

## **Aquatic ecology**



### **Fisheries**

Of the 970 hectares of the Gardens' natural lands more than 300 hectares are aquatic environments. These include an incredible diversity of habitats ranging from cold Niagara Escarpment creeks to the warm and fertile coastal marshes of Lake Ontario. This diversity and abundance of aquatic habitats provides for almost unparalleled fish diversity. Over 60 species of fish inhabit the Gardens' marshlands.

Most of the Gardens' aquatic habitats are of great ecological significance representing the best, and often only, remaining spawning and nursery habitat for virtually every fish species in Burlington Bay and western Lake Ontario. It is estimated that these nursery environments produce about 20 million new fish annually — more than double the entire provincial stocking effort through fish hatcheries.

Virtually every element of the Gardens' aquatic habitats has been harmed to some

degree over the past century. As a result, small populations of any given native species remain, with more than 20 species completely eliminated.

The most common species found today are those that have adapted to shallow, open-water environments. These species include brown bullhead, white perch and gizzard shad, totaling nearly 90% of all fish produced in our wetlands annually. Until recent conservation projects began, the common carp was the most abundant adult fish found in Cootes Paradise. Now, with the virtual elimination of carp through the Fishway, aquatic habitat conditions are improving, initiating the recovery of a wide range of species.

Native species leading the way include bluegill sunfish, largemouth bass, and the historically dominant yellow perch.

### **Monitoring**

Annually, aquatic ecologists monitor the fish population to study spawning, feeding and schooling behaviours, and most importantly, to note significant changes in diversity and population abundance. A variety of monitoring programs are in place, including visual spawning surveys, electrofishing surveys, and Fishway operation.

Monitoring begins in March at the Fishway when the spawning season gets off to an early start with the migration of pike, trout and suckers into Cootes Paradise. Pike also start migrating into the rehabilitated Hendrie Valley ponds in lower Grindstone Creek. Spawning runs of various species continue through the Fishway until early July, with channel catfish the last species to pass through the structure. Late summer monitoring is carried out to examine the success of young fish produced in the nursery areas, and is done by electrofishing selected sites. In the fall, monitoring concludes with visual spawning surveys along various creeks for a variety of salmon and trout species, including the introduced Chinook salmon and brown trout.

### **Water Quality**

Water quality testing throughout the Gardens' aquatic habitats is one of the most important factors in determining their health. Local water quality over the past century has not been characteristic of naturally occurring water in Ontario, and native aquatic species have suffered while flora and fauna introduced from other parts of the world have become abundant. Today the water can be described as having periods of reasonable quality interspersed with poor quality. This is a substantial improvement from the 1970s when local water quality was rated as poor, but it is still far from the level necessary to become a thriving wetland once again. Several projects are underway to eliminate the current periods of poor quality water.

### **Monitoring**

Royal Botanical Gardens has conducted a long-term water quality monitoring program since 1977. Some of the parameters measured in the program include dissolved oxygen, nutrients, sediment and water clarity. The closer each parameter is to a certain



concentration level, the closer the quality of water is to being suitable for a wide variety of indicator species and is therefore considered acceptable.

Parameters are not independent of each other; the level of one element affects the level of another. There are 15 monitoring stations in and around the Cootes Paradise and lower Grindstone Creek systems where water samples are collected twice a week between May and September. In addition to long-term monitoring, on-going research is conducted to address scientific questions and direct restoration initiatives and conservation projects.

Water quality targets

- water clarity > 1.5m
- dissolved oxygen > 5mg/l
- total phosphorus < 70ug/l
- nitrates < 2mg/l
- chlorophyll A < 20 mg/l
- total suspended sediment < 25 mg/l

### **Water cycles**

The timing of water level changes, and the depth over which they range, are two of the fundamental factors that determine the types of plants and animals found in a wetland. While species composition changes with the type of water cycle found, a basic relationship exists. Generally, water rises in the spring, floods the previous year's dead vegetation in the marsh, and fish and other aquatic organisms migrate into the marsh to breed, the water then recedes and the vegetation re-grows. This cycle repeats year after year. As weather patterns vary from year to year the time of maximum flooding also varies, which in turn affects the breeding success of fish and wildlife. Extremes of drought or heavier precipitation can dramatically altered the species composition, with droughts promoting tremendous wetland plant growth, and floods causing short term explosions in fish and wildlife species.

Two general water cycles affect the Gardens' wetlands. The Lake Ontario water cycle affects the coastal marshes portions, and the creek/floodplain water cycle affects the rivermouth portions. Both of these water cycles have been altered over the last century and many of the aquatic species found in these habitats have suffered. Currently the lake level is regulated by a dam on the St. Lawrence River and results in delayed spring peaking, as extra water released during the previous fall is recovered. For the creeks, land use changes have destabilized the flows and floods, resulting in higher but shorter duration floods as the water is now piped off the land to the creeks through storm drains and weeping tiles.