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Onondaga County Department of Water Environment Protection
SUNY College of Environmental Science and Forestry



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Onondaga Lake Fishery: 2011 Fact Sheet

For decades, scientists at Onondaga County Department of Water Environment Protection (OCDWEP) and the State University of New York College of Environmental Science and Forestry (SUNY-ESF) have been monitoring Onondaga Lake to evaluate how the lake is changing as pollution levels decline. Taken together, the findings of the two comprehensive programs offer a unique window into the changing ecosystem of this valuable community asset. OCDWEP and SUNY-ESF have collaborated on this 2011 Fact Sheet which describes the current status of Onondaga Lake's biological community, and focuses on the lake fishery.



Largemouth Bass



Lake Sturgeon

A Changing Ecosystem

The OCDWEP and SUNY-ESF biological monitoring programs track plant and animal communities in the lake ecosystem. The monitoring programs measure the number and types of fish, aquatic plants, macroinvertebrates, phytoplankton (algae), zooplankton, and dreissenid (zebra and quagga) mussels. Results of the biological monitoring programs are very encouraging; the lake now supports a diverse and productive biological community. The fish community provides quality angling opportunities. Onondaga Lake now resembles other regional lakes of its size with respect to the number of fish species, plant abundance and water clarity.

There are some subtle differences. For example, Onondaga Lake supports fewer invertebrate prey such as dragonflies and mayflies compared with nearby lakes, and researchers are actively seeking to understand why. One factor may be the nature of the lake's aquatic vegetation. While submerged aquatic vegetation is now abundant, there is little emergent vegetation along the lake shoreline, which may limit egg-laying habitat for these insects.

Onondaga Lake Fish Community

The Onondaga Lake fish community consists of a diverse group of native and non-native species. Surveys conducted since 1987 have identified a total of 66 species. Many of these species are highly valued by anglers, including largemouth bass, smallmouth bass, walleye, brown trout, brown bullhead, yellow perch, and sunfish. Some, such as alewife, golden shiner, and other minnow species, serve as important sources of forage for sport fish and other predators. Still others, such as longnose gar, bowfin, and the state-threatened lake sturgeon, are valued for their unique appearance, life history, or relative scarcity. Together, all of these species comprise a vibrant and dynamic fish community that continues to change in response to improvements in the lake environment and a myriad of physical and biological forces at work in the lake.

Some recent changes in the fish community can be attributed directly to stocking efforts. For example, lake sturgeon have made their way to Onondaga Lake from Oneida Lake, where they had been stocked as part of an effort to re-establish this species. Other species can be tracked to exotic invasions from outside the watershed. Round gobies were introduced to the Great Lakes through ballast water in transoceanic ships, and were first documented in Onondaga Lake in fall 2010. Similarly, the alewife, first documented in 1946, likely entered through the canal system. This species has experienced dramatic population fluctuations over the years, with current population estimates at record levels.

The remarkable recovery of the system is exemplified by the increased numbers and wider distribution of large brown trout, which are stocked in Ninemile Creek, and now persist throughout most of the year in the lake. The distribution of the most popular sport fish, largemouth and smallmouth bass, varies seasonally as well as from year to year, perhaps in part reflecting changes in the aquatic vegetation in the lake.

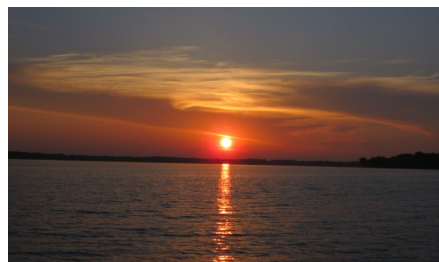
Exotic fish species such as round goby and alewife can have a profound effect on the overall lake ecosystem by altering food-web relationships, affecting water clarity, and changing species interconnections. Further changes in the lake's fish community are anticipated as water quality and habitat conditions improve. The significant reduction in ammonia and phosphorus input, and the consequent shift from eutrophic (nutrient-rich) to mesotrophic (moderate nutrient levels) conditions are expected to expand available fish habitat within both the littoral zone and the pelagic zone.

Fish species documented in Onondaga Lake, grouped by relative abundance (2001–2010)

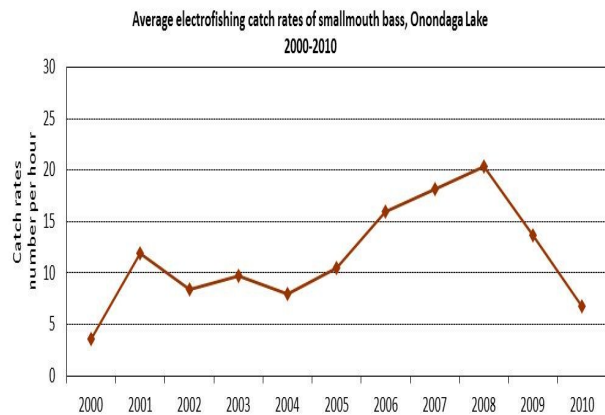
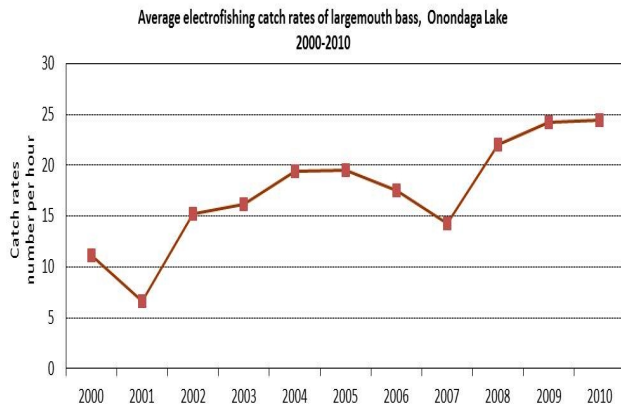
Very Common Species			Common Species				Uncommon Species			
Alewife	Banded Killifish	Bluegill	Black Crappie	Bluntnose Minnow	Bowfin	Brook Silverside	Black Bullhead	Chain pickerel	Goldfish	Greater Redhorse
Brown Bullhead	Carp	Gizzard Shad	Brook Stickleback	Brown Trout	Emerald Shiner	Fathead Minnow	Green Sunfish	Johnny Darter	Lake Sturgeon	Longnose Dace
Golden Shiner	Largemouth Bass	Pumpkinseed	Freshwater Drum	Longnose Gar	Logperch	Northern Pike	Northern Hogsucker	Quillback	Rainbow Trout	Round Goby
Smallmouth Bass	Walleye	White Perch	Rock Bass	Tessellated Darter	Shorthead Redhorse	Channel Catfish	Rudd	Spotfin Shiner	Tiger muskie	Trout Perch
White Sucker	Yellow Perch		Yellow Bullhead				Tadpole madtom	White Bass	Silver Redhorse	Rainbow Smelt



Longnose gar



Northern pike



Where are all the bass?

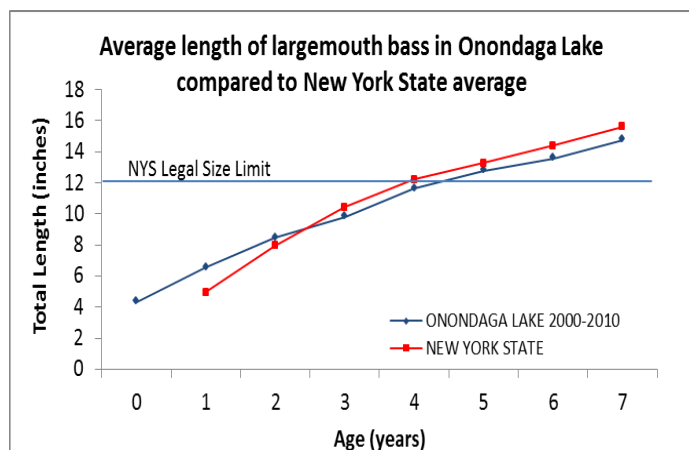
In the past few years, annual catch rates of smallmouth bass have declined, while largemouth bass have increased or remained steady (see plots above). Bass fishermen report that smallmouth bass are difficult to catch. While the exact cause of this decline is currently unknown, scientists are studying the changing conditions in the lake due to water quality improvements, and their effects on the fish community. Onondaga Lake is part of a larger system and is dynamic; therefore, changes in the fish community are expected. At first glance, the story seems simple: nutrient loading from the Syracuse Metropolitan Wastewater Treatment Plant (Metro) has been greatly curtailed, and excessive algal production in the lake has declined as a consequence. This has resulted in more plant growth due to better water clarity and sunlight reaching greater depths than previously; the increased macrophyte cover provides habitat that is more favorable to largemouth bass. But the story is more complex, as events not directly related to nutrient input, such as invasive species and changes in alewife, affect the lake’s biological community.

How fast are the largemouth bass growing?

Age and growth estimations were made from scales collected from 810 largemouth bass captured between 2000 and 2010. These growth rates were compared to growth rates estimated based on studies conducted on Onondaga Lake in the early 1990s; results suggest that growth rates have not changed significantly over the past decade. Overall, growth rates of largemouth bass in Onondaga Lake are comparable to those found in many other New York State lakes (see figure below). Under the current 12-inch minimum statewide size limit, most largemouth bass in Onondaga Lake are recruited into the fishery (that is, reach the legal size limit for capture) during their fourth and fifth growing seasons.

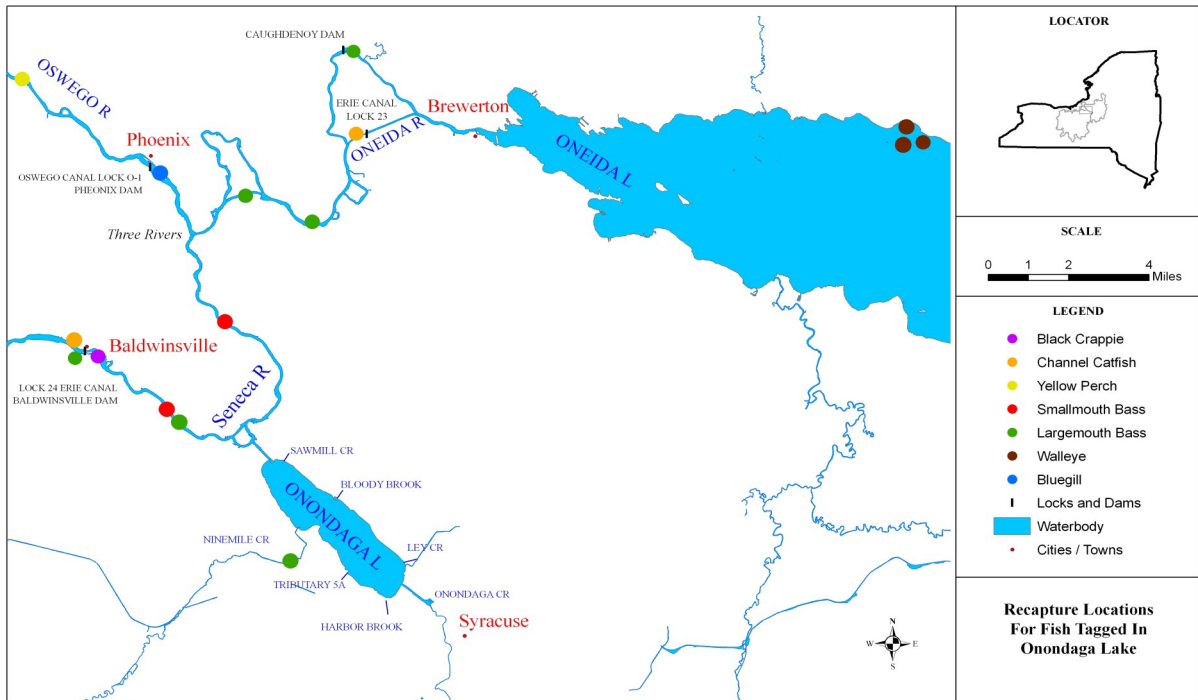


Largemouth bass



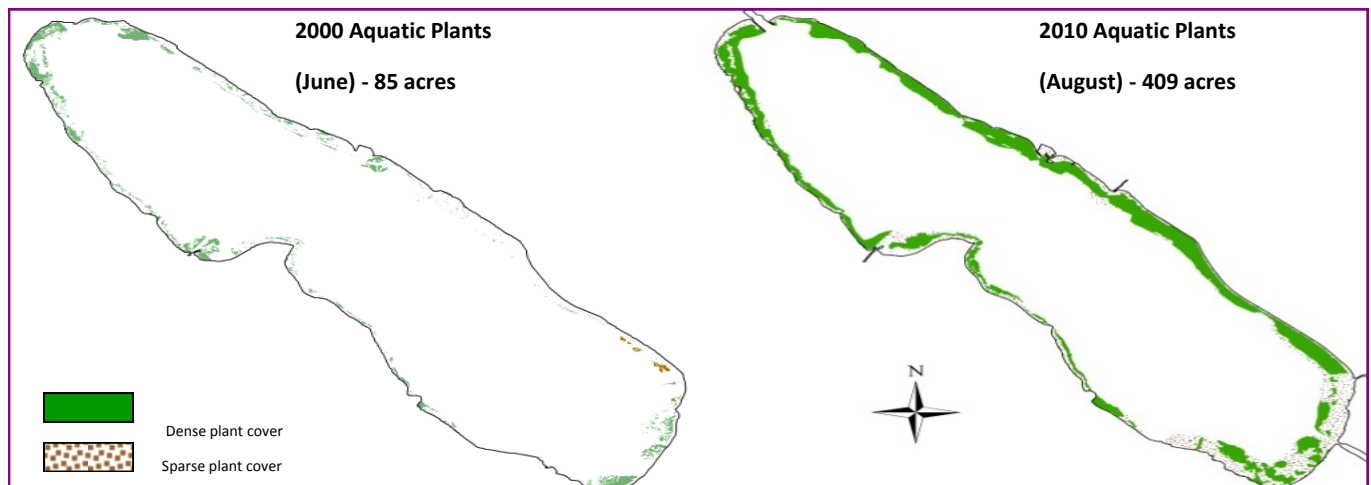
Fish Migration Patterns

Onondaga Lake is an open system, connected to the Seneca, Oneida and Oswego Rivers. Recent fish tagging studies have documented where the fish move and how they use the system. Many species swim between the lake and the larger system throughout the year. As illustrated below, fish tagged in Onondaga Lake have been found in Three Rivers and Oneida Lake.



Aquatic Vegetation

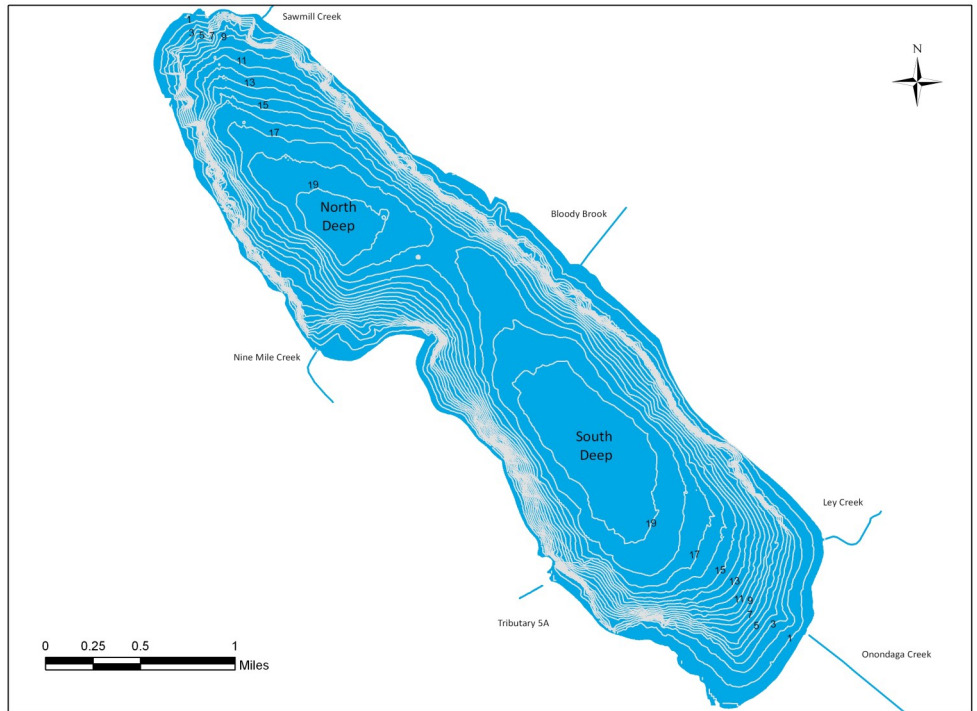
Aquatic macrophytes are an important component of lake ecology; they produce food for other organisms, shelter fish and wildlife, and help stabilize sediments. The productivity, distribution, and species composition of macrophyte communities are affected by environmental factors such as light, temperature, sediment composition, nutrient status and wave energy. In 2000, ten species of aquatic macrophytes were identified in Onondaga Lake, although the community was dominated by three species, sago pondweed, common waterweed, and water stargrass. In 2010, twenty-three species of aquatic macrophytes were identified, with five species dominating the community including coontail, common waterweed, water stargrass, southern naiad, and Eurasian water milfoil. Coverage has increased from 85 acres in 2000 to 409 acres in 2010. The majority of the lake shoreline now supports aquatic vegetation.



Where are good places to fish?

Onondaga Lake has a varied recreational fishery, with largemouth and smallmouth bass, pumpkinseed and bluegill, yellow perch and brown bullhead some of the more common sport fish present.

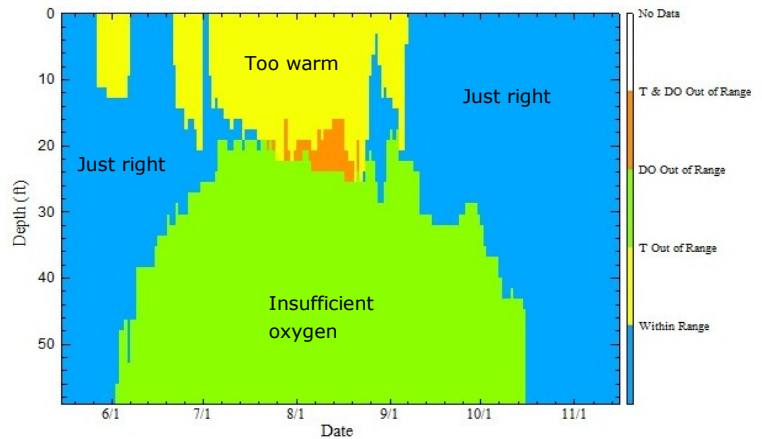
One aspect of the Onondaga Lake fishery of interest to anglers is the bathymetry, or bottom contours of the lake. Locating areas of drop-offs (where the contour lines are very close together) or shallow shelves may help anglers target desired fish species.



Assessing Fish Habitat

Water temperature and dissolved oxygen (DO) levels are two of the most important factors affecting fish habitat. Onondaga County tracks "fish space" each year—a plot of the interaction of water temperature and DO. For coldwater fishes, such as brown trout, preferred habitat conditions have DO concentrations above 6 mg/l and temperatures below 22°C. As illustrated in the graph to the right, in 2010 the DO concentrations were too low in the lake's deep water between mid-June and October (green shading), and water temperatures were too high in the upper waters during the summer (yellow shading) for coldwater fishes.

Illustrating Fish Habitat through the Year



Fish Habitat in Onondaga Lake in 2010
Note: Water temperature < 22 deg. C and dissolved oxygen >= 6.0 mg/L between May 15 and November 15.

Onondaga Lake is not classified by the New York Department of Environmental Conservation as a trout water. The lake supports a productive warm and coolwater fishery, and water quality conditions support coldwater species in the spring and fall.



Brown trout

Exotic Species Awareness

Onondaga Lake is now home to many non-native species. Some, like round goby and alewife, can influence biological and physical conditions. Onondaga Lake has already changed as a result of the invasion of alewife, zebra mussels and quagga mussels. The impact of the newly-established round goby population is not yet known. The water chestnut, a rooted plant with floating leaves that can form large, dense mats that provide poor habitat and can interfere with angling and boating, has been found near the lake outlet. It is important for anglers and boaters to avoid introducing species into the lake. Read and follow all signs posted at access points regarding appropriate ways to minimize the chance of spreading exotic species, and encourage others to do the same.



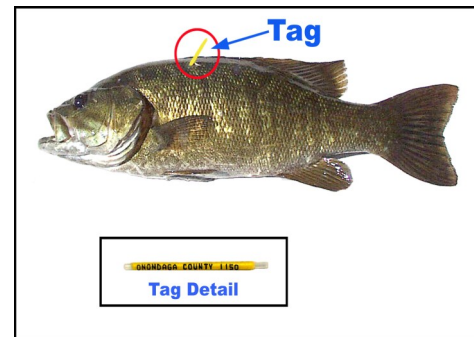
Alewife



Round goby

If I catch a fish with a tag, what should I do?

Many fish are tagged with a colored "spaghetti tag" below the dorsal fin (fin on the fish's back). The information gathered from these tags, such as how far the fish moved and how much it has grown since it was tagged, is important in understanding the fish community. Anyone catching a tagged fish should record the tag number, the length, weight if known, and location caught, and report this information to OCDWEP (315-435-2260 ext. 360) or SUNY-ESF (315-470-6606).



Smallmouth bass

What about fish consumption advisories?

Similar to other waters in New York State, a health advisory for Onondaga Lake fish was issued by the New York State Department of Health. Specifically, the advisory states to eat no walleye of any size, no largemouth or smallmouth bass over 15 inches, no more than four meals per month for brown bullhead and pumpkinseed, and no more than one meal per month for any other legal species. For information on fish consumption advisories for New York waters, see the State's health advisory report at <http://www.health.state.ny.us/environmental/outdoors/fish/docs/fish.PDF>



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More information about the lake's biological community and changing water quality, including annual monitoring reports, may be found on the Onondaga County web site.