



Common Carp Backgrounder

Closely related to the goldfish and the largest member of the minnow family, the common carp (*Cyprinus carpio*) is identified by its long dorsal fin, olive-green back, yellowish sides and sucker mouth. Carp, native to temperate regions of Asia, are one of the many non-native invasive species found within the RBG natural lands. Carp are a fast growing fish, which 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 foraging and spawning behavior of carp is one of the key human-induced marsh stressors contributing to the degradation of the RBG's marsh habitats. Carp exclusion has been seen as the necessary first step in marsh habitat restoration by RBG since the 1940s. Accordingly, various attempts have been made from commercial carp fishing and net barriers in the early 1950s, to the present and very successful projects such as the Fishway and Christmas Tree enclosures. Carp elimination benefits all levels of the marsh environment because it allows for the regrowth of aquatic plants and improved water clarity, the foundation of a marsh ecosystem.

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History of Carp Introduction

Carp are valued as a food source in many cultures, so human activity has introduced them across the globe. For centuries carp have been used to stock fish hatcheries. Carp have an adaptable diet, grow to a large size very quickly, and thrive in warm nutrient rich waters. First introduced to New York State in 1831, after decades of intentional and accidental releases, they are now abundant throughout the Great Lakes and much of southern North America.

Carp were first introduced to Lake Ontario in the 1870s when they were raised and stocked from a fish hatchery at Wilmont Creek. as a replacement for the disappearing Atlantic Salmon. By the 1930s, carp had become the dominant species throughout the RBG marshlands. Serious ecological impacts begin to occur once carp densities exceed **50kg/ha**. In the early 1990s before the installation of the carp barrier, carp occurred at an average density of **800 kg/ha** throughout the RBG 300 ha of marshlands. This large population size is a result of a combination of factors, including altered water quality, an altered lake water cycle, and the fact that warm river-mouth marshes, such as those found at RBG, are the niche of the species.

Wetland Destroyers - Carp Ecology

Due to carp's large size, even moderate population densities (>50 kg/ha) of carp can uproot and crush aquatic plants faster than they can regrow. Their foraging behaviour acts like a marsh rototiller uprooting plants, while spawning clusters among the flooded vegetation crush both native plants and animals. Plants are the foundation of the marsh system, so vegetation loss results in system collapse.

Carp are specifically adapted to foraging on the floor of a rivermouth marsh environment in the soft sediments. When feeding, carp force their face into the soft rivermouth sediments using their sucker-mouth to inhale the bottom material. The inhaled sediment is then filtered across their gills, retaining the food (worms, aquatic insects, mollusks, crustaceans, decaying organic matter (detritus) and seeds), while the fine sediment is expelled into the water column. This behaviour both physically uproots existing aquatic plants and re-suspends the bottom sediments, degrading water quality and further impacting plant growth. Although this is a common feeding behaviour of a number of native Ontario fish (e.g. fathead minnow), no native fish nearly as large as carp uses this foraging style in the marsh environment.

Carp depend on aquatic plants for spawning. Each spring when water temperatures approach 17°C, groups of adult-carp congregate in the flooded vegetation. During spawning, a single female will be pursued by up to 20 males, thrashing about and scattering the adhesive eggs onto the plants. Due to their large size, this activity crushes both native plants and small organisms. In the early 1990s, spawning aggregation densities in the flooded vegetation of the RBG marshlands were measured at approximately 5,000 kg/ha. Also, a single 10kg female carp will carry approximately 1,000,000 eggs, making them an ideal species for quickly colonizing unstable habitats such as degraded marsh environments.

Carp Elimination Through Behavioural Cycles

Annual Cycle of carp movement

- Spring: migrate up-river to floodplain areas, spawn on flooded vegetation
- Summer: return to river-mouth marsh to forage and grow
- Fall: leave shallows of river-mouth marsh for the winter
- Winter: remain dormant and inactive in deeper water until spring.

The elimination of carp is an integral step in the rehabilitation of the RBG nature sanctuary marshlands. Knowledge of carp behaviour is a key factor in the elimination technique. Behaviour patterns include a spring migration into the shallow marshlands, and fall migration out to the adjoining deeper waters of Burlington Bay. This is because carp prefer to spend the spring and summer in the marshlands and to leave the marsh for the winter. Declining fall water levels of Lake Ontario, and associated RBG marshlands, in combination with winter ice, generally leaves the marshes less than 30 cm deep during the winter and uninhabitable. Some winters the marshes freezes completely to the bottom, eliminating most any species still within. Cooling fall weather triggers the migration out of the marsh. The fact that carp leave the marsh to over-winter in the bay is what makes carp exclusion possible because they can be intercepted when they return to the marsh areas in the spring.

By excluding carp from the marshlands, they are prevented from accessing their main spawning area. Although the excluded carp may spawn in other areas of the Hamilton Harbour basin, the survival rate of their young is very low because appropriate nursery conditions exist only within the shallow marsh environment. For this reason it is only necessary for the barrier to exclude mature carp (> 35 cm long). Over time, the carp reproduction is greatly reduced and the overall carp population also declines.