- Restore degraded emergent marshes that could provide habitat for SGCN in the basin, including control of invasive plants and water level management. This will benefit freshwater wetland amphibians, uncommon turtles of wetlands, and freshwater marsh nesting birds.

- Manage invasive plant species to enhance habitats for SGCN, including massasauga, Blanding's turtle, bog turtle, spotted turtle, and marsh-nesting birds. Eliminate mute swan populations in the SELO basin.

- Manage uplands adjacent to aquatic habitats used by lake and river reptiles to maintain necessary linkages between the two for nesting and dispersal habitat. Further enhance and protect riparian habitat, especially through agricultural properties, to protect freshwater bivalves.

- Continue hatchery rearing of lake sturgeon and Atlantic salmon and expand restorations to rebuild the Lake Ontario populations. Restore stream habitats for fish spawning, by dam removal or other fish passage accommodations, where it will not affect sea lamprey control (by allowing range expansion).

- Continue exploring the feasibility of restoring deepwater fish species such as bloater, kiyi, and shortnose cisco to Lake Ontario.

- Explore captive breeding to expand populations of freshwater mussels, especially elktoe.

- Where possible, mitigate fragmentation of habitat for herpetofauna in the basin by creating below grade road passages, or relocation of obsolete roadways. Species to benefit from this action include Blanding's turtle, bog turtle, and spotted turtle.

- Manage and expand nesting sites for common tern on Oneida Lake and Lake Ontario through vegetation or substrate management, control of competing species, and limiting human disturbance during critical nesting periods.

- Maintain or increase the amount of early successional forest and shrublands in the basin through timber harvest and maintain habitat suitability of

grasslands through properly-timed mowing. Also, assess the feasibility of using prescribed fire and managed grazing by domestic livestock (e.g., goats, cattle) to manage grasslands and other early successional plant communities.

- Increase capabilities for water level management, especially for wetlands along Lake Ontario, and use other wetland management techniques in the basin to simultaneously benefit the most critical species of freshwater marsh nesting birds and herpetofauna. Where possible, weirs or other structures should be considered to mimic natural water levels to benefit SGCN.

- Employ captive breeding, head-starting, nest protection, and repatriation techniques to enhance populations of massasauga, Blanding's turtle, spiny softshell, bog turtle, wood turtle, piping plover, and karner blue butterfly, consistent with species recovery plans where applicable.

- Maintain or enhance habitats for SGCN that occur on existing public lands (State Forest lands, WMAs, State Parks, etc.). Limit seasonal use of wheeled off-road vehicles in specific areas where SGCN may be adversely affected.

Information Dissemination Recommendations

- Continue and enhance educational programs to private landowners, local governments and others regarding BMPs for all SGCN. These include existing USDA and Cooperative Extension programs for wetland and grassland species, and sustainable forestry and forest stewardship programs for early successional and mature forest species.

- Educate the public to dispel myths and fear of massasauga (and other snakes) and convey their ecological role and value.

- Develop educational materials to foster public support or acceptance of dam removal, invasive species management, and access restrictions to protect SGCN at critical times of the year.

- Update educational signs at Chittenango Falls State Park regarding Chittenango ovate amber snails. Create signage for zoos that participate in the captive breeding program.

- Develop and disseminate BMPs for mosquito control to protect SGCN at Cicero Swamp and other wetland ecosystems.

Regulatory and Legislative Recommendations

- Encourage the protection of marsh-nesting birds and aquatic herpetofauna by local governments through use of personal watercraft regulations.

- Pursue protection of wetlands not currently covered by Article 24 regulations through map amendments or by working with local government to adopt local ordinance where such wetlands provide critical habitat for the most critical species of freshwater marsh nesting birds, freshwater wetland amphibians, vernal pool salamanders, and uncommon turtles of wetlands. In the case of freshwater wetland amphibians and vernal pool salamanders, expand the 100 foot upland buffer around wetlands to reflect a more accurate upland forage range for these species.

- Strengthen legal protection for reptiles and amphibians in New York, and support law enforcement efforts to prevent illegal taking of massasauga and other herp SGCN.

- Protect critical stream segments that provide habitat (including water quality) for SGCN through Article 15 or other regulations to limit non-point source pollutants, erosion, sedimentation and hydrologic alterations.

- Make necessary law changes to ensure that revenue generated from use of State lands goes into a dedicated account for stewardship purposes including habitat conservation.

Incentives

- Provide LIP payments to private landowners for conservation of habitats for grassland species and bog turtles in the SELO basin. Expand the LIP in future years to meet the needs of many other SGCN.

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Tables and Figures

Tables

Figures