

THREATENED ECOSYSTEMS

Prior to European settlement, Cootes Paradise and the shallows of Hamilton Harbour sheltered vast and thriving freshwater coastal marshes. Most coastal marshes are found where a creek or river drains into a larger body of water. Nutrient-laden sediments eroded from the watershed are deposited at the river's mouth, creating a shallow enriched bay. The combination of a constant supply of nutrients and the warm shallow water, creates a highly productive environment that supports a wide assortment of aquatic plants, fish, birds, and wildlife.

The bounty and richness of the flora and fauna of coastal marshes of the Great Lakes did not go unnoticed by 19th century settlers. The marshes offered abundant fishing and hunting opportunities, and when drained, they provided fertile farmland with easy access to shipping and water. As a result, many of the large cities on the lower Great Lakes sprang up where coastal wetlands once thrived.

Today only a fraction of these coastal marshes remain undisturbed. For example, of the estimated 500 hectares of marshland that once existed in Hamilton Harbour and Cootes Paradise, only about 50 hectares remain today. This loss is especially pronounced along the south shore of the Harbour, where 140 years of filling, dredging and industrial development have virtually eliminated once abundant wetlands.



Aerial view of Cootes Paradise marsh.

In 1986, the Hamilton Harbour Remedial Action Plan (HH-RAP) was initiated to combat environmental degradation in the watershed. Besides controlling industrial pollution and sewage effluent, this plan emphasizes the creation and restoration of fish and wildlife habitat. A prime example of this restoration work is found in Cootes Paradise, a 250 hectare wetland sanctuary owned by Royal Botanical Gardens (RBG). The largest remaining coastal marsh in western Lake Ontario, this provincially significant wetland is an important staging area for migrating waterfowl, and a vital nursery area for most fish species in Hamilton Harbour and the western end of Lake Ontario.



Abandoned in the 1870s, the Desjardins Canal has evolved from a boathouse fishing village to the current site of the Fishway.

Decline and Recovery of Cootes Paradise

Once nearly 100% covered by emergent and submergent aquatic plants, the extent of marsh vegetation has declined to 85% cover in the 1930s, and to only 15% in 1985. A variety of stresses were responsible for this decline. Human development and farming in the watershed contaminated the marsh's tributary streams with sewage effluent, eroded soil, and chemical runoff. Within the marsh, carp activity physically damaged and destroyed the marsh plants. Carp activity and eroded soil from the watershed also muddied the marsh water, limiting light penetration and plant growth. Controlled lake water levels, and the introduction of non-native plant species have also disrupted marsh ecology. For the restoration of Cootes Paradise to be successful, RBG and other partners in the HH-RAP agreed that an effective carp control program and pollution abatement programs in the watershed were necessary.



CARP AS WETLAND DESTROYERS

Reducing the carp population in Cootes Paradise is a vital step in the marsh restoration process. This will improve water clarity, allow marsh vegetation to recover naturally, and improve the success of wetland planting programs.

A relative of the goldfish, common carp (*Cyprinus carpio*) usually have olive-green backs, yellowish sides and white bellies. These robust fish are covered in large, protective scales, and have two pairs of barbels (whiskers) around a sucker mouth. The sucker mouth is used to suck up globs of soft bottom sediment. The carp then swishes the sediment around in their mouth, keeping the food, and expelling the sediment. If the sediment is fine enough, it remains in suspension, muddying the water.

Carp food is most abundant among the roots of aquatic plants. Consequently their favourite habitat is shallow bays and marshes. "Rooting" by carp around these plants damages the roots, often



This carp weighed 16 kg (35 lbs.). Carp at the fishway usually range from 2 to 11 kg (5 to 25 lbs.) Carp up to 25 kg (64 lbs.) are on record.

killing or uprooting the plants. The resistance of the plants to carp "rooting" is related to the bottom type, the strength of the plant roots and the timing of seed production. Aquatic plants are the foundation of the marsh ecosystem. By "knocking out" the foundation, the entire system collapses. The loss of plants also results in the loss of a stream channel through the marsh.

FISH AND WETLANDS - MOTHER NATURE'S FISH HATCHERY

Many animals have evolved to depend on shallow coastal marshes for at least part of their life cycles. Marshes are especially important as nesting and nursery areas for raising young. While ducks are the most celebrated of these creatures, marshes are just as important to fish. Of the 156 fish species in the Great Lakes watershed, approximately 130 species directly depend on coastal marshes for reproduction. Fish such as bass, perch, pike and minnows spawn in the warm shallows. Some species use the plants themselves as a nesting site. Other species such as trout, salmon, walleye and suckers spawn in tributary streams or rivers. All of these fish use the marsh as a nursery habitat. The dense aquatic plants and associated invertebrates provide the young fish with abundant food, while affording protection from predators.

Since a marsh is a spawning and nursery area, the fish community of a marsh varies throughout the year. This is because different species spawn at different times of the year. The general rule of thumb is that an individual adult fish will spend about a month in the marsh spawning. The adult fish will then return to its adult habitat in deeper water. Most species of adult fish enter the marsh in the spring and early summer to reproduce, while a few spawn in the fall. The resulting young-of-the-year fish dominate the marsh by late summer. The migration of adults out of the marsh also reduces competition between adults and offspring. The young fish are left with an ample food supply and grow quickly. It is critical for young fish to store up enough energy to survive their first winter. Some adult fish will also forage in the marsh at different times of the year. These include bowfin, catfish, and gar in the summer, and trout in the spring and fall. As fall arrives all the fish move out of the marsh. This is because during the winter months much of the marsh will freeze to the bottom.

Species	Spawning Date (months)											
	J	F	M	A	M	J	J	A	S	O	N	D
Bigmouth Buffalo												
Black Bullhead												
Black Crappie												
Bowfin												
Brown Bullhead												
Brown Trout												
Carp												
Channel Catfish												
Chinook Salmon												
Freshwater Drum												
Gizzard Shad												
Goldfish												
Lake Trout												
Largemouth Bass												
Longnose Gar												
Northern Pike												
Rainbow Trout												
Shorthead Redhorse												
Silver Redhorse												
Smallmouth Bass												
Walleye												
White Bass												
White Crappie												
White Perch												
White Sucker												
Yellow Perch												

Above are the spawning habits of some of the fish that visit Cootes Paradise. The shaded area indicates the months of Fishway operation.



Carp require plants to spawn on, and due to their size and numbers are quite destructive. In Cootes each spring thousands of large carp crowd into the plants. Splashing in the plants at this time may draw your attention to them. To fully appreciate the impact of spawning carp, just imagine a pack of large, excited dogs frolicking in your favourite flowerbed!

Carp are native only to temperate regions of Asia. However, as they are valued as a food fish in many cultures, human activity has taken them across the globe. Carp have been used in aquaculture for centuries, as they have an adaptable diet, grow to a large size very quickly, and thrive in warm nutrient-enriched water. They were first introduced to New York state in 1831, and after decades of intentional and accidental releases, they are now abundant throughout the Great Lakes and much of southern North America.

In the late 19th century, government in the United States and Canada promoted carp as a “worthwhile addition to the natural fauna of North America”. In 1881, Samuel Wilmont, Superintendent of Fish Culture in Canada, stocked carp in a fish hatchery on Lake Ontario. His goal was “to make carp available for public distribution throughout the waters of Canada...to see those waters deserted by salmon now, stocked with a fish that will be welcome to the poor man’s table” (McCrimmon, 1968). Unfortunately Samuel Wilmont did not have an understanding of the ecology of carp.



Commercial carp netting in Cootes Paradise in the 1950s.

PROFILE OF A MARSH-BUSTER

Feeding:

- Feeding physically damages plants and restricts light penetration by increasing water turbidity.
- Carp are bottom-feeders - eating a wide range of mollusks, worms, aquatic insects, crustaceans, detritus (decaying organic material), and seeds.
- Carp usually suck up a mouthful of bottom ooze, select desired food items, and expel the remaining mud into the water.

Spawning:

- Spawn in and on plants in bays and marshes in May and June, when the water reaches 17 °C (63 °F).
- Groups of up to 20 thrashing individuals roil in the plants, often with their backs out of the water.
- Carp are extremely prolific - large females may lay over 2 million eggs each year.
- Fertilized eggs are sticky and become attached to the aquatic plants, and hatch in 3 to 6 days.
- Carp do not look after their young, and very few will survive to maturity - young are eaten by predatory fish (i.e. pike, bass, bowfin) and birds (i.e. herons, terns, and kingfishers).
- Carp over 1.5 kg (3.8 lbs.) have few natural enemies, and may live for 20 years. That is a lot of eggs in a lifetime!
- Young may reach 13-19 cm (5-7”) in length during their first summer, but do not reach sexual maturity until 3 to 4 years of age (35-45 cm).

Surfing the Web- Interesting Sites

Royal Botanical Gardens, www.rbg.ca

Environment Canada - Great Lakes Information, www.on.ec.gc.ca/water/greatlakes/intro-e.html

Bay Area Restoration Council/Hamilton Harbour Remedial Action Plan, www.hamiltonharbour.ca

Environment Canada’s Green Lane, www.ec.gc.ca/envhome.html

Great Lakes Wetlands Information, www.great-lakes.net

McMaster University’s Ecowise Project, www.mcmaster.ca/ecowise/

U.S Environmental Protection Agency - Great Lakes, www.epa.gov/glnpo/

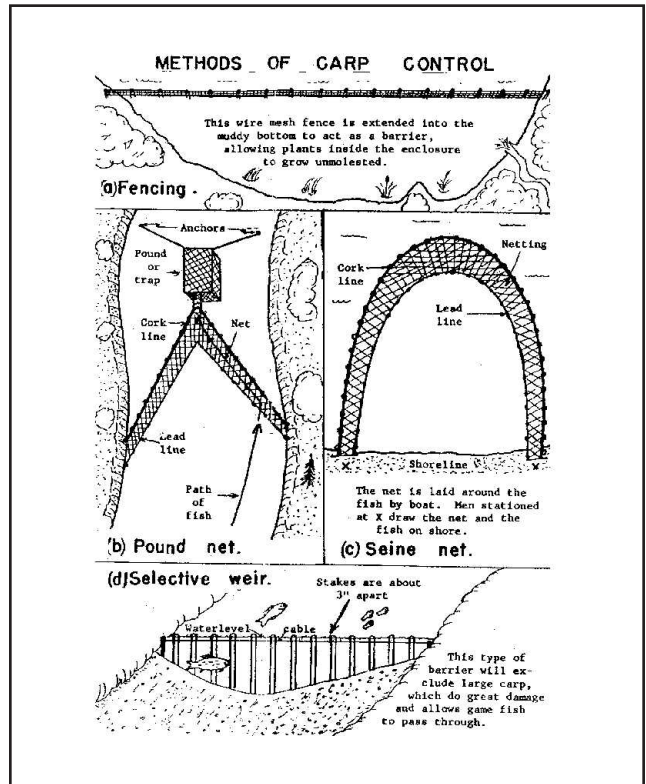
National Wetlands Research Centre, www.nwrc.gov/



The concept of carp control in Cootes Paradise is by no means a new idea!

- **1930s** - Carp were blamed for the loss of wild rice and wild celery in Cootes Paradise
- **1949** - Carp control was deemed necessary. The construction of a dam on the Desjardins Canal was proposed to lower water levels in Cootes and kill carp fry. However this project was never carried out.
- **1950-1951** - A pound net was placed across the Desjardins Canal to exclude carp (and all other large fish), but operation was too expensive to continue.
- **1954-1960** - A wetland planting program was combined with the commercial harvest of roughly 140 000 carp using seine nets. This program was quite successful in restoring marsh vegetation, but carp numbers rebounded after the harvest ended.
- **1961** - A selective weir was proposed on the Desjardins Canal to exclude carp.
- **1986** - Hamilton Harbour Remedial Action Plan (RAP) was initiated to combat environmental degradation and wildlife loss.
- **1987** - RBG and the National Water Research Institute experimented with a variety of methods to control carp damage. These included lowering water levels in Mercer's Glen, a 2.2 ha (5.4 acre) pond, and building carp enclosure fences in West Pond.
- **1991** - Under the auspices of the RAP, RBG initiated Project Paradise to restore Cootes Paradise marsh. Wetland planting inside carp enclosures was used with great success.
- **1993-1994** - The 585 m (2 100') long "Aqua Dam™" (a portable water-filled dike) was installed to temporarily drain and re-vegetate a large portion of Cootes Paradise.

- **1996** - The fishway on the Desjardins Canal began operating in March. However, it was damaged in May after a severe storm, and operation was suspended for the year.
- **1997** - After a series of repairs and underwater inspections, the new and improved fishway emerged victorious in 1997. After the first year of successful carp exclusion, Cootes Paradise marsh is on its way to recovery!



Carp control measures in Cootes Paradise in the 1950s (from Lamoureux, 1961).



A fenced-in carp enclosure in which cattails are planted to protect them from carp damage, prior to the Fishway.



THE FISHWAY - HOW IT WORKS

The Fishway is located on the Desjardins Canal between Hamilton Harbour and Cootes Paradise, under the McQuesten (High-Level) Bridge on York Boulevard. The primary function of the Fishway is to prevent the spring migration of **adult** carp from Hamilton Harbour into the marsh. The Fishway is also equipped with a series of baskets to capture other fish and pass them over the Fishway. The Fishway operating season runs from March to November. The operating season is dictated by the migration times of fish into the marsh.

The Fishway is strategically located between the spawning area (the marsh and its tributaries), and adult habitat (the harbour and Lake Ontario) of the fish. The Fishway is able to function simply because all fish leave Cootes Paradise in the fall to over winter in the deeper harbour and lake waters. The fish return to the marsh in the spring and summer to spawn. Grates on the Fishway act as a strainer preventing passage of all large fish (>30 cm) into the marsh, while maintaining water flow and access for smaller fish.

The bars in the grates are spaced 5 cm (2 in.) apart. The width of the bars prevents passage through the grates of fish larger than 30 cm (12 in.) in length. The width of the bars is designed such that they are as wide as possible, while still preventing access of **adult** carp. Carp reach maturity between 3 and 4 years of age, and at this time their width is more than 5 cm. Once adult carp access to the marsh is prevented, successful spawning is severely limited, resulting in a smaller harbour carp population.

Operation of the Fishway is necessary to allow access to the other large fish species to and from their spawning areas within the marsh. There are 46 fish species in Lake Ontario and Hamilton

Harbour which grow large enough to require passage over the Fishway. To accommodate the larger fish species, the Fishway is equipped with a series of baskets to capture and move the fish into and out of the marsh. During the operating season the baskets are capturing fish 24 hours a day. The baskets cannot discriminate between carp and other fish. As a result, the baskets which are catching fish moving from the harbour to the marsh also catch large numbers of carp. The carp are sorted from the other fish on the Fishway. The carp are returned to the harbour side of the barrier, while the other fish are released into the marsh.

The Fishway serves as a valuable fisheries research tool. Fishway technicians gather information on the migrating fish, including sex, length, and weight for most of the fish handled. This important scientific data will provide insight on fish populations, species diversity and spawning success in the Hamilton Harbour watershed. Also due to the wide variety of fish species which occur, the Fishway provides an excellent opportunity for the public to view the native fish of Ontario.



A large channel catfish is passed over the Fishway into Cootes Paradise.



Department of Fisheries and Oceans Photo

Fish passing through the Fishway such as these pumpkinseed sunfish are measured, weighed, and sexed.



The Fishway viewed from Cootes Paradise.



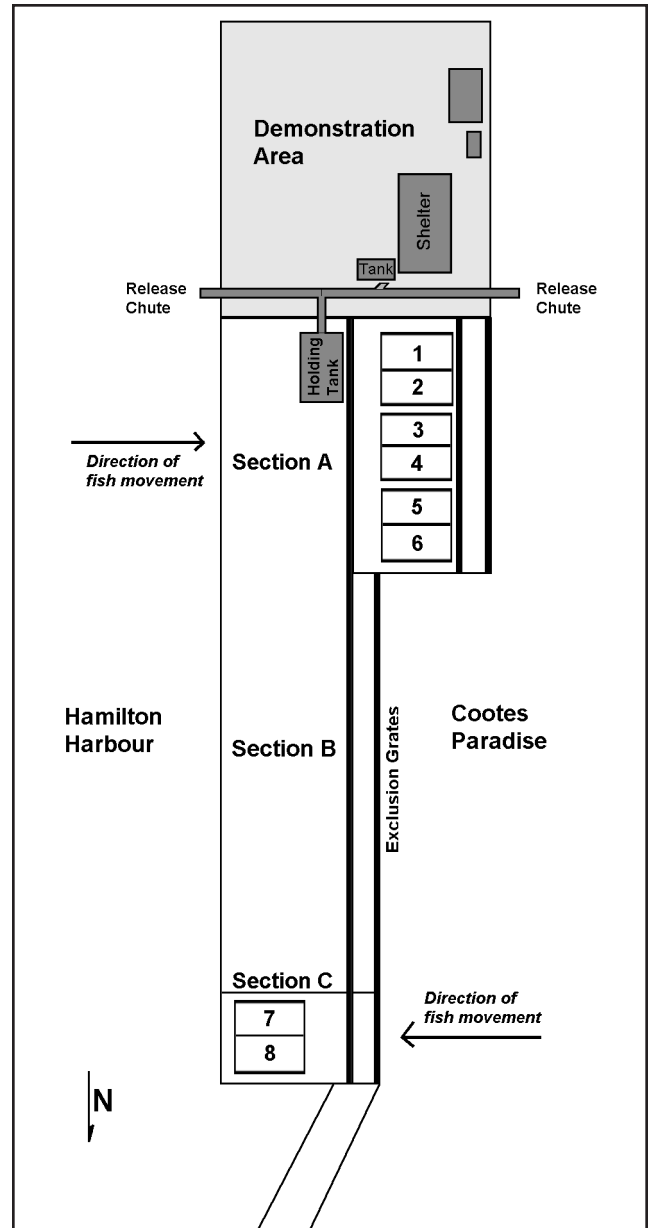
THE FISHWAY DESIGN

The Fishway Consists of Three Main Sections:

- A) **SOUTH (UPSTREAM) SECTION** - contains 6 chambers and the processing area. The baskets in these chambers capture fish moving from the harbour to Cootes Paradise. These baskets are also lifted during Fishway operation. Carp and goldfish are separated from the other species and returned to the harbour, while all other species are moved into the marsh.
- B) **CENTRE SECTION** - consists of a series of metal grates with 5 cm (2") wide openings. This section acts like a strainer, and allows small fish (less than 30 cm or 12" in length) and water to move freely through the fishway, while preventing access to mature carp. Held in place by posts, these grates are anchored firmly in the canal bottom.
- C) **NORTH (DOWNSTREAM) SECTION** - contains two chambers (7-8). These chambers contain baskets to capture fish moving from Cootes Paradise to Hamilton Harbour. These baskets are lifted during Fishway operation, and the fish captured are recorded and released on the harbour side of the barrier. Once Fishway operation finishes in November, one-way brushes are installed so fish remaining in the marsh can leave.



Baskets at the Fishway are lifted daily. Here the catch is emptied into a sorting table.



Schematic fishway diagram, as seen from above.

The Fishway is designed to pass fish in and out of the marsh with as little interference to their migration as possible. The Fishway is located in the canal on an angle, as opposed to straight across the canal. This is to help guide fish to the appropriate end of the Fishway. The Fishway is the only fishway in the world equipped to move fish in either direction. This is because other fishways are associated with dams on rivers. In these situations fish moving downstream are able to pass the dam by going over top, or underneath. The Fishway baskets are designed to handle fish up to 2m (6 ft) in length. Unlike other fishway baskets, the Cootes Fishway baskets are also designed with a water holding tank at the bottom, allowing the fish to remain in the water when lifted.



WHAT WE CAUGHT IN 1997

Between March 21 and October 30, 1997, a total of 25 379 fish large enough to require passage over the fishway were captured and transported over the Fishway. A total of 26 of the potential 46 large fish species occurred (*see page 8 for details*). Every lift of the baskets yielded some fish. Individual basket catches were as high as 800 fish. A single processing of all the baskets resulted in as many as 2000 fish.

The most common fish were carp, brown bullhead, white sucker, freshwater drum, channel catfish, gizzard shad, and rainbow trout. The remaining species were rare. A total of 220 fish were tagged for future identification, including bowfin, channel catfish, bass, and pike. Also of interest at the fishway was the presence of three species of suckers: silver redhorse, golden redhorse and shorthead redhorse. These species were thought to no longer exist in the harbour.

An additional 25 248 small fish were incidentally captured. These are fish that are small enough to pass through the grates but were incidentally in the baskets. These include young of the 26 larger fish species as well as an additional 16 smaller size fish species.



Thousands of thrashing carp could be seen lined up on the harbour side of the Fishway during May. Most of these fish ranged from 2 to 4 kg, but some were as large as 25 kg.

FISHWAY SUMMARY

Fish Large Enough to Require Passage

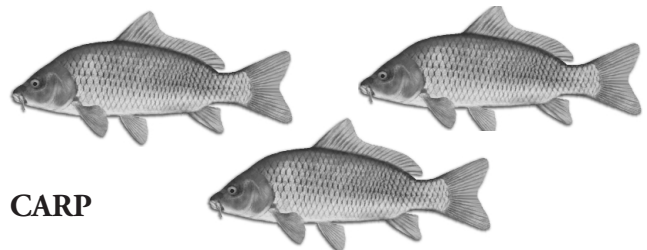
Total number of fish handled	25 379 fish
Daily fish catches	1 to 2000 fish
Number of fish tagged	220 fish
Total number of large species caught	26 species
Potential number of large fish	46 species
Number of species with over 200 caught	7 species
Fish rarely seen in the harbour area	6 species

Carp, Goldfish and Hybrids

Estimated carp population in canal	97 000 fish
Catch in baskets leaving Cootes (OUT)	40 carp
Catch in baskets entering Cootes (IN)	14 619 carp
Percent of "IN" catch consisting of carp	82 % of total
Recapture rate	Approx. 3%
Maximum number per basket	Over 800 carp
Average carp size	2-4 kg
Peak spawning run	May-June
Male:Female sex ratio	Approx. 2:1

Incidental Catch of Small Fish

Immature fish	25 248 fish
Small fish species	60% of total
Number of small fish species (minnows, shiners, sunfish, and darters)	40% of total 16 species



CARP

Carp, goldfish and their hybrids represented 82% of the 18 043 fish caught trying to enter Cootes Paradise. These fish were returned to the harbour side of the barrier. In contrast, only 64 carp, goldfish and hybrids were found in the baskets leaving the marsh. This is a reflection of the effectiveness of the Fishway. A number of carp leaving the marsh were immature fish that were able to squeeze through the grates. The few larger individuals were trapped in Cootes Paradise prior to the barrier's closure the previous winter, and managed to survive.

A total of 2 950 carp were fin-clipped at the Fishway. Only 2.9% were recaptured. Using this recapture percentage, fisheries ecologists estimate that, during the 1997 spawning season, about 97 000 carp were trying to enter Cootes Paradise through the Desjardins Canal! Fishway baskets sometimes held over 800 carp - an awe-inspiring sight indeed!



FISH MOVING THROUGH THE FISHWAY DURING THE 1997 SEASON (March 21 to October 30)

- The summary only includes those fish large enough to require passage. All carp, goldfish and hybrids were turned back into the harbour.
- The “harbour status” codes are as follows: **C**= common, **U**= uncommon, **R**= rare, **I**= introduced to Great Lakes. An * indicates a species that has recently returned to Hamilton Harbour.

Species	Scientific Name	Spawning Habitat	Harbour Status	Into Cootes	Out to Harbour
Bigmouth Buffalo*	<i>Ictiobus cyprinellus</i>	marsh plants	R	1	0
Black Bullhead*	<i>Ameiurus melas</i>	marshes, bays	R	1	0
Black Crappie	<i>Poxomis nigromaculatus</i>	marsh plants	R	14	5
Bowfin	<i>Amia calva</i>	marshes	R	16	5
Brown Bullhead	<i>Ameiurus nebulosus</i>	marshes	C	1897	3459
Brown Trout	<i>Salmo trutta</i>	streams	R, I	3	5
Carp	<i>Cyprinus carpio</i>	marsh plants	C, I	14 619	40
Carp x Goldfish	<i>C. carpio x C. auratus</i>	marsh plants	U, I	97	23
Channel Catfish	<i>Ictalurus punctatus</i>	marshes, rivers	U	412	304
Chinook Salmon	<i>Onchorynchus tshawytscha</i>	streams	U, I	20	5
Freshwater Drum	<i>Aplodinotus grunniens</i>	marshes, bays	C	77	914
Gizzard Shad	<i>Dorosoma cepedianum</i>	marshes	C	24	290
Golden Redhorse*	<i>Moxostoma erythrurum</i>	streams	R	0	1
Goldfish	<i>Carassius auratus</i>	marsh plants	U, I	20	1
Lake Trout	<i>Salvelinus namaycush</i>	inshore shoals	R	3	0
Largemouth Bass	<i>Micropterus salmoides</i>	marshes, bays	U	0	4
Longnose Gar	<i>Lepisosteus osseus</i>	marshes	R	0	2
Northern Pike	<i>Esox lucius</i>	marsh plants	R	14	25
Rainbow Trout	<i>Onchorynchus mykiss</i>	streams	U, I	80	148
Shorthead Redhorse*	<i>Moxostoma macrolepidotum</i>	streams	R	0	1
Silver Redhorse*	<i>Moxostoma anisurum</i>	streams	R	2	2
Smallmouth Bass	<i>Micropterus dolomieu</i>	marshes, bays	R	0	1
White Bass*	<i>Morone chrysops</i>	inshore shoals, streams	R	0	5
White Perch	<i>Morone americana</i>	marshes	C, I	15	25
White Sucker	<i>Catostomus commersoni</i>	streams	C	670	2070
Yellow Perch	<i>Perca flavescens</i>	marshes	R	5	1

Interpreting Fishway Results:

Catches at the Fishway may not accurately reflect the species composition or numbers of fish migrating through because:

- A portion of the adults of some species are small enough (<30 cm) to be able to pass through the 5 cm wide grates undetected (e.g. yellow perch, white perch, and black crappie).

The number of fish of an individual species going into the marsh and the number leaving the marsh do not necessarily match. Possible reasons for this discrepancy include:

- Some fish spent the previous winter in Cootes Paradise (e.g. pike and rainbow trout).
- Some fish moved down from the watershed (e.g. largemouth bass).
- Some fish have not returned to the harbour by the end of October (e.g. bowfin and channel catfish).
- Weight loss during spawning allowed the fish to fit through the 5 cm grates on return to the harbour.



SUCCESS OF CARP CONTROL

It is impossible for the Fishway to eliminate all the carp from Cootes Paradise. Rather, its goal is to reduce their numbers to an ecologically acceptable level. The current goal of the Fishway is to reduce the number of carp in the marsh to less than 40 adults per hectare of marsh. This translates into less than 6000 carp in total in Cootes Paradise. According to marsh surveys conducted in 1997, the carp population was between 2000 and 3000 fish, well within the established goal of less than 6000 fish.

Prior to the construction of the Fishway, approximately 50 000 adult carp could be found in Cootes Paradise at any one time. This represents a spawning density of about 5000 fish per ha. of marsh vegetation!

SIGNS OF RECOVERY IN THE MARSH

A number of dramatic improvements were seen in Cootes Paradise in 1997, the first complete season of carp exclusion. These included greater water clarity, the production of more young-of-the-year fish, an explosion of aquatic plant growth, and the return of several species of plants and animals that have not been found in Cootes in years (*see Vegetation Monitoring Fact Sheet for details*). All of these changes indicate that the marsh restoration project is moving in the right direction. The future of Cootes Paradise looks optimistic!

FUTURE PREDICTIONS

Numbers of all the native fish species were substantially lower than in a healthy system. However in 1997, catches of rainbow trout and channel catfish were larger than expected, while numbers of yellow perch and largemouth bass were disappointing. As the vegetation returns, the abundance of most species is expected to increase dramatically, particularly yellow perch. The return of appropriate spawning, and nursery habitat (a vegetated marsh) will promote a more diverse and healthy fish community. This natural restructuring of the fish community will also increase the predation rate on young carp, through the recovery of predator species like bass, walleye, bowfin and pike.



Young Northern Pike are dependent on marsh vegetation for their survival.

REFERENCES

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- Scott, W.B. and E.J. Crossman, 1973. Freshwater Fishes of Canada. Royal Ontario Museum, Toronto.



VISITING THE COOTES PARADISE FISHWAY

Visitors at the Fishway are always welcome! See for yourself how the Fishway baskets are lifted and emptied, and watch our professional Fishway technicians sort and measure their catch. Watch the carp take the "waterslide" back to Hamilton Harbour! You are welcome to drop by to informally watch the action. Guided group tours can be arranged in advance by calling **905-527-1158 ext. 276** at Royal Botanical Gardens. The Fishway is staffed Monday to Friday, March to October, excluding holidays. Baskets are usually lifted at 8:30 am and 2:30 pm, although afternoon lifts may be cancelled late in the season. Remember, weather conditions at the Fishway can be cold, wet and windy, so dress appropriately.



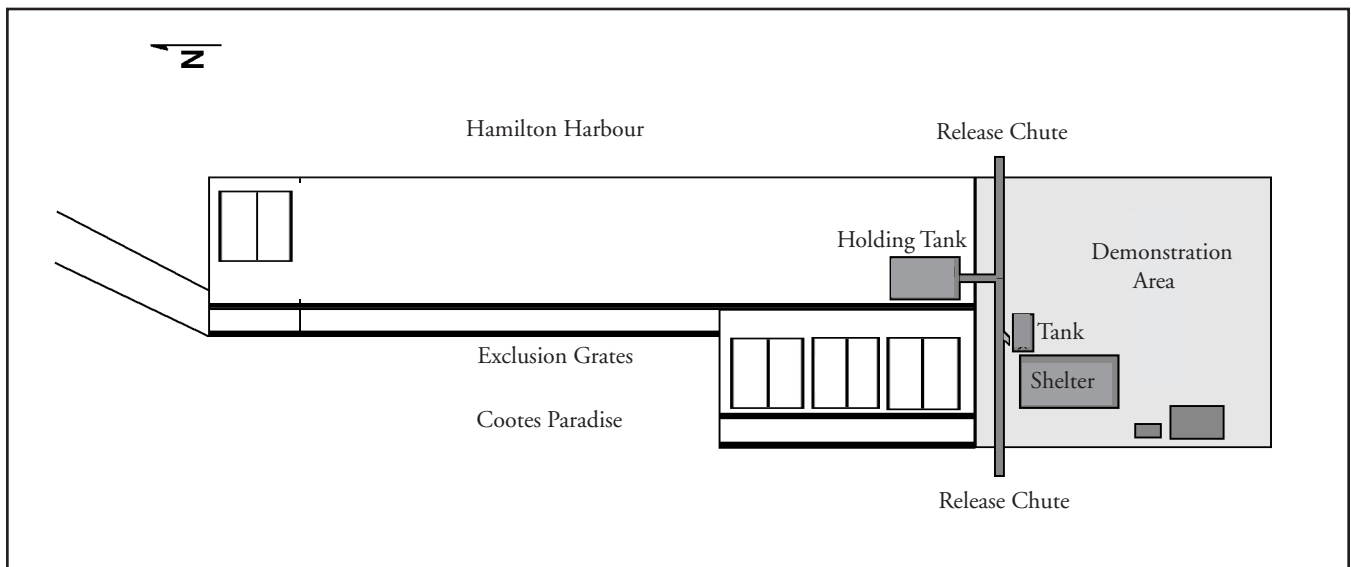
A snapping turtle is introduced to fishway visitors.

Notice to Teachers and Tour Organizers

The Cootes Paradise Fishway is a unique opportunity to view fish up close as they are passed through the Fishway on their annual spawning migration. Please be aware of the dangers associated with the overhead crane and basket operation, deck conditions (especially in colder weather) and other aspects of fish sorting and scientific data collection at this facility. We request your co-operation in maintaining control over your students at all times during the demonstration. Please instruct your group to obey the operators, stay behind the marked barriers, and do not allow students to handle the fish. They sometimes defend themselves with sharp teeth and spines, and may have harmful bacteria on them!



A variety of different fish species can be seen up close as they pass through the Fishway.





GETTING TO THE COOTES PARADISE FISHWAY

- 1) From **Hwy 403**, exit onto **Main St. (East)**. Turn left onto **Dundurn St.** (first lights). Turn left onto **King St. West**
OR
 From **York Blvd**, turn right onto **Dundurn St.** Turn right onto **King St.**
- 2) Turn right onto **Macklin Rd.** Park at Princess Point at the end of Macklin Rd. Follow the Desjardins Trail to the Fishway (a 0.7 km walking or biking path).

FISHWAY OPERATION SCHEDULE

March	Mon. - Fri. 2:30 p.m.
April through June	Mon. - Fri., Sun.* 9 a.m. and 2:30 p.m.
July through September	Mon. - Wed. 9 a.m. Fri. 2:30 p.m.
October	Weather Dependent

*Lifts occur on the 2nd and 4th Sundays from April to June.

*The Fishway does not operate on the Friday before a Sunday lift.



The Cootes Paradise Fishway.

PROJECT PARADISE GUIDED TOURS

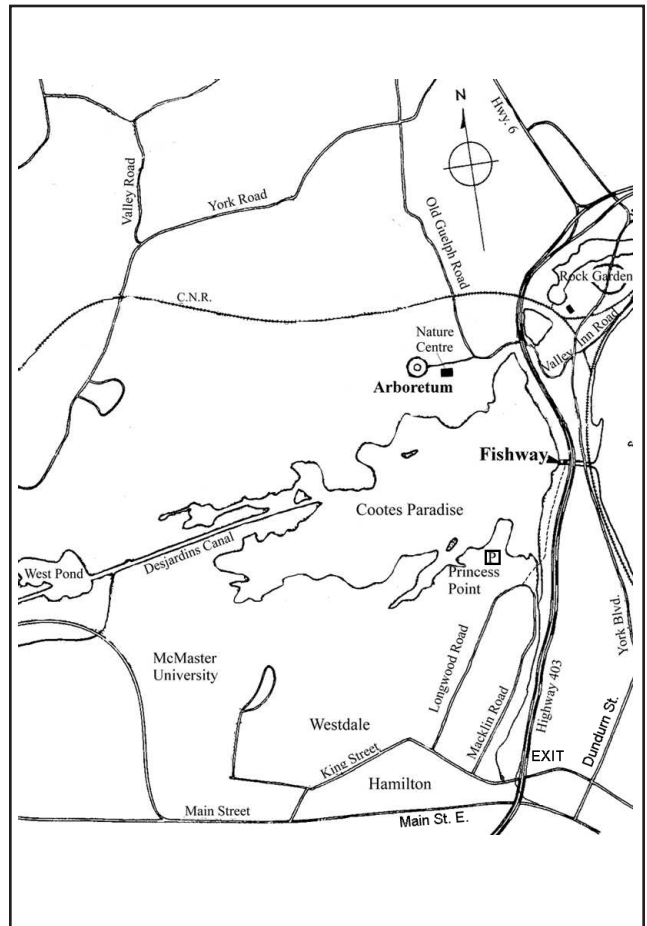
905-527-1158 ext. 276

Royal Botanical Gardens offers guided group tours to three of the project sites. Tours consist of either: a Project Paradise overview slide presentation and guided tour *or* guided tour only. Call prior to booking a tour to enquire about tour rates.

A group minimum of 20 is required.

TOURS

- 1) **Cootes Paradise Trails** - Enjoy an overview of the marsh restoration project during a pleasant hike on the north shore trails. Stops include a reconstructed amphibian habitat, and a cormorant nesting colony. **Duration 2-3 hr**
- 2) **The Fishway** - Observe dozens of native fish species up close during their annual spawning migration, and learn about one of the key components of the marsh restoration project. **Duration 1-2 hr**
- 3) **Pike Spawning Marsh** - Learn about the relationship between rivers, their floodplains and fish, during a boardwalk view of the Grindstone Creek valley. Visit a unique project designed to restore reproductive habitat of Hamilton Harbour pike. **Duration 1-2 hr**





SUMMARY OF FISHWAY FACT SHEET

- Cootes Paradise marsh is one of the largest and most important coastal wetland systems in western Lake Ontario. It provides valuable feeding and nesting habitat for a variety of birds, fish, mammals and amphibians.
- A number of human-induced stresses have degraded Cootes Paradise over the years. Introduced carp are partially responsible for destroying aquatic plants and stirring up sediments. Carp control is necessary for the restoration of Cootes Paradise to be successful.
- Since the 1950s, RBG, in partnership with other agencies, has attempted to control carp in Cootes Paradise through a variety of techniques. All of the following have met with limited success: commercial harvesting, planting wetland vegetation inside fenced carp enclosures and the construction of the Aquadam™.
- The Fishway on the Desjardins Canal was completed in 1996. This structure is designed to prevent the spring spawning migration of carp into Cootes Paradise, while allowing all other fish species to migrate to and from Cootes Paradise and Hamilton Harbour.
- The first successful year of the Fishway was 1997. Between March and October, 25 379 fish longer than 30 cm (large enough to require passage over the fishway) were caught, representing 26 different species. The most common large species were carp, brown bullhead, white sucker, freshwater drum, channel catfish, gizzard shad and rainbow trout.
- In 1997, 14 789 carp were caught at the Fishway and turned back into Hamilton Harbour. Prior to construction of the Fishway, approximately 50 000 adult carp inhabited Cootes Paradise during the spawning season. The 1997 adult carp population was estimated to be less than 3000 fish!

For more information, contact:

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Hamilton Harbour RAP Office
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Project Partners

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| Bay Area Restoration Council (BARC) | Hamilton Naturalists' Club |
| City of Burlington | Hamilton Region Conservation Authority |
| City of Dundas | McMaster University |
| City of Hamilton | Ontario Ministry of Environment and Energy |
| Department of Fisheries and Oceans | Ontario Ministry of Natural Resources |
| Environment Canada | Royal Botanical Gardens |
| Friends of the Environment Foundation | The Regional Municipality of Hamilton-Wentworth |
| Great Lakes 2000 Clean Up Fund | The Regional Municipality of Halton |
| Halton Region Conservation Authority | Waterfront Regeneration Trust |
| Hamilton Harbour Commissioners | |
| Hamilton Harbour Remedial Action Plan Stakeholders | |



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