Description of the basin

The Southwest Lake Ontario Basin covers an area of 2.2 million acres in western and central New York. The basin stretches across the state from north to south and includes three major subwatersheds, the West Lake Ontario, Lower Genesee, and Upper Genesee. There are 13 major municipalities within the basin, including the western part of the city of Rochester, and all or part of 10 counties. The basin-wide human population estimate in 2000 was 1.2 million people, with population density varying from relatively low density in the southern portion of the basin, to moderate density in the north, to high density in the Rochester metro area. The basin is a highly diverse landscape ecologically and topographically covering several ecological zones and a wide variety of vegetative cover, wildlife habitat, and land use.

The southern half of the basin is within the High Appalachian Plateau ecozone, including portions of the Central Appalachians, Cattaraugus Highlands, and a small section of the Allegheny Hills subzones. This large area is predominantly deciduous forest cover on rolling to moderately steep topography with occasional coniferous plantations. The northern part of the basin, which lies within the Erie Ontario Plain subzone of the Great Lakes ecozone, is by contrast primarily an agricultural region with scattered and fragmented forest stands and is generally flat. A significant land form in this portion of the basin is the Niagara Escarpment which runs through southern and central Ontario, Canada and western New York. The escarpment is especially prominent in the Niagara County area of New York.

Wetland habitats in the basin include wooded swamps, emergent marshes, wet meadows, riparian and linear wetlands, shrub swamps, and open water habitats, with the majority of these wetlands being located in the central and northern portions of the basin. There are 7466.6 miles of mapped streams in the basin, which include a diversity of cold water trout streams and slow-moving rivers. The major river in the basin is the Genesee River, which originates in Pennsylvania and drains into Lake Ontario near Rochester. The Mt. Morris Dam, built by the U.S. Army Corps of Engineers in 1952 to provide flood control, splits the Genesee into two major subwatersheds (upper and lower). The Erie Canal passes through the northern part of the basin and provides water to many basin tributaries, thereby affecting water quantity and quality. Many ponds and small lakes encompassing thousands of acres of open water, and the basin contains several of the smaller, western glacial Finger Lakes (Silver, Honeoye, Canadice, Hemlock, and Conesus), which in themselves offer varied habitats. The portion of Lake Ontario in the basin includes 90 miles of shoreline and extends north into the lake to the international border with Canada.

According to the U.S. Environmental Protection Agency's Multi-Resolution Land Classification (MRLC) map information, the predominant land cover classifications are agricultural lands (row crops - 39% and pasture/hay - 16%), deciduous forest (26%) and mixed forest (12%) (Southwest Lake Ontario Table 1, Southwest Lake Ontario Figure 1). Just over 4% of the basin is classified as developed land. The MLRC national data distinguishes between natural grassland and old fields, hay, pasture, and row crops, but although there is evidence that grasslands were historically found in the basin, there are no lands in the basin currently classified by the MLRC as natural grasslands. In New York, however,

our pasture/hay and row crops are sometimes referred to as grasslands by many management agencies, including the Department of Environmental Conservation (DEC).

A wide variety of different types of government-owned lands in the basin provides a diversity of habitat types. Iroquois National Wildlife Refuge, the only national wildlife refuge in the basin, straddles the municipal boundaries of Shelby in Orleans County and Alabama in Genesee County and is abutted by DEC - managed Oak Orchard Wildlife Management Area (WMA) to the east and Tonawanda WMA (partially in the basin) to the west. Lands managed by DEC in the basin include wildlife management areas (Southwest Lake Ontario Table 2) and state forest lands (Southwest Lake Ontario Table 3). The state forest lands include one unique area and many state forests for a total of more than 80,000 acres. Of the many state parks in the basin (Southwest Lake Ontario Table 4), the largest is Letchworth State Park at more than 14,000 acres. The park encompasses the Genesee River from near Mount Morris Dam to Portageville to the south. Several of the other state parks in the basin are located along the Lake Ontario shoreline. Some county, city and town properties in the basin provide significant habitat for Species of Greatest Conservation Need (SGCN). For example, the City of Rochester owns 7,100 acres of land around Hemlock and Canadice lakes which were acquired to help secure their water supply. The Tonawanda Indian Reservation, governed by the Tonawanda Band of the Seneca Nation of Indians, is largely in the basin just south of the Tonawanda WMA and also provides habitat for SGCN. Other protected areas in the basin include lands owned by non-governmental organizations (NGO). For example the Nature Conservancy owns lands in the western Finger Lakes region, and the Bergen Swamp Preservation Society owns lands in and around Bergen Swamp in Genesee County. Other areas of land in the basin are protected by means other than ownership by a government agency or NGO. For example, some privately owned lands are protected by a conservation easement or are under a formal cooperative agreement through programs offered by organizations like the U.S. Department of Agriculture, Natural Resources Conservation Service and United States Fish and Wildlife Service.

In addition, several types of specially designated areas in the basin provide important wildlife habitat and may offer some degree of protection. Bird conservation areas (BCA) (Southwest Lake Ontario Table 5) are designated by New York State at the Braddock Bay and Oak Orchard wildlife management areas. These BCAs are modeled after the National Audubon Society's Important Bird Areas Program (IBA). The basin contains 8 state-designated Critical Environmental Areas (CEA) (Southwest Lake Ontario Table 6), which are traditionally designated by DEC to protect drinking water supplies but may also be designated for a variety of other reasons and by other government agencies. Some may provide habitat for SGCN. For example, the City of Rochester designated broad categories of CEAs to protect wetlands, wooded properties in the city, steeply sloped areas, designated open space, and lands within 100 feet of major waterways. Ten areas are designated as Significant Coastal Fish and Wildlife Habitat (Southwest Lake Ontario Table 7) by the Department of State, many of which have confirmed or suspected populations of SGCN.

There are 68 state-classified inactive hazardous waste sites in the basin, 25 of which are in the City of Rochester. All the sites range in classification from Class 2

to Class 4, with the majority of them being Class 2 sites that pose a significant threat to public health or the environment and require action. Class 3 sites do not present a significant threat to the public health or the environment, and Class 4 sites are those that are properly closed but require continued management.

Critical habitats of the basin and the species that use them

There are 130 SGCN species that currently occur in the basin and 27 species that historically occurred in the basin but are now believed to be extirpated (Southwest Lake Ontario Tables 8-10). Of those 130 SGCN currently occurring in the basin, it is believed that the populations of 39 species are decreasing, 8 are increasing, 7 are stable, and 76 are of unknown status.

The Natural Heritage Program's Element Occurrence Database indicates that the Southwest Lake Ontario Basin contains important habitats for many rare mollusk, insect, bird, and herpetofauna species. For example, the Southwest Lake Ontario basin sustains important populations of grassland-breeding birds, including areas designated by the New York Natural Heritage Program as critical for preservation of grassland species biodiversity and significant ecological communities. All 11 grassland-breeding bird species that are listed as SGCN in New York appear to be experiencing declines, although some are too rare to determine a precise trend. In response to these declines, Audubon New York has gathered a consortium of the agencies and organizations active in grassland conservation in New York. This group is working to coordinate projects and identify target areas for future conservation projects. Portions of the basin have been designated by this group as priority "grassland wildlife zones" to focus conservation efforts and spending on these vital grassland bird populations and habitat. The basin also has statewide significance for a variety of other SGCN, including marshbirds, riparian tiger beetles (one of only two known cobblestone tiger beetle populations in New York State was recently discovered on the Genesee River near Letchworth State Park), Eastern massasauga rattlesnakes (one of only two known New York populations occurs in the basin), and western chorus frog (may be one of the most robust populations in the state).

Because fish are generally harder to collect and identify than many other wildlife species, there is, a tendency to give them less attention simply because we know less about them. Aquatic organisms are generally more difficult to observe, and it is more difficult to identify their habitat requirements. Further complicating this is that aquatic habitats may actually be more easily disturbed. According to the Comprehensive Wildlife Conservation Strategy species accounts, nearly 50% of the fish species of greatest conservation need that historically occurred in the Southwestern Lake Ontario Basin are no longer found there. Some fish species, such as black redhorse, are found in very limited distribution statewide, and the Southwest Lake Ontario basin is one of only two basins statewide where this species is found. In addition, a stable, remnant population of western pirate perch has been documented in Buttonwood Creek, and efforts to restore lake sturgeon to the Genesee River have begun.

The species of greatest conservation need in the basin are dependent on a wide variety of habitat types, and many of these species require multiple habitats throughout their life cycles. DEC staff members who compiled the SGCN information in the CWCS planning database were asked to indicate habitats associated with critical life stages and activities for those species. During the analysis for each basin, a listing of species occurring in the basin and the critical habitats associated with their life cycles at the system and subsystem levels were

extracted from the database. The resulting aquatic and terrestrial habitats are summarized in the tables below. The last column of the table indicates the number of species that indicated the system-subsystem as critical habitat. The habitat classifications in the database were adapted from the New York Natural Heritage Program's *Ecological Communities of New York State, Second Edition* (Edinger at al., 2002). In most cases the habitats were simplified from the many vegetation associations listed in the community classifications. In the case of lacustrine and riverine systems, the subsystems were modified to reflect the classifications most often used by fisheries managers in DEC, e.g., "cold water-shallow".

Each of these systems and subsystems is further refined into a habitat category in the CWCS planning database and can be viewed in the Taxa Reports appended to this strategy. The habitat categories are excluded here for the sake of simplicity but were considered during the basin analysis. A complete listing of habitat types used in the preparation of the CWCS can be found in Appendix B. These critical habitats are not a comprehensive listing of all the habitat associations found in the basin; rather they are a subset of the habitats deemed critical to SGCN that occur in the basin (Southwest Lake Ontario Tables 11 and 12). In addition, a single species may require multiple habitats throughout its life cycle, so the total of the final columns may exceed the 157 SGCN that presently occur or historically occurred in the basin.

Certain locations in the Southwestern Lake Ontario Basin provide especially important habitat for SGCN because of one or more of the following characteristics:

- rarity or uniqueness of the habitat type(s) present
- the presence of multiple, contiguous habitat types
- protection and/or management of wildlife, and a particularly low degree of human encroachment and development.

Examples of some of these areas are listed and described below.

Iroquois Wetland Complex

Consists of Iroquois National Wildlife Refuge (10,818 acres), Oak Orchard WMA (2,500 acres) and Tonawanda WMA (5,684 acres - a portion of which is in the basin), the Iroquois wetland complex encompasses nearly 20,000 acres of wildlife habitat in the Great Lakes plain between Buffalo and Rochester. The complex is composed primarily of wetland habitat (emergent marshes, hardwood swamps, wet meadows, and scrub/shrub), but also includes large areas of grassland and upland forest. The area, which has been identified as both an IBA and a BCA, provides important nesting habitat for a large number of bird SGCN, including freshwater marsh nesting birds (black tern, least bittern, pied billed grebe, and American bittern), grassland birds (bobolink, grasshopper sparrow, Henslow's sparrow, eastern meadowlark, northern harrier, and sedge wren), bald eagles, cerulean warblers and prothonotary warblers. In addition, the area is a significant stopover for migrating waterfowl and other species and provides habitat for several herpetofauna SGCN.

Letchworth State Park and Surrounding Area

Letchworth State park lies along the Genesee River and contains deep gorges (up to 550 feet deep), waterfalls, a 6-mile-long canyon and a variety of habitat types. The habitats include deciduous woods, shrub/scrub, riparian, coniferous and mixed woods, grasslands, and wetlands. The portion of the Genesee River that flows through the park is designated as a scenic river under the Wild, Scenic, and Recreational Rivers state legislation. This is the only river in the basin designated under the program. The Mount Morris Dam National Recreation Area is wholly contained within the park. Letchworth State Park and the surrounding area provide important habitat for many forest and grassland breeding birds of greatest conservation need and has been identified as an IBA. Of particular importance, the Letchworth area may contain the largest population of yellow-breasted chat in New York State. In addition, as mentioned above, one of just two cobblestone tiger beetle populations in the state has been located in sparsely vegetated gravel bar habitat along the Genesee River near the park.

Bergen Swamp

Located in eastern Genesee County and a remnant of glacial Lake Tonawanda, the Bergen Swamp/Black Creek area is a large wetland/riverine complex which contains a diverse assemblage of habitat types, including some very rare natural communities. The area consists of northern white cedar forest, open marl, pine-hemlock, and beech-maple deciduous forest, and contains a high diversity of flora and fauna. Bergen Swamp is designated as an IBA and provides habitat for a variety of bird SGCN (including the Canada warbler, willow flycatcher and blue-winged warbler) and herpetofauna SGCN (including Eastern massasauga, Jefferson salamander, spotted turtle, queen snake, and coal skink).

Braddock Bay Complex

Located along the shore of Lake Ontario west of the city of Rochester, the Braddock Bay Complex includes the 2,125 acre Braddock Bay WMA, 375 acres of land leased by the town of Greece, and privately owned lands (including lands owned by the Genesee Land Trust). Habitat types include lakeshore, freshwater wetlands, ponds, deciduous woods, and grasslands. These habitats are all contained within an environment with significant suburban development. Designated as both an IBA and a BCA, the area is a significant stopover site for migrating owls and songbirds and has large spring hawk flights. A number of SGCN breed in the complex, including northern harrier, sedge wren, and several freshwater marsh nesting birds such as least bittern, pied-billed grebe, American bittern, and, historically, black tern. Buttonwood Creek, immediately upstream of Braddock Bay, is an important habitat for the western pirate perch. This portion of the stream presently receives minimal protection under the ECL, where habitat disturbance is the biggest threat to this species. The Braddock Bay and Salmon Creek area is also designated as a Significant Coastal Fish and Wildlife Habitat.

Nation's Road Grasslands

This site includes exceptional, privately owned grassland and oak-savanna habitat with a diverse community of breeding and wintering birds. The 27,000 acre site lies in the Genesee River Valley among old fields, oak-scattered savanna, and riparian habitat. Some of the SGCN found at the site, and that caused the site to be designated as an IBA by Audubon New York, include grassland birds such as

northern harrier, upland sandpiper, sedge wren, vesper sparrow, grasshopper sparrow, Henslow's sparrow, and bobolink. Other SGCN that breed at the site include sharp-shinned hawk, Cooper's hawk, American woodcock, red-headed woodpecker, willow flycatcher, horned lark, wood thrush, blue-winged warbler, and yellow-breasted chat. In winter, the area supports large concentrations of northern harriers, rough-legged hawks, short-eared owls, and flocks of horned larks that can number in the hundreds.

Niagara Escarpment

The Niagara Escarpment provides unique, rocky, wooded forest habitat within the Lake Ontario plain in Niagara County. This unique habitat, with its associated vernal pools at the escarpment base, provides important habitat for a variety of flora and fauna, including SCGN herpetofauna such as hybrid blue-spotted x Jefferson salamanders.

The Western Finger Lakes: Silver, Conesus, Hemlock, Canadice, and Honeoye Lakes and the Surrounding Landscape

These lakes sit in heavily forested landscapes characterized by two lakes with undeveloped shorelines (Hemlock and Canadice), large wetland systems at the southern ends of the lakes. The silver maple/ash swamp that forms the southern shoreline of Honeoye Lake is the largest occurrence of this natural community in the state, and has the largest occurrence of Appalachian oak/hickory forest in the state. DEC, The Nature Conservancy, the Finger Lakes Land Trust, and Finger Lakes Community College have already made progress in protecting and managing important lands here, and continued focus in the western Finger Lakes is needed to realize the full conservation benefits of this public/private partnership. The unique mosaic of natural communities in this landscape shelters the timber rattlesnake and coal skink, in addition to numerous other SGCN, including interior forest nesting birds like the black-throated blue warbler. Conesus Lake Inlet harbors the blackchin shiner, a fish SGCN.

Johnson Creek near Kuckville

The redfin shiner, longear sunfish, and several species of freshwater mussel SGCN have been documented at this site in recent years. Like Buttonwood Creek, this portion of the stream presently receives minimal protection under the ECL, where habitat disturbance is the biggest threat to these species.

Genesee River below the Lower Rochester Falls

This area is included within a City of Rochester designated critical environmental area (CEA). United States Geological Survey and Fish and Wildlife Service staff have surveyed this area and have found key areas within the river suitable for lake sturgeon spawning and nursery habitat. Efforts to evaluate lake sturgeon juvenile habitat in the Genesee River via stocking hatchery-reared fish have begun.

The Niagara Bar in Western Lake Ontario

This is an area off the mouth of the Niagara River that extends out into Lake Ontario about 4 miles. The USGS has documented that naturally spawned lake trout survival is high in this area. This area should also be surveyed to determine its importance to fish SGCN. It may more properly be considered with the Niagara River in the Lake Erie portion of the CWCS document.

Overall trends in the basin

Reduction of agricultural land results in loss of grasslands used for haying and pasture. The amount of land in agriculture in this basin has been reduced from about 92% of the total land cover in 1900 to 55% in 2002.The nature of the remaining agriculture has changed as well. Cropland diversity has decreased as row crop monocultures have become the dominant agricultural land use. As smaller farms have been consolidated into larger units, monocultures have become more expansive. Consequently, adjacent edge habitats in the form of grasslands, woodlands, and strip cover (e.g., fence rows, hedgerows) have either been lost outright or dramatically altered in size and shape. This loss of habitat not only affects resident wildlife communities but may also have played a role in the decline of migratory species such as Neotropical migratory birds that breed in the basin.

The basin, the southern portion in particular, has experienced an increase in older-growth deciduous forest cover in the past several years. Accompanying this increase in older-age forest has been a decline in shrub and young forest habitat. Forest inventory data from the USDA Forest Service Forest Inventory and Analysis Program show that between 1968 and 2002 Niagara, Orleans, Monroe, Genesee, Livingston, Wyoming, and Alleghany counties (area roughly approximating the basin), had a 113% increase in large-diameter trees (including deciduous and coniferous trees); a 242% increase in medium diameter trees; and a 45% decline in seedling/sapling early successional habitat. These trends have accompanied an overall decline in agricultural acreage statewide.

Emergent marshes along the shores of Lake Ontario have declined significantly since the 1900s, primarily due to the effect of the altered hydrologic regime resulting from Lake Ontario water level regulation. The Lake Ontario Management Plan estimates losses of about 50% of the lake's pre-colonial wetlands throughout the entire lake basin. That loss may be as high as 60% to 90% in the intensely urban shoreline areas of the lake as found in Rochester. Wetlands in the entire Great Lakes plain increased by 17,000 acres between the 1980s and 1990s according to DEC Bureau of Habitat information on statewide wetland trends. This increase generally applies to only the eastern Lake Ontario subwatershed portion of the basin, however, the acreage of shrub swamp decreased by 18,000 acres and the acreage of emergent marsh decreased by 15,000 acres in that same period. The net gain in total acreage in that decade came from increases in open water and forested wetland, which increased by 39,000 and 11,000 acres respectively. Not surprisingly, populations of freshwater marsh nesting birds in the Southwestern Lake Ontario basin appear to be in decline. In addition, there have been major fish losses incurred in emergent wetland areas like Braddock Bay, where longear sunfish, Iowa darter and lake chubsucker are no longer found. Of the 34 species that occur in the basin and list emergent wetlands as a critical habitat, 12 are in decline, 3 have been extirpated from the basin, and 13 are of unknown status.

Dramatic changes in the Lake Ontario fish community have been underway for several decades, and several species are extirpated or extinct. The predator fish community has been supplemented with major programs stocking salmonids, but these species have also been depleted by cormorants. Fish communities are being

altered by invasive species and habitat degradation. The number of fish-eating gulls and cormorants in Lake Ontario has increased dramatically in the last 20 years. This is likely related to the banning of DDT and reduction in other toxics entering the lake. The rebound of these species, especially cormorants, can cause competition with SGCN for habitat and food resources.

Water quality in inland aquatic and riparian habitats has improved due to a reduction in point-source municipal and industrial pollutants by the construction of better waste-water treatment systems. However, non-point sources (NPS) of pollution, altered hydrology from storm water management, riparian corridor degradation, and exotic species invasions are now a larger component of the threats to water and aquatic habitat quality. Recent years have seen remarkable improvements in certain commercial, residential, and agricultural storm water management techniques, which have reduced some nonpoint source pollution. A desire to improve the aesthetic values of inland lakes of the SWLO basin and to alleviate the effects of invasive submersed aquatic vegetation has resulted in the compilation of lake and watershed management plans and an increase in the use of various methods to control these plants.

Threats

General Discussion

The major environmental stressors in the basin are related to changes in human land use, such as agricultural practices and commercialization, residential development, and industrial and commercial development (Southeast Lake Ontario Table 13). he negative effects of these land uses on natural resources include loss and fragmentation of natural habitat to development; sedimentation and erosion due to altered hydrology; storm water discharges; toxic substances in water and sediment, and nutrient discharges related to municipal waste and on-site septic systems. These major stressors are mentioned in several management and restoration plans that include all or part of the Southwestern Lake Ontario Basin in their area of interest.

The stressors vary in their prominence across the subwatersheds of the basin. In the more densely populated areas of the basin, degraded water quality from nutrients and toxic substances and habitat destruction are of greater magnitude and are related to residential, commercial and industrial development. The lower Genesee River and portions of Lake Ontario near Rochester are in need of restoration related to these issues.

In areas of the basin dominated by agriculture, fertilizer and pesticide runoff and soil erosion are of greater magnitude. In these more rural areas, too, on-site septic systems leach nutrients into aquifers and surface waters. Rural areas within a short distance of urban centers are also most prone to sprawl, a driving factor in habitat fragmentation.

In parts of the southern portion of the basin (for example, around some of the Finger Lakes) there are large tracts of land that, up to this point, have had a low level of human disturbance and encroachment. Therefore, these areas may not currently face all of the same threats to the same degree as other parts of the basin.

Specific Threats to Species of Greatest Conservation Need

The most frequently cited threat to species groups occurring in the Southwestern Lake Ontario Basin was outright loss of habitat via conversion to a human dominated land use. This threat was the most frequently listed for both terrestrial and aquatic species. It includes hardening of the landscape with buildings and roads; but can also include activities like land clearing and wetland draining for agriculture and mining. Thanks to programs such as the Natural Resources Conservation Service's "Swampbusters," wetland drainage for agriculture is not presently occurring to a large extent in the basin, but the effects of past drainage are still an issue. Complicating the picture is the habitat function that is provided by much of the agricultural lands in the basin at this time. Pasture and hay lands provide a surrogate for natural grasslands in the lake plains and when managed in a certain way with the needs of wildlife in mind these agricultural uses may be very beneficial to grassland wildlife. However, when agricultural management

activities like mowing of hayfields occurs at the wrong time of year, grassland nesting species may be disturbed or killed.

Fragmentation of remaining habitat is also a significant threat to terrestrial species. The overall human population of the Southwestern Lake Ontario Basin has not increased significantly in the last 50 years, and U.S. Census Bureau (n.d.) projections to 2030 show that this trend will remain unchanged. At first glance this would appear to indicate no increase in development threats in this basin. However, the humans in the watershed are, in fact, developing more and more of the landscape, creating a "sprawl" effect unrelated to population growth. According to the Brookings Institution's Center on Urban and Metropolitan Policy, overall human population increased slightly in the Rochester and Finger Lakes region between 1982 and 1997 by 56,570. In the same period, 50,000 acres of land became urbanized and population density dropped by 14.2% to 4.2 persons per acre. The result is increased fragmentation of habitats by residential and commercial developments, roads and other infrastructure and a decrease in the size of contiguous habitat blocks and interior habitats. The development of roads and utility rights-of-way can directly affect the number of species struck by cars on roads, or colliding with power-generating and transmission facilities, and communications towers. In the future, development for the production of wind energy may also become an issue in this basin.

Degradation of water quality, which may include contaminants, was the second most common threat listed to aquatic species groups in the basin. Degradation of water quality comes from increased soil erosion and runoff as a result of altered hydrology, nutrient-induced algal blooms, and reduced dissolved oxygen caused by excessive algae decay or increased temperatures. There is major damage from sedimentation in spawning and nursery areas in riffles and runs. The majority of fish species losses are likely due to this threat.

Toxic contaminants were listed as the second most common threat to terrestrial species in the basin and the third most common among aquatic species. Some persistent toxins are identified in the Lake Ontario Management Plan as impairments to reproduction and survival of several SGCN. For example, PCB contamination negatively affects reproduction and survival of river otter, and PCBs, Dioxin, and DDT compounds negatively affect reproduction and survival of bald eagles. Mercury, at levels high enough to cause concern is also found in sport fish tissues in the lake.

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

Persistent toxins are also a concern in the lower Genesee River for the same reason. Toxic contamination and sediment that is present in the Genesee River had originated from a variety of sources over time of varying severity. These sources include, but are not limited to, both industrial and municipal point and nonpoint sources (which have been discharged licitly and illicitly).

Atmospheric deposition is a significant statewide issue because New York State is downwind from major mid-western sources of airborne pollution. Though it is perhaps a larger threat in some of the other New York State watersheds, the SWLO Basin's extensive aquatic resources, limestone bedrock (particularly in the northern part of the basin) and relatively thin soils do make it susceptible to negative effects caused by airborne pollutants.

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

Conversion of habitats from one natural land cover type to another was cited as the third most common threat to terrestrial species. This threat highlights the need to not only protect habitats from development and degradation, but to also effectively manage natural processes like forest succession, fire, and flooding. This is a complicated issue, because what may be excellent habitat for one suite of SGCN species may not be for other SGCN. For example, a grassland field which provides habitat for grassland birds may eventually transition into a shrub habitat which is no longer valuable for grassland species, but may provide excellent habitat for early successional/shrubland species.

Lake Ontario regulation has altered the lake's natural hydrologic regime, affecting the survival of species dependent on coastal marshes. In particular, rapidly rising or falling water levels as a result of short-term changes in flow rates through the St. Lawrence River dams may either strand or flood nests of marsh nesters such as least bittern, American bittern, black tern, and king rail. There is also the general threat of hydrologic alteration as a result of the numerous dams on tributary streams in this watershed. Extensive research has revealed the importance of the natural flow regime as the engine of biodiversity in rivers, streams, and other water bodies. The species populations that inhabit a river have adapted to the natural pattern of floods and low flows, which provide the opportunities for spawning and germination that maintain the full range of flora and fauna.

Exotic species have threatened the Great Lakes ever since Europeans settled in the region. Since the 1800s, more than 140 exotic aquatic organisms of all types-including plants, fish, algae, and mollusks have become established in the Great Lakes. As human activity has increased in the Great Lakes watershed, the rate of introduction of exotic species has increased. More than one-third of the organisms have been introduced in the past 30 years, a surge coinciding with the opening of the St. Lawrence Seaway.

Several exotic and/or invasive species are a significant concern to SGCN in the basin. In addition, diseases, in particular Type E botulism in Lake Ontario, are another potential threat to certain SGCN. Exotic/invasive species and diseases in the basin that pose a significant threat to SGCN include:

CRUSTACEA

- Exotic zooplankton such as spiny waterflea (*Bythotrephes cederstroemi*) and fish hook waterflea (*Cercopagis pengoi*) compete with and prey on

native zooplankton species. Its sharp spine makes it extremely hard for fish to eat. This has induced changes at all trophic levels in the Lake Ontario and inland lake food chains.

- Rusty crayfish (*Orconectes rusticus*) - Rusty crayfish are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations.

FISH

- Common carp (*Cyprinus carpio*) - Carp degrade shallow lakes by causing excessive turbidity, which can lead to declines in waterfowl and important native fish species.
- Ruffe (*Gymnocephalus cernuus*) - The ruffe can displace other species in newly invaded areas due to its high reproductive rate, its feeding efficiency across a wide range of environmental conditions, and characteristics such as sharp spines on their gill covers, and dorsal and anal fins that may discourage would-be predators.
- Sea lamprey (*Petromyzon marinus*) - Predaceous, eel-like fish that have contributed greatly to the decline of whitefish and lake trout in the Great Lakes. Since 1956, the governments of the United States and Canada, working jointly through the Great Lakes Fishery Commission, have implemented a successful sea lamprey control program.
- Alewife - Reduces zooplankton biomass due to grazing and competes with native forage fish, which in turn appears to induce thiamine deficiencies in salmonids. However, alewives play an important role in the Lake Ontario, Hemlock Lake, and Canadice Lake ecosystems as prey for stocked salmonid predators.
- Round gobies (*Neogobius melanostomus*) - A bottom-dwelling fish that competes for spawning sites and other habitat with native fish like mottled sculpin, logperch darters, and smallmouth bass. Round goby thrive in the Great Lakes Basin because they are aggressive, voracious feeders which can forage in total darkness. Goby can survive in degraded water conditions, and spawn more often and over a longer period than native fish. Round goby have shown a rapid range expansion through the Great Lakes.

MOLLUSKS

- Zebra mussels/quagga mussels (*Dreissena polymorpha* and *Dreissena bugensis*) - compete with native mussels and reduce phytoplankton biomass. This has induced changes at all trophic levels in the Lake Ontario and inland lake food chains.

PLANTS

- Purple Loosestrife (*Lythrum salicaria*) -This plant can form dense, impenetrable stands that are unsuitable as cover, food or nesting sites for a wide range of native wetland animals, including ducks, geese, rails, bitterns, muskrats, frogs, toads and turtles. Adults can disperse 2 million seeds annually, and there is a lack of effective predators in North America. Recently, however, several host-specific European insects have been released as a long-term biological control in North America.
- Common reed (*Phragmites australis*) - In some circumstances, particularly in disturbed areas, this plant can become invasive and out-compete other plant species, resulting in a degraded system with negative effects on some wildlife species, including several SGCN.

- Invasive Submersed Aquatic Vegetation - Eurasian Water Milfoil (*Myriophyllum spicatum*) and Curly-leaf pondweed (*Potamogeton crispus*) are exotic plants that form surface mats that interfere with aquatic recreation. In nutrient-rich lakes they can form thick underwater stands and vast mats at the water's surface. In shallow areas the plant can interfere with boating, fishing, and swimming. The plant's floating canopy can crowd out important native water plants. In the lakes of the SWLO basin, the plant appears to coexist with native flora, but little is known how these plants affect fish and other aquatic animals.
- Flowering rush (*Butomus umbellatus*) - It grows in shallow areas of lakes as an emergent, and as a submersed form in water up to 10 feet deep. Its dense stands crowd out native species like bulrush.

BIRDS

- Mute swan - Displaces other waterbirds, possibly including SGCN such as the black tern, with its aggressive behavior and reduces the amount of submerged aquatic vegetation available for native wildlife.

DISEASE

- Type E botulism - Botulism, a disease caused by *Clostridium botulinum*, has been recognized as a major cause of mortality in migratory birds since the 1900s. Although type C botulism has caused the die-off of thousands of waterfowl (especially ducks) across the western United States, type E botulism has been mainly restricted to fish-eating birds in the Great Lakes. Fish and waterbird mortality events were documented on Lake Ontario in 2002 through 2004. Type E botulism was isolated in each of these outbreaks.

Priority Issues in the Basin

None that were not discussed in prior sections.

Vision, Goals and Objectives for the Basin

Vision

The Southwest Lake Ontario Basin will be part of a healthy and sustainable ecosystem. The Southwest Lake Ontario Basin will be well understood as a habitat system. The current and historical extent of major habitat types will be understood and used to set goals for management. The status and trends of all SGCN in the basin will be monitored and understood. The stream systems in the basin will have effective riparian buffers.

Existing conservation partnerships will be strengthened and new ones formed. Public and private conservation partners will work in a coordinated fashion to gather the most accurate, comprehensive data on SGCN and their habitats within the basin. The data will be in a format that can easily be accessed and shared among conservation partners, and disseminated to the public in a meaningful way and raise awareness and support for issues surrounding SGCN.

Conservation partners will work in a coordinated fashion to manage SGCN and their habitats over large spatial and temporal scales. This will be accomplished through comprehensive planning, land protection, adaptive management, and rigorous evaluation.

No SGCN that presently exists in the basin will be extirpated and native SGCN that are no longer found in the basin will be reintroduced where appropriate. All SGCN will have adequate habitat to sustain populations with minimal intervention from conservation partners. Threats to species and their habitats will be diminished through cooperative action taken by state and federal agencies and their conservation partners. The relationships between these partners will be strengthened and communication improved. Conservation actions will be clearly outlined, understood, and supported by conservation partners and the public.

Goals and Objectives

- Determine the current and historical extent of grasslands, early successional and shrub, deciduous/mixed forest cover, and wetlands in the basin.
- Conduct habitat mosaic planning and set target goals for these habitat types (e.g., maintain X acres of wetlands, maintain Y acres of forests with larger diameter trees, increase the amount of grassland and early successional forest and shrub habitat by Z percent, etc.).
- Determine locations and monitor trends of SGCN in the basin.
- Maintain and improve stream systems by protecting and enhancing riparian buffers.
- Reduce pollution and siltation runoff into streams and tributaries.
- Improve connectivity and habitat function of protected areas in the basin.

- Restore priority habitats affected by land use practices.
- Prevent further introductions of aquatic and terrestrial non-native invasive species.
- Monitor the quality and quantity of habitats on a 10-year rotational cycle.
- Identify specific threats to SGCN in order to prioritize habitat protection and restoration efforts.
- Identify key areas for acquisition, restoration, and/or other means of protection.

Priority Strategies/Actions for Basin-wide Implementation

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

Data collection recommendations for Critical Species

A number of priority species and groups need population, habitat, and life-history research to address critical data gaps. In particular, an important first step is to locate and inventory key areas in the basin that are utilized by SGCN. This information will help more clearly identify threats and establish baseline information for these species.

EARLY SUCCESSIONAL FOREST/SHRUBLAND BIRDS

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

FRESHWATER MARSH-NESTING BIRDS

- Initiate a baseline population survey to determine abundance and distribution. Refine monitoring techniques to better detect population trends.

- Inventory breeding sites and map at a coarse scale to select key monitoring locations. Analyze habitats at multiple scales to better understand characteristics important to nest-site selection.

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

- Monitor occurrence and nesting success of black tern, least bittern, and king rail in Lake Ontario coastal marshes. The suitability of marshes for these birds could also be tested by monitoring nesting success of the more common Virginia rail. Such a focused monitoring effort would provide a direct measure of the effect of a new Lake Ontario water regulation plan (to be adopted in 2006), and provide information needed by decision-makers to interpret the plan's effects and possibly improve it.

GRASSLAND BIRDS

- Complete an inventory of potential grassland habitat including species present, distribution, and relative abundance of priority species. Develop and implement a monitoring program to supplement the Breeding Bird Survey (BBS) for grassland bird species to determine population trends and evaluate effectiveness of conservation efforts in the basin. This effort has already been initiated by a New York grassland bird group led by Audubon New York.

HERPETOFAUNA

Priority species are massasauga, lake and river reptiles, uncommon turtles of wetlands, vernal pool salamanders, woodland and grassland snakes, and western chorus frog.

- Document life history parameters specific to these species in New York, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland-upland habitat requirements.
- Periodically resurvey areas of known occurrence to detect population trends.
- Conduct research to document the extent of upland habitat required by vernal pool breeding salamanders.
- Determine significance of specific threats to populations of vernal pool salamanders and develop management recommendations to address significant threats.
- Research and develop mitigation measures to address the adverse effects of habitat fragmentation on woodland and grassland snakes.
- Conduct surveys to determine present distribution and monitor extant populations of western chorus frog.
- Investigate reasons for the observed decline of western chorus frog.

LAKE ONTARIO BAY AND LOWER RIVER AND RIVER-MOUTH FISH

Priority species are lake sturgeon, western pirate perch, longear sunfish, Iowa darter, redfin shiner, lake chubsucker, and Atlantic salmon

- Continue surveys to understand current distribution of these species.
- Determine the population status of these species in SWLO basin. Expand fishery surveys to document presence, distribution, and associated habitats for redfin shiner, Iowa darter, and lake chubsucker.
- Survey habitats to document life history requirements of these species.
- Inventory and assess losses to habitat in bays and river mouths of SWLO.
- Research threats to habitat and populations.

LAKE ONTARIO FISH

Priority species are sauger, ninespine stickle back, and deepwater ciscos

- Continue surveys to understand current distribution of these species. Determine the population status of these species in SWLO basin.
- Survey habitats to document requirements.

- Research threats to habitat and populations. Declines in Lake Ontario populations are poorly understood. They may be related to changes in lake productivity.

- Inventory and assess losses to habitat in Lake Ontario.

RIVERINE FISH

Priority species include: black redhorse, American eel, blackchin shiner, bigeye chub, and heritage strain brook trout

- Continue surveys to understand current distribution of these species. Determine the population status of these species in SWLO basin. Expand fishery surveys to document presence and distribution of black redhorse, blackchin shiner in Conesus Inlet, and bigeye chub.

- Survey habitats to document requirements in order to evaluate reintroduction potential for the basin.

- Inventory and assess losses to habitat in tributaries of SWLO.

- Research threats to habitat and populations.

RIPARIAN TIGER BEETLES

- Survey cobble bar for riparian tiger beetles to determine population status in the basin. Two species of unknown status in the basin depend on this habitat.

FRESHWATER BIVALVES

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

- Develop standard survey protocols for development projects in the basin to prevent further decline of these species.

- Investigate the best survey methods to detect rare species, and evaluate status and trends of all species that occur in the basin. High priority species within this group include: eastern pondmussel, wavyrayed mussel, and fat pocketbook.

- Determine population distribution and abundance of freshwater bivalve species-at-risk in this basin.

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

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

DATA COLLECTION RELATED TO TOXIC SUBSTANCES

Toxics monitoring in fauna is recommended for species in 12 species groups in a number of taxa. As outlined in the "Threats to the Basin" section above, persistent toxics and pesticides are of concern in this basin. The Lake Ontario Program already monitors several of these species for PCBs, mercury, dioxin, and DDT compounds. Due to the high agricultural land use in this basin, monitoring the effects of pesticides on sensitive species is warranted, especially because many of these species are dependent upon remaining agricultural lands for habitat.

- Specific recommendations for freshwater marsh nesting birds include a recommendation to periodically monitor the levels of contaminants in marsh birds and their eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival. The highest priority species within this group are black tern, pied-billed grebe, least bittern, American bittern, and king rail.

- Specific recommendations for freshwater bivalves include a recommendation to research effects of pesticides and other chemicals, including ammonia, on all life stages of freshwater bivalves: sperm/egg, glochidia, larva, and adults. The highest priority species within this group are eastern pondmussel, wavyrayed mussel, and fat pocketbook.

- Specific recommendations for other butterflies include a commendation to determine the sensitivity of species to chemical formulations, particularly diflubenzuron and other commonly used agricultural pesticides. In addition, determine the effect of *Bacillus thuringiensis kurstaki* (BTK) used in gypsy moth sprayings on other butterfly species. The highest priority species in this group is Persius duskywing.

Data Collection Recommendations for Critical Habitat

AGRICULTURAL FIELDS

Large row-crop monocultures and decreased crop diversity can negatively affect wildlife and their habitats in agriculturally dominated ecosystems. In addition, farm management practices such as conventional tillage, may have negative consequences such as loss of food source, like waste grain and wheat seeds from post-harvest fields, and increased soil erosion and loss of cover. Trends in modern farm operations toward increased field size and loss of adjacent edge habitat negatively affect some wildlife species, but can actually benefit some grassland songbird species that require large areas of contiguous grassland.

- Specific recommendations for grassland birds include a recommendation to evaluate the effects of specific farming and management practices on productivity of grassland birds. Specific investigations should include: timing and frequency of mowing; intensity of grazing; comparative effects of management regimes like mowing, haying, and prescribed fire; and buffer strip characteristics. All species of grassland birds that occur in this basin are considered high-priority species.

EARLY SUCCESSIONAL HABITATS

Shrubland and early successional forest species are in widespread decline in New York and throughout the Northeast as forest stands mature. Sustainable timber harvest is a way to provide more much needed quality habitat. With proper forest

management, such as proper erosion control, detrimental effects on other wildlife can be minimized.

- Specific recommendations for early successional forest/shrubland birds include a recommendation to develop best management practices for sustainable silviculture that incorporates the critical habitat needs of this suite of species. Investigations may include: timing, size, and shape of cuts; species and structural diversity of vegetation, and soil retention techniques. All species of early successional forest/shrubland birds that occur in this basin are considered high-priority species.

FRAGMENTATION OF HABITAT

Fragmentation of habitats in the basin is a common threat to several species groups. Many issues influence the effects and severity of fragmentation on given species groups. These include patch size and shape, edge effects, and connectivity of remaining habitat patches. Juxtaposition of wetland and grassland habitats has been shown to positively influence wildlife species diversity. This basin contains significant amounts of both habitat types and provides opportunity for landscape management of species that depend on these systems. The relative abundance and distribution of grasslands and wetlands in this basin highlights the importance of this area statewide.

Fragmentation is a threat to aquatic species as well. Dams in the watershed prevent migration and dispersal of a variety of aquatic species including freshwater bivalves. Isolated populations are more vulnerable to extirpation by both natural and anthropogenic events.

- Specific recommendations for freshwater marsh nesting birds and grassland birds include demographic studies to identify source and sink populations, metapopulation dynamics, and factors that influence reproductive success and survival. High-priority species for freshwater marsh nesting birds are black tern, pied-billed grebe, least bittern, American bittern, and king rail. All grassland birds are considered to be of high priority.

- Specific recommendations for freshwater bivalves include investigating the flow requirements of freshwater bivalves and modeling the effects of flow changes both in volume and timing. Additional research is needed on population dynamics of listed mussel species including connectivity and genetic distinctiveness of populations and subpopulations. The highest priority species within this group are Eastern pondmussel, wavyrayed mussel, and fat pocketbook. Invasive zebra mussels, quagga mussels, and, to a lesser extent, Asian clam species in the Great Lakes and other parts of the state compete with native bivalves.

Planning recommendations

EXISTING MANAGEMENT PLANS AND AGREEMENTS

Several existing management plans address natural resource conservation issues within the basin (Table 16). The goals and objectives of these plans vary in focus (e.g., water quality, planning and development, fish and wildlife), spatial and temporal scale, and cooperating partners; however, they all provide valuable information on conservation threats and strategies in this region of New York State and should be consulted before implementing recommended actions.

NEW PLANNING RECOMMENDATIONS

- There is a clear need for a habitat mosaic management plan for grassland, early successional forest, shrub habitat, mature forest stands, and wetlands in this basin. Of the 130 SGCN occurring in the basin, 41 depend on grasslands, 20 depend on barrens and woodlands, 38 depend on forested habitat, and 46 depend on wetlands. Some species depend on all four of these habitat types at some point in their life cycle. All of these habitats have competing needs and priorities. The balance and cooperative management of all of these habitat types is essential to the health and abundance of many of the SGCN currently living in this basin. It is very important to consider both public and private lands in planning efforts and to incorporate both strategies that focus on land protection and management of public lands and strategies that deal with partnerships with private landowners. It is also important to involve and facilitate cooperation between the many potential partners, including DEC, NYSOPRHP; USFWS; NPS; NRCS; NY Audubon; TNC and the Natural Heritage Program; local land trusts; New York Forest Owners Association; Ducks Unlimited, Inc; Pheasants Forever; National Wild Turkey Federation; Ruffed Grouse Association; watershed groups; private landowners; local governments, and others. Part of this mosaic habitat management planning effort should involve the development of a protected lands GIS data layer as a powerful tool for conservation planning and determining measures of success at the regional scale. Such a data layer would incorporate all the protected lands in public and private ownership and assign each site to a category reflecting its protection status (easement, fee ownership, etc.). Combining this data layer with SGCN occurrences and other landscape features would provide an excellent and unique analysis of the conservation status of each SGCN and the role played by each priority site in achieving goals at the regional watershed and statewide scales.

- The southern portion of the basin is dominated by deciduous forest cover. This is an opportunity to integrate the needs of early successional forest/shrubland birds, deciduous/mixed-forest breeding birds, woodland snakes, and vernal pool salamanders. These species often need heterogeneous forest structure during different life stages. Herpetofauna also need wetlands within the forest to breed.

- The birds mentioned above all require varying types of vertical forest structure. Wildlife biologists and researchers should develop habitat management guidelines for forest stages important to SGCN that include patch size and distribution in the landscape, timing of management actions, and microhabitat characteristics. These guidelines should be considered by

forest managers on public lands and made available to private forest owners interested in wildlife management.

- Develop a management plan that provides guidance on maintaining, enhancing, and restoring early successional forest/shrub habitat for Canada warbler and golden-winged warbler and also other species such as American woodcock and brown thrasher.

- Investigate the feasibility of managing the forests in the basin with controlled burning. Draft a fire-management plan in accordance with these findings.

- The northern portions of the basin are dominated by grasslands with several large wetland complexes interspersed in the landscape. This is an opportunity to integrate the needs of wetland-and grassland-dependant species into a holistic management plan for the basin. Components of this larger picture are:

- Develop a management plan for the basin that includes land acquisition and management targets for all wetland-and grassland-dependent species of greatest conservation need. Minimum management area sizes for various animal classes should be determined, and targets for acquisition and temporal and spatial targets for management actions (mowing, water control) should be set. This should be a component of the above-mentioned mosaic management plan and incorporate basin-specific objectives from a statewide grassland-bird management plan (already being developed by a consortium of agencies and organizations active in grassland conservation in New York led by Audubon NY) and existing wetland planning efforts including the North American Waterbird Plan, Bird Conservation Regional plans, and others. Specific tasks associated with this planning include:

- Investigate the feasibility of managing grasslands in the basin with controlled burning. Draft a fire-management plan in accordance with these findings.

- Work with the USDA and other partners to develop grassland management incentives that benefit SGCN in this basin.

- Review existing planning documents and participate in ongoing planning efforts to take advantage of opportunities to protect and manage lands for SGCN in this basin.

- Review state park master plans, DEC unit management plans and wildlife management area plans for opportunities to better manage state lands for SGCN in the basin.

- Participate in the USFWS refuge Comprehensive Conservation Plan process for Iroquois Natural Wildlife Refuge scheduled for 2007 to provide information on management of wildlife refuges for the benefit of SGCN. In particular, Iroquois NWR has vast stretches of emergent marsh that could benefit freshwater marsh nesting birds, rare turtles, and other herpetofauna. This planning process incorporates human uses as well as wildlife management considerations into refuge operations.

- Continue participation in North American water bird planning. Focus on and refine recommendations for common loon, blue-winged teal, and wintering waterbirds.

- Participate in other planning efforts in the basin (such as watershed plans, lake plans, etc.). As these plans are developed and revised, incorporate information about SGCN and opportunities to benefit SGCN in the basin.

- Continue to develop recovery plans for all fish SGCN (and other aquatic species) particularly longeared sunfish, deepwater ciscos, Atlantic salmon, and lake sturgeon.

- Develop recovery plan for longeared sunfish based on SWG-funded research conducted by SUNY Brockport. The distribution of this species is limited to the Southwestern Lake Ontario and Lake Erie basins.

- Incorporate freshwater mussel goals and objectives into regional water quality and fisheries management plans and policies.

- Coordinate with other involved agencies to develop monitoring and control plans that include measures to detect invasive species and actions to control them before they become threats. Develop statewide and regional hazard analysis and critical control point (HACCP) plans.

- Develop a monitoring and control plan that includes measures to detect invasive bivalves and actions to control them before they become threats.

- Develop an avian and bat migration route map using advanced radar imaging and other methodology, and also investigate the effects of landform factors on travel routes. The development of this map and other related information for use as a planning tool is a high priority as new wind power proposals are developed for areas within the Southwestern Lake Ontario Basin.

Land Protection Recommendations

This category of actions encompasses a variety of acquisition mechanisms such as easements, cooperative agreements, fee title acquisition, donations, development rights acquisition, and others. The type of acquisition should be determined by the interested parties based on their means and conservation goals. Interested parties may be one or more government entities or non-governmental organizations.
A common threat to many SGCN in this basin is the degradation of water quality in aquatic habitats. This can be a result of siltation; nutrient runoff; temperature increases; toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects.

- In key locations, acquire development rights to protect water quality for listed mussel populations. The high-priority species group that will benefit from this recommendation is freshwater bivalves.

A common threat to many SGCN in this basin is the loss of habitat due to anthropogenic changes like development, dredging, wetland draining, and shoreline hardening. These changes result in loss of habitat quantity and often disrupt the function of remaining habitat. Connections between patches of similar or different, yet complementary habitats are needed for migration and dispersal. Isolated patches do not allow for effective metapopulation dynamics and make species vulnerable to extirpation from a variety of causes. Reduction of patch size also results in increased negative edge effects, predation, reduction in population, and reduction in the types of species the patch can support.

The lands owned by the state and federal government in the basin are primarily forest and wetland. There is a need to acquire, through fee title or easements, grasslands, especially large grasslands adjacent to other open habitat types. This will enable better management and protection of these habitats for grassland species. Acquisitions should reflect the recommendations of priority grassland focus areas from the NYS Grassland Bird Management Plan. The Nation's Road grassland area surrounding the Genesee River in the towns of York and Avon has been identified as valuable habitat by Audubon NY and The Nature Conservancy and is a good example of a potential acquisition project. Protection of some of this area has already been implemented at a local level through conservation easements. Priority species that would benefit from these acquisitions include grassland birds.

- Acquisition of forested and grassland upland tracts adjacent to wetland properties is critical to protection and restoration of amphibian, reptile, and freshwater marsh nesting bird species in this basin. Ideally these will be parcels where human development has not fragmented the two cover types. Identification of candidate parcels with these characteristics should occur immediately. Parcels within the Hemlock/Canadice Lake/Honeoye Lake watersheds could possibly fit into this category. Priority species groups that would benefit from these acquisitions are vernal pool salamanders, uncommon turtles of wetlands, freshwater marsh nesting birds, grassland birds, and breeding waterfowl.
- More than 50% of the wetlands of New York State have been lost over the past century. Emergent marsh habitat and lands with wetland restoration potential adjacent to state-owned land should be acquired through fee title or easement.

Studies have demonstrated that large emergent habitat parcels are more likely to support certain marshbird species such as black tern, bitterns and rails. Priority species groups that would benefit from these acquisitions are, uncommon turtles of wetlands, freshwater marsh nesting birds, transient shorebirds, and breeding waterfowl.

- Acquisition of upland parcels within and adjacent to the Braddock Bay wetlands complex has been identified as a priority for many migratory birds by Audubon NY and the Genesee Land Trust (Lake Ontario Habitat Priorities). Priority species groups include grassland birds, freshwater marsh nesting birds, and breeding waterfowl.

- Support the acquisition of the Rush Oak Openings property in Region 8. This acquisition priority appears in the Open Space Conservation Plan of 2002. This site expands on the DEC and Nature Conservancy owned parcels of an extremely rare Oak Opening community as described in Edinger et al. (2002). This community includes grassy savannas and wetlands that could provide habitat for a number of SGCN.

- Support the acquisition of the Great Bend property in Region 8.This acquisition priority appears in the Open Space Conservation Plan of 2002. The site contains dense woodlands and open meadows.

- The Black Creek-Bergen Swamp complex is only partially protected, and further acquisition of wetlands and buffering uplands through appropriate means is important for protecting this very diverse site.

- The Niagara escarpment holds much of Niagara County's biodiversity in terms of its herpetofauna and flora. Protection is necessary for key parcels along the escarpment which are at great risk of development and clearing for landscape views.

Management and Restoration recommendations

Overall alteration of the landscape, primarily since European settlement began has disrupted the natural cycle of habitat disturbance (e.g., fire, wind throw, flooding cycles etc.). Although some of the alterations to the landscape provide important habitat, as in the case of hay and pasture lands, in many cases management actions such as mowing, burning, silviculture, water-level manipulation, and control of exotic/invasive species are necessary to mimic natural processes and maintain or manipulate habitats to benefit SGCN. In addition, in many areas where habitat has been severely degraded or altered, habitat restoration is often needed to provide habitat for SGCN.

- Priority management recommendation for early successional forest/shrubland birds are:
  - Conduct sustainable silvicultural operations (both even-aged and uneven-aged) with a goal of producing early successional habitat for wildlife on public and private land.
  - Maintain, restore, and enhance early successional habitats through the use of prescribed fire.
  - Forest structure management; maintain various maturity stages and diverse forest structures through forest management that utilizes even aged and uneven-aged forestry in forest stands to benefit forest dwelling SGCN. Maintain understory trees for lower altitude nesters like black-crowned night heron. Try to control deer browse of understory. Create small openings with wetlands or small (~0.25 acre) ponds to benefit forest- breeding raptors and herps.

- Priority management recommendation for forest breeding raptors is:
  - Maintain appropriate breeding habitat for forest breeding raptors around occupied nest sites with emphasis on long-eared owl.

- Priority management recommendations for freshwater marsh nesting birds are:
  - In marshes that have managed water levels, manage water levels to improve nesting habitat and prevent nest loss for freshwater marsh nesting birds, and optimize water and vegetation cover for blue-winged teal and uncommon turtles of wetlands.
  - Restore emergent marsh to benefit freshwater marsh nesting birds.
  - Manage predators in nesting areas to reduce egg and chick loss.

- Priority management recommendation for grassland birds is:
  - Use mowing and/or prescribed fire to manage vegetative structure of established grasslands. This should be incorporated into Landowner Incentive and Farm Bill programs. Mowing should be delayed until after August 1.
  - Provide incentives to convert row crops to grasslands.

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

- Priority management recommendations for uncommon turtles of wetlands are:
  - Employ a variety of habitat management techniques to control vegetative succession in order to preserve wetland suitability for these turtles, especially Blanding's and spotted turtles.
  - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation.

- Priority management recommendation for woodland snakes is:
  - Develop and implement mitigation strategies to counteract adverse effects of habitat fragmentation, especially timber rattlesnake.
  - Priority management recommendation for Eastern massasauga is:
  - Manage vegetative succession by prescribed burns, herbicide application, and mechanical removal. Evaluate the effectiveness of these measures for increasing habitat suitability.

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

- Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and riverine fish are:
  - Fully develop and implement the existing Strategic and Operational Management Plan for Imperiled Fish Species (Carlson 2000a). This includes regular sampling and habitat restoration.
  - Investigate the feasibility of removing dams that may hinder success of these species. Make this part of a statewide strategy to improve fish SGCN populations by restoring passage across barriers.
  - Reassess the status of state and federally listed fish species and determine if a change in listing status is warranted.

A common threat to many SGCN, and a major threat to aquatic SGCN in this basin, is the degradation of water quality in aquatic habitats. This can be a result of siltation, nutrient runoff, temperature increases, toxics, and lowered dissolved oxygen. Land acquisition can be used to prevent or remediate these effects; however, the implementation of best management practices (BMPs) to protect water quality is a more effective and more economically feasible approach.

- Priority management recommendation for lake/river reptiles is:
  - Manage water borne pollutants that adversely affect lake and river reptiles like pathogens and toxic substances.
- Priority management recommendation for freshwater bivalves is:
  - Manage areas of important mussel populations by controlling degradation factors, including livestock access, point and nonpoint source pollution, and flow alterations.
- Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and Riverine fish are:
  - Manage areas of important populations by controlling degradation factors, including point and nonpoint source pollution, habitat alterations, and flow alterations.
  - Spawning and nursery habitats of important fish populations should be protected and managed to avoid siltation into gravel areas.

- Fully develop and implement the existing Strategic and Operational Management Plan for Imperiled Fish Species (Carlson 2000a).

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

- The priority management recommendation for freshwater marsh nesting birds is:
  - Control purple loosestrife where it is known to have a negative effect on marsh nesting birds. Techniques could include biological controls.
- The priority management recommendation for lake/river reptiles is:
  - Control invasive aquatic plants where they are negatively affecting lake and river reptiles. Techniques could include biological, chemical, and mechanical means.
- The priority management recommendations for vernal pool salamanders are:
  - Control invasive aquatic plants where they are negatively affecting lake and river reptiles. Techniques could include biological, chemical, and mechanical means.
  - Limit introductions of fish and other predatory species into habitats critical to vernal pool salamanders.
- Priority management recommendations for Lake Ontario bay and lower river and river mouth fish, Lake Ontario fish, and Riverine fish is:
  - Control invasive aquatic plants where they are negatively affecting these fish. Techniques could include biological, chemical, and mechanical means.

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

- The priority management recommendations for lake/river reptiles are:
  - Reduce excessive disturbance by watercraft in habitats critical to lake and river reptiles.
  - Reduce incidental take of lake and river reptiles by fishing gear.
  - Employ restoration techniques for queen snake at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.
  - Employ restoration techniques for spiny softshell at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.
- The priority management recommendation for vernal pool salamanders is:
  - Reduce habitat destruction and collisions by off-road vehicles in vernal pools occupied by salamanders.
- The priority management action for uncommon turtles of wetlands is:

- Employ restoration techniques for Blanding's turtle at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.

❖ The priority management action for woodland/grassland snakes is:
- Employ restoration techniques for timber rattlesnake at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.

❖ The priority management action for eastern massasauga is:
- Employ restoration techniques for massasauga at selected sites as needed. These techniques should include captive breeding (where appropriate), head-starting, nest protection, and repatriation/relocation strategies.

Information Dissemination Recommendations

Sharing of data allows stakeholder groups to make informed decisions about activities that may help or harm SGCN. Sharing of information may take many forms, including best management practices, fact sheets, and educational outreach programs.

- Some agricultural and silvicultural operations may lack wildlife-based objectives, thus may be detrimental to wildlife. Providing information to public and private land managers may help mitigate detrimental practices.
  - Make information available to public and private land managers regarding the benefits and need for early successional habitat, including even-aged forest stand management and sustainable silvicultural practices. Also, develop recommendations for landowners and managers for maintaining abandoned land in early successional habitat.
  - Work with public utilities to manage rights-of-way to provide maximum habitat benefits to early successional forest/shrubland birds.
  - Develop an outreach program for public and private land managers to increase awareness of the benefits of grasslands and wildlife-friendly agricultural practices.
  - Promote the establishment of vegetated buffers around agricultural fields to protect wetlands and streams from runoff.
  - Provide education and outreach to forest managers regarding silvicultural practices compatible with forest breeding raptors. A high-priority species that will benefit from this action is the long-eared owl.

- Introduction and spread of exotic species can often be minimized or prevented through increased awareness of natural resource users to the negative effects of these species on native wildlife. Awareness should be accompanied by specific actions that natural resource users can employ to prevent spread of invasive and exotic species.
  - Post educational signs at boater access sites to highlight the dangers to native mussel populations posed by the spread of exotic mussels and the role of boats in their spread.
  - Develop and post educational signs in appropriate languages at markets dealing in live bivalves, fish and crustacea, explaining the dangers of releasing exotic animals into New York State.
- Human behavior can be altered by education and outreach. Providing information about negative effects of human disturbance on wildlife can help reduce detrimental interactions.
  - Enhance public education to curtail collection and translocation of turtles and snakes. This includes dispelling common myths about the dangers posed to people and pets by native snakes.
  - Develop an outreach and educational tool to highlight the possible detrimental effects of human disturbance on wetland-dependent wildlife. An example could be off-road vehicle effects on vernal pool and marsh nesting species.

Regulatory and Legislative Recommendations

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

Habitat Loss

- Pursue expanded protection for wetlands that are smaller than 12.4 acres and that are important to SGCN in the basin through the "unique local importance" provisions of Article 24 of the Environmental Conservation Law. Priority species that will benefit from this action include Blanding's turtle, spotted turtle, Jefferson salamander, and blue-spotted salamander.
- Review the status of wetland sites currently or historically used by endangered, threatened, or rapidly declining freshwater marsh nesting birds, regardless of wetland size. Wetlands locally important for these species should be protected either under existing provisions of Article 24 of the ECL or by local ordinance.
- Afford protected stream status under ECL §608.2 to Class D non-navigable stream segments that provide habitat for SGCN. An example is Buttonwood Creek which contains the western pirate perch.

Water Quality

- Limit the use of pesticides on publicly owned marshes to prevent reduction of insect populations and contamination of wetlands used by SGCN.
- Require testing of all new pesticides, consistent with current DEC and EPA regulations, for effects on all life stages of freshwater bivalves prior to approval for use in the state.
- Expand permit review of activities on critical stream segments that provide habitat for SGCN and enforce regulations to abate NPS pollutants, erosion, sedimentation, and hydrological alterations.
- Continue the development of an in-stream flow policy for New York State that reflects the importance of natural flow regimes. Such a policy could call for reservoirs, dams, withdrawals, and diversions to be operated in a manner that mimics the natural flow regime as closely as possible.

Human-Wildlife Interaction

- Modify the ECL to include small game protections for queen snake, eastern ribbon snake, spiny softshell turtle, eastern massasauga. Blanding's turtle, spotted turtle, blue-spotted and Jefferson salamanders, smooth greensnake, and timber rattlesnake.
- Enhance law enforcement to limit collection and translocation of wood turtles, massasauga.

Invasive Species

- Develop and implement a noxious weed law to control the introduction and distribution of exotic and invasive species such as purple loosestrife. This will benefit multiple taxa.

- Participate in international efforts to develop regulatory control of exotic invasive species via shipping in the Saint Lawrence Seaway.

Incentives

None at this time.

Literature Cited and Sources Consulted

Black Creek Watershed Coalition. Black Creek Watershed State of the Basin Report. 2003.

Carlson Douglas. Management of New York's Imperiled Fishes from the original plan "Strategies and near term operational plan for the management of endangered, threatened and special concern fishes of New York" by D. Bouton (1994). DEC, Endangered Fish Project. Albany, NY. Feb. 2000.

Chapter 43-B of the Consolidated Laws of New York Environmental Conservation Laws of New York State. Art. 24.

Environment Canada. Fish and Wildlife Habitat Status and Trends in the Canadian Watershed of Lake Ontario. 2000.

New York Department of State. State of Conesus Lake: Watershed Characterization Report. 2002.

- - -. Conesus Lake Watershed Management Plan. Livingston County Planning Department. Mar. 2003.

U.S. Army Corps of Engineers. The Genesee River Basin Action Strategy. Genesee/ Finger Lakes Regional Planning Council. Oct. 2004.

U.S. Census Bureau. (n.d.) *State Interim Population Projections by Age and Sex: 2004 – 2030*. Retrieved August 3, 2005, from http://www.census.gov/population/www/projections/projectionsagesex.html

USEPA. Lakewide Management Plan for Lake Ontario. 1987.

- - -. Biodiversity Around the Great Lakes. 2002.

- - -. Great Lakes Strategy 2002 - A Plan for the Millennium. 2002.

The Nature Conservancy. Conservation Blueprint for the Great Lakes. 2003.

Tables and Figures

Tables

Figures