ROYAL BOTANICAL GARDENS
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Common Carp Backgrounder

Common Carp (*Cyprinus carpio*) are the largest member of the minnow family and closely related to goldfish. They are identified by their long dorsal fin, olive-green back, yellowish sides, and sucker mouth. Carp are native to temperate regions of Asia and are one of the many non-native invasive species found within the RBG lands. Carp are a fast growing fish: they are sexually mature at two to four years of age (35 to 45 cm, ~1 kg) and may live up to 40 years, reaching 110 cm (40kg). The average carp caught at the Cootes Paradise Fishway weighs between 2 and 11 kilograms, but carp as large as 25 kilograms have occurred.

The eating and spawning behavior of carp contribute to the destruction of the marsh. They stress is considered "human-caused" because carp are not naturally found in Cootes. Since the 1940s, RBG has identified that keeping carp out of the marsh is the necessary first step in returning the marsh habitat to a healthy wetland. Accordingly, many attempts have been made to keep carp out. In the 1950s, carp fishing and net barriers were tried. Today, very successful projects such as the Fishway and Christmas Tree barriers are working. Keeping carp out of the marsh is good for the whole marsh environment because wetland plants can grow and the water stays clear, which are both important for a marsh ecosystem.

Why are the Carp here?

Carp are a food source in many cultures, so people have introduced them to places all over the globe. Carp are not picky eaters, they grow large very quickly, and they do well in warm water with lots of nutrients. The large fish were brought to New York State in 1831. Today they are found in all the Great Lakes and much of southern North America.

Carp were first introduced to Lake Ontario in the 1870s from a fish hatchery at Wilmont Creek. They were brought in to replace Atlantic Salmon, which were not common anymore. By the 1930s, carp was the dominant species in RBG marshlands. Carp start to harm the environment when they are **50kg of carp for every hectare (50kg/ha)**. In the early 1990s, there was an average carp density of **800 kg/ha** throughout the RBG 300 ha of marshlands. This large population size happened because of many factors, including changed water quality, changed lake water cycles, and the attraction of warm river-mouth marshes, such as those found at RBG, which are loved by carp.

Wetland Destroyers - Carp Ecology

Due to the large size of carp, even a medium-sized population (>50 kg/ha) of carp can dig up and hurt wetland plants faster than they can grow back. The fish's eating behavior (foraging) acts like a hoe or shovel digging up plants, while groups of carp trying to lay and fertilize fish eggs (spawning) among the plants crush both native plants and animals. Plants are the foundation of the marsh system, so losing them means the whole ecosystem will collapse.

Carp are specifically adapted to foraging on the floor of a rivermouth marsh environment in the soft soils. When feeding, carp force their face into the mud using their sucker-mouth to suck in the bottom material. The inhaled soil is then filtered across their gills, keeping the food (worms, aquatic insects, mollusks, crustaceans, decaying organic matter (detritus) and seeds), while the fine sediment is expelled back into the water. This behaviour both physically uproots wetland plants and stirs up the bottom sediments, ruining the quality of water quality and further destroying plant growth. There are other native Ontario fish (e.g. fathead minnow) feed like this, they do not grow as large as the carp in marsh habitats.

Carp need the wetland plants for spawning. Each spring when water temperatures get close to 17^{o}C, groups of adult carp group near the flooded plants. During spawning, a single female thrashes about and scatters the eggs onto the plants. She will be chased by as many as 20 males who want to fertilize the eggs. Due to their large size, this activity crushes both native plants and small organisms. In the early 1990s, groups of spawning fish in the RBG marshlands were measured at approximately 5,000 kg/ha. Because a single 10kg female carp will carry around 1,000,000 eggs, carp are the perfect species to fill a poor habitats such as damaged marsh environments.

Carp Elimination Through Behavioural Cycles

Removing carp is an important part of making RBG marshlands healthy again. Knowing about carp behaviour is a key factor in knowing how to remove them. Each year, carp behave in a similar way:

- In the spring they migrate up-river to floodplain areas, and spawn on vegetation
- In the summe they return to river-mouth marsh to eat and grow
- In the fall they leave shallow water in the river-mouth marsh for deep water
- In the winter they remain inactive in deeper water until spring.

The fact that carp leave the marsh and go to the bay for the winter is what makes excluding carp possible. They can stopped from entering the marsh when they try to return in the spring.

When we keep carp out of the marshlands, they are cannot get to their main spawning area. Although the excluded carp may lay eggs in other areas of the Hamilton Harbour basin, the chance that the young fish survive is very low. The young fish need the shallow marsh environment which they cannot get in the harbour. For this reason it is only necessary for the barrier to block adult carp (bigger than 35 cm long). Over time, the carp population gets smaller.