From the earliest inhabitants to modern-day residents, people throughout history in the United States and Canada have prized the Lake Huron to Lake Erie Corridor as a source of water, food, transportation and recreation. Despite human pressures, the Corridor continues to support a remarkable mount of aquatic biodiversity. Protecting this precious water resource is essential to the continued prosperity of the surrounding region.

The Land and Water Connection

Lake waterways and land may seem to connect only at shorelines, the interconnectedness of water and land is far beyond a simple beach.

Many animals know this. For example, beaver fells trees on shore and uses them to build lodges in the water. The bald eagle nests in trees on land, yet feeds prey caught in the water. Many reptiles and amphibians feed and live in waters but nest in uplands. Humans on land but go on or into the water swim, boat and fish.

Nearly everything that takes place on land, especially human activity, affects the health and biodiversity of waterways. An example is removing trees and shrubs from a riverbank. It may seem like a simple, isolated action. But it can have widespread effects on the complex system of the river: The loss of roots that anchor soil and absorb rainwater can result in greater surface run-off. The increased water volumes can increase the river’s speed, leading to erosion of embankments downstream. The increased amounts of soil going into the river can bury a fish spawning bed. That can reduce fish populations, resulting in smaller catches for anglers.

Whether we live upstream or downstream, on hills or lowlands, in rural or urban areas, we are all connected by water — to each other, to fish and mammals, to birds and insects, to reptiles and amphibians, to wildflowers, shrubs and trees.

The shoreline of Lake St. Clair in Tecumseh, Ontario.

Nearshore Waters

The Great Lakes cover one-third of the region known as the Great Lakes Basin. Although the vast waters of the deeper, larger Great Lakes dominate the Basin geographically and ecologically, they are not as biologically diverse or productive as the fringes and shallows of those lakes. These shallow water areas are known as nearshore waters. They are home to nearly all species of Great Lakes fish, as well as many types of birds and mammals at some point in their life cycles. The water in these areas has the warmth and shallowness to support warm-water fish and other aquatic organisms. Almost the entire Lake Huron to Lake Erie Corridor is categorized as nearshore waters.

Unfortunately, because of their closeness to the land and human communities, nearshore waters are most vulnerable to pollution and degradation. Pollution not only affects the water that passes through the Lake Huron to Lake Erie Corridor, but also settles into the bottom sediments of the Corridor’s rivers and lakes, thus impacting aquatic life for decades.

The nearshore water environment has been changed physically, chemically and biologically by human activity. Raw sewage, fertilizers and pesticides, industrial discharges and polluted stormwater runoff are among the contaminants that have entered the Corridor, to the detriment of wildlife and humans.
Aquatic Food Web

The food web within nearshore waters has many links, extending from extremely tiny microorganisms to large fish, birds, mammals and humans. Individual food chains can be incredibly complex. They may involve hundreds of different types of organisms. A food chain can be understood by examining the different levels, called trophic levels, through which energy flows. These include producers, consumers and decomposers.

Primary producers form the first link in a food chain. In a freshwater ecosystem, such as the Lake Huron to Lake Erie Corridor, primary producers include phytoplankton, periphyton, and aquatic macrophytes. These are plants that depend on the sun for their energy.

Phytoplankton, also called algae, grow suspended in the open waters. More than 80 species of phytoplankton inhabit the Detroit River and 71 species have been identified in Lake St. Clair. Periphyton are larger algae, which are attached to the lake bottom or to other aquatic plants.

Aquatic macrophytes, or submersed aquatic plants, are large, rooted plants that live under the surface of shallow water, usually less than 23 ft (7 m) deep, where there is good light penetration. They are the dominant primary producers in the St. Clair River, Lake St. Clair and Detroit River system. The macrophyte beds that grow on the fringes of coastal marshes and along the shoreline provide food and cover for waterfowl and fish.

Zooplankton are the most numerous animals in the open waters. These microscopic creatures move about and eat by straining algae from the water. In turn, zooplankton are eaten by many small fish, such as sunfish and minnows, and the larval stages of many game fish species, including yellow perch.

Secondary consumers in an aquatic ecosystem include reptiles and amphibians such as bullfrogs, painted turtles, and water snakes. They eat insects and other small prey.

Tertiary consumers include such large predatory game fish as walleye and muskellunge. They feed on smaller fish that in turn had fed on zooplankton and insects.

Decomposers are bacteria and other microorganisms that break down and feed on the decaying remains of aquatic organisms. The breakdown of the organic matter also creates nutrients for green plants. Decomposers play a critical role in maintaining the complex biological and chemical systems of the open water environment.

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Phytoplankton can be seen only with a microscope, which reveals their fascinating shapes and colors. Fragilariocystis spp. (above) are diatoms that are common in the waters of the Lake Huron to Lake Erie Corridor during winter, spring and fall while the blue-green algae, Oscillatoria spp. (below), dominate in the summer months of July and August.

An energy pyramid is a useful way to visualize the transfer of energy in food chains. Energy is lost as it passes through each trophic level. The presence of producers, or autotrophs, for autotrophs is the presence of consumers, or heterotrophs. In the biosphere, plants account for 99 percent of all biomass. All other organisms constitute the remaining one percent.

The top, or quaternary consumers, in the aquatic food chain are fish eaters—humans, mammals and birds, such as cormorants and bald eagles. Decomposers are bacteria and other microorganisms that break down and feed on the decaying remains of aquatic organisms. The breakdown of the organic matter also creates nutrients for green plants. Decomposers play a critical role in maintaining the complex biological and chemical systems of the open water environment.
**Return of the Mayfly**

The burrowing mayfly (Hexagenia spp.) is one of the most important fish foods in open waters. The burrowing mayfly nymph feeds on the decaying remains of aquatic plants. In turn, both the aquatic nymph and the flying adult mayfly are food for many animals, especially fish and birds.

Large swarms of flying insects are a common sight around water during the summer. These are burrowing mayflies that have emerged from their aquatic stage as adults and are mating. They may seem like a nuisance but it is important to remember that they, like many other aquatic insects, provide an important link in the food chain.

Burrowing mayflies are sensitive to poor water quality. In the 1960s, they became scarce because of toxic pollutants in the water and sediments. With improved water quality their population has rebounded, to the benefit of wildlife and people.

**Freshwater Mussels**

Historically, the St. Clair River, Lake St. Clair and Detroit River and their tributaries supported large, diverse populations of freshwater mussels. The Detroit River had one of the biggest varieties of freshwater mussels in the entire Great Lakes Basin, with at least 35 species recorded in the early 1900s. Lake St. Clair had 32 recorded species.

The diversity of freshwater mussel species is related to glacial history. During the late stages of the Wisconsin glacial period, there were many drainage routes that flowed through southeastern Michigan and southwestern Ontario. These drainage routes enabled aquatic species to move in from other river basins, such as the Mississippi, St. Lawrence and Allegheny. Consequently, many different freshwater mussels were able to colonize in the Corridor’s water bodies. Mussels that persist today are a globally significant component of the Lake Huron to Lake Erie Corridor’s aquatic biodiversity. Today, virtually all of the freshwater mussel species that are listed as endangered, threatened or of special concern in Michigan and Ontario are confined to southeastern Michigan and southwestern Ontario waterways, including Lake St. Clair, the Sydenham River in Ontario, and the Raisin, Huron, Clinton, Belle, Black and Pine Rivers in Michigan. In fact, the Sydenham River is now the most significant refuge for freshwater mussels in the Corridor.

Freshwater mussels are in the Unionidae family, also known as pearly mussels. They are natural water cleaners and an important part of the aquatic food chain. They are an endangered species in the U.S. Freshwater mussels were harvested for this purpose along a 19-mi (30-km) stretch of the Thames River below London, Ontario.

Wild celery (Valisineria americana) populations declined by 72 percent from the 1950s to the 1980s in the Detroit River. They have since rebounded and exceed levels of 30 years ago. This increase is attributed to greater water clarity, which is believed to be the result of water filtration by the algae, a non-native, invasive aquatic species. Wild celery is the preferred food of diving ducks such as canvasbacks, redhead and scaup.

**Submersed Aquatic Plants**

More than 20 species of submersed plants occur in the St. Clair River, St. Clair and Detroit River system. The most common species are listed in the chart below.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potamogeton spp.</td>
<td>Pondweeds</td>
<td>Near coastal marshes, especially in the Canad River Marsh, Humbug Marsh and Gibraltar Bay. The St. Clair River’s swift current and straight channel prevent the widespread growth of emergent aquatic plants but they do occur around the river’s islands, shoals and shoulders. The extensive coastal marshes of the St. Clair River Delta and the shallows of Lake St. Clair support the largest beds.</td>
</tr>
<tr>
<td>Myriophyllum spicatum</td>
<td>Eurasian watermilfoil</td>
<td>An invasive aquatic species that has spread throughout North America since its introduction in the 1940s. This feathery looking aquatic plant forms thick mats in rivers, lakes and streams where it displaces native aquatic plants, thus impacting fish and wildlife.</td>
</tr>
<tr>
<td>Najas flexilis</td>
<td>Bushy pondweed</td>
<td>A widespread coastal marshes of the St. Clair support the largest beds.</td>
</tr>
</tbody>
</table>

Eurasian watermilfoil (Myriophyllum spicatum) is an invasive aquatic species that has spread throughout North America since its introduction in the 1940s. This feathery looking aquatic plant forms thick mats in rivers, lakes and streams where it displaces native aquatic plants, thus impacting fish and wildlife. Once an area is infested, it can interfere with boating by entangling propellers and degrading swimming areas.

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Mussels’ movement upstream and reproduction capability are intricately linked to fish. Female mussels’ eggs are fertilized when sperm is drawn in from surrounding water, so a male of the same species needs to be nearby to avoid localized extinction. The fertilized eggs develop into the larval stage inside the female. Once they are developed, the female releases her young when she senses a fish is near. Some mussels will wave specially adapted tissues that look like fish prey in order to lure a fish. The young mussels, called glochidia, have to attach themselves to a host fish or they will die. This generally harmless parasitic stage lasts a matter of weeks before the glochidia mature and drop off the fish to begin a new life, in a different place than the mother.

Mussels are an excellent indicator species, or gauge, of local water quality because they are relatively stationary. They face many more threats now than in the past, including poor water quality, sedimentation, loss of larval fish hosts, channelization of rivers and streams, and invasive species. The greatest threat in the Lake Huron to Lake Erie Corridor is the zebra mussel, a non-native species that reproduces at a tremendous rate without need for a fish host. It displaces native freshwater mussels and wins the competition for food and oxygen. Zebras even colonize the shells of native mussels, encumbering and starving them to death.

The zebra mussel has decimated native freshwater mussel populations in the Corridor. The original number of 35 species in the Detroit River had been dropping relatively slowly, but fell faster after zebra mussels arrived. Surveys found 28 different species in the 1980s but only 24 in the early 1990s. The Detroit River once supported one of the last strongly-reproducing populations of the northern riffleshell, which is on the federal list of endangered species in the U.S. and Canada. However, recent surveys indicate it may no longer exist in the river because of the exotic mussel invasion.

Native freshwater mussels have found a few refuges. Researchers recently discovered isolated populations of native mussels in the nearshore coastal marshes of western Lake Erie, the mouth of the River Raisin and the St. Clair River Delta at Walpole Island. Scientists are conducting investigations to better understand how these populations survive and if they remain stable. Research into freshwater mussels, and the impact of exotic mussels on them, is critical to managing and preserving the Corridor’s rich aquatic heritage.

The Biology of Freshwater Mussels

The snuffbox (Epioblasma triquetra) is a small freshwater mussel with unique bivalves that look like dripping paint. They live deep within the sediment of slow-moving rivers and streams, preferring a sand, gravel or cobble substrate with little flowing water. The rounded sculpin egg case is a fish host. Distribution in snuffboxes has been reduced significantly throughout North America; most populations have become small and isolated. It is listed as endangered in both Michigan and Ontario.

The rayed bean (Villosa labialis) is one of the smallest freshwater mussels. It lives in rivers and along lakeshores swept by shallow waves, where it is often found deeply buried in sand or gravel among roots of aquatic plants. It is extremely rare globally. Its distribution overlaps that of the northern riffleshell. It is important in protecting rare fish associated with the habitats of mussels like the rayed bean, whose larval fish hosts are not known. One widespread in southern Ontario, the rayed bean is now found only in the east branch of the Sydenham River. In Michigan, it is still found in the Pine River to St. Clair County, the Clinton River in Oakland County, the River Raisin in Monroe County and the upper Detroit River.

Freshwater Mussel Species at Risk in the Lake Huron to Lake Erie Corridor

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<tbody>
<tr>
<td>Purple wartyback</td>
<td>Cyclonaias tuberculata</td>
</tr>
<tr>
<td>White catspaw</td>
<td>Epioblasma oblique perobliqua</td>
</tr>
<tr>
<td>Northern riffleshell</td>
<td>Epioblasma torulosa rangiana</td>
</tr>
<tr>
<td>Snuffbox</td>
<td>Epioblasma triquetra</td>
</tr>
<tr>
<td>Wavy-rayed lamp mussel</td>
<td>Lampilla fasciata</td>
</tr>
<tr>
<td>Mucketpess</td>
<td>Obvaria olivaria</td>
</tr>
<tr>
<td>Round hickorynut</td>
<td>Obovaria olivaria</td>
</tr>
<tr>
<td>Round pigot</td>
<td>Plbryonia coccinea</td>
</tr>
<tr>
<td>Mudpuppy mussel</td>
<td>Syzygopsis antique</td>
</tr>
<tr>
<td>Purple lilypust</td>
<td>?</td>
</tr>
<tr>
<td>Rayed bean</td>
<td>?</td>
</tr>
<tr>
<td>Rainbow</td>
<td>?</td>
</tr>
</tbody>
</table>

Many freshwater mussel species have colorful names, such as purple wartyback and round pigot, which give clues to their appearance.

The snuffbox (Epioblasma triquetra) small freshwater mussel with unique things that look like dripping paint. They live deep within the sediment of slow-moving rivers and streams, preferring a sand, gravel or cobble substrate with little flowing water. The rounded sculpin egg case is a fish host. Distribution in snuffboxes has been reduced significantly throughout North America; most populations have become small and isolated. It is listed as endangered in both Michigan and Ontario.

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Lake whitefish, lake trout and lake herring still occur, but are no longer major seasonal components of the St. Clair River, Lake St. Clair and Detroit River system. Historically, these large cold-water fish were not residents, but migrated through the corridor from Lakes Erie and Huron to spawn in the fall. These three fish species largely disappeared from the region during the early 1900s due to over-fishing, construction of the shipping channel and water pollution. Lake sturgeon, sauger, and blue pike also were once common. Today, the lake sturgeon, sauger and lake herring are species at risk in the region. The blue pike is extinct.

Great Lakes fish use the Lake Huron to Lake Erie Corridor as a permanent home, a seasonal home or a migratory pathway. Most warm-water fish, such as sunfish, sucker, catfish and drum, are permanent residents. Cool-water species such as walleye, lake sturgeon, yellow perch, muskellunge and northern pike are present throughout the year. Populations of these fish also come from other lakes in large numbers during the spring and summer for feeding, spawning and nursery habitat. Larger cold-water fish, such as salmon and rainbow trout, use the Corridor to migrate between Lakes Huron and Erie or to dine on seasonally abundant forage fish.

Different types of aquatic habitats support different fish species. Some fish, such as northern pike and pumpkinseed, are highly dependent on coastal wetlands. Others, such as smallmouth bass and largemouth bass, can be found both in coastal wetlands and non-vegetated waters. Larger fish, such as walleye and muskellunge, frequent deeper channel waters. The loss of coastal wetlands and riparian habitats has contributed to the decline of many fish that depend on aquatic vegetation for spawning, feeding and cover.

The loss of coastal wetlands and their associated beds of submerged aquatic plants can affect fish populations because they provide spawning and nursery habitat for many popular sport fish species. Largemouth bass, smallmouth bass, northern pike, walleye, yellow perch and muskellunge reproduce in Great Lakes coastal marshes.

The wetlands and reefs of the lower Detroit River are the most significant spawning and nursery habitat for the entire river and for most of western Lake Erie. It is estimated more than 10 million adult walleye migrate there annually. Other major spawning areas include Lake St. Clair and the Thames River.

“… All the world is now familiar with this lustrous and exquisite fish (lake whitefish), with which our strait and lakes abound, and which has become an important article of commerce. In our river they are only taken by seine and dragnets, in the spring and fall. The latter is the reason of the great run, it commences with the approaching of cold water in October, lasting until nearly winter—many a time I have watched the boats they pull upstream—a song keeping time the ears—drop the net, and now rapidly to shore. Here both ends are drawn by windlass, the bag of the net soon hoisted, dissented with the shining capers. They are thrown into a pile, from which the finest and largest may be selected free to ten cents a piece. The seine of one catches all kinds of fish that come in its sweep, and are not too small to take its two and half inch mesh. Among a occasionally a huge sturgeon, often twenty pounds weight. And more rarely that of a fish and delicate bone bough, muskellunge. The latter is also taken by hook and line in our river and in Lake St Clair.*

—BELA HUBBARD, "MEMORIALS OF A HALF CENTURY", 1887
The lake sturgeon belongs to a group of fish that predates the dinosaurs by 40 million years. It is one of the longest-living and most primitive animals in the world. A lake sturgeon may grow to eight feet (2.4 m) in length, weigh up to 300 lb (136 kg) at maturity and live up to 125 years.

**The Return of the Lake Sturgeon**

Historically, the lake sturgeon (Acipenser fulvescens) has been a significant member of the Great Lakes fish community.

During the past century, lake sturgeon populations have become so low that fishing is extremely limited. It is listed as an endangered species in the U.S. Causes of the decline include human alteration of the landscape as well as sedimentation and pollution in the water, all of which changed the amount and quality of spawning habitat.

Commercial over-fishing in the late 19th Century is also partly responsible for the population decrease. Annual commercial lake sturgeon production in the Lake Erie and Lake St. Clair system peaked at five million pounds in 1885. It has been near zero since 1910. However, the lake sturgeon appears to be making a comeback in the region. For the first time in decades, juvenile lake sturgeon have been found in the Canadian St. Clair River in the 1880s by commercial ships. After hatching, young sturgeon migrate into adjacent marshes and larger lakes.

Many agencies and universities have been working to restore the lake sturgeon. Since 1997, researchers from the University of Michigan School of Natural Resources have been using telemetry to track the population’s seasonal movements in the St. Clair River and Lake St. Clair. Through this tracking, scientists hope to identify key spawning grounds and to better understand migratory patterns. Other agencies and institutions such as the Ontario Ministry of Natural Resources, Michigan Department of Natural Resources, U.S. Fish and Wildlife Service, U.S. Geological Service and Central Michigan University are also researching lake sturgeon and their habitat. Information gathered from these efforts is essential to the development of long-term strategies for increasing the sturgeon population and protecting spawning locations. Recent research found an increase in two-and-three-year-old juveniles. This is encouraging news. With continued research and proper management, it is hoped this ancient fish will be as abundant in the third millennium as it was in ages past.

**Exotic Fish in the Lake Huron to Lake Erie Corridor**

More than 15 species of exotic fish live in the Lake Huron to Lake Erie Corridor. Of these, alewife, rainbow trout, coho salmon, chinook salmon, brown trout, common carp, round goby and white perch are found in abundance.

These fish began to appear in the Great Lakes system in the 1800s. Some were deliberately introduced to boost sport fishing. Among them are salmon and trout, which have had little negative impact on native fisheries and are popular with anglers. Other exotic fish, such as the round goby, were released accidentally through the discharge of ballast water from transatlantic freighters and have reproduced in extraordinary numbers.

Common cold-water, cool-water, warm-water, and forage fish species found in the Lake Huron to Lake Erie Corridor

- **Cold-water:** Lake whitefish, lake herring, lake trout, brown trout*, coho salmon*, Chinook salmon*, rainbow trout*.
- **Cool-water:** Lake sturgeon, northern pike*, muskellunge*, walleye* and yellow perch*.
- **Warm-water:** Black crappie*, brown bullhead*, yellow bullhead, black bullhead, largemouth bass*, rock bass*, bluegill*, smallmouth bass*, freshwater drum, channel catfish*, common carp*.
- **Forage:** Gizzard shad, minnows, trout perch, killifish, silver sides, sticklebacks, sculpins, rainbow smelt*, alewife*.

*= Important game fish species  # = Exotic fish species

**Source:** ENSI DAYE TATE A BIODIVERSITY ATLAS OF THE LAKE HURON TO LAKE ERIE CORRIDOR | ON THE OPEN WATER
ON THE OPEN WATER | EXPLORE OUR NATURAL WORLD: A BIODIVERSITY ATLAS OF THE LAKE HURON TO LAKE ERIE CORRIDOR

**Fish at Risk**

Many fish species found in the St. Clair River, Lake St. Clair and Detroit River are considered to be at risk in either Michigan or Ontario due to declining populations. Decreases in the abundance and diversity of fish are caused by various factors, including water pollution and invasive species. The main causes, though, are loss and degradation of fish habitat, the extensive draining and filling of coastal wetlands, the edge of the navigation channel and hardening of the shoreline, all significantly reduced and degraded habitat. Fish surveys confirm these impacts. For example, few fish species are found near the steel break walls that now dominate much of the Corridor’s shoreline.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake sturgeon</td>
<td>Acipenser fulvescens</td>
</tr>
<tr>
<td>Eastern sand darter</td>
<td>Ammocrypta pellucida</td>
</tr>
<tr>
<td>Lake herring</td>
<td>Coregonus artedi</td>
</tr>
<tr>
<td>Lake chubsucker</td>
<td>Erimyzon sucetta</td>
</tr>
<tr>
<td>Mooneye</td>
<td>Mooneye genuineus</td>
</tr>
<tr>
<td>Silver chub</td>
<td>Hybopsis stripurens</td>
</tr>
<tr>
<td>Northern brook lamprey</td>
<td>Lethosomus brevirostris</td>
</tr>
<tr>
<td>Bigmouth buffalo</td>
<td>Lethosomus brevirostris</td>
</tr>
<tr>
<td>Spotted gar</td>
<td>Lepisosteus oculatus</td>
</tr>
<tr>
<td>Black redhorse</td>
<td>Microstoma minuta</td>
</tr>
<tr>
<td>River redhorse</td>
<td>Microstoma carinatum</td>
</tr>
<tr>
<td>Northern madtom</td>
<td>Noturus stigmosus</td>
</tr>
<tr>
<td>Pugnose shiner</td>
<td>Nototopsis angusta</td>
</tr>
<tr>
<td>Bridle shiner</td>
<td>Nototropsis bifrenatus</td>
</tr>
<tr>
<td>Pugnose minnow</td>
<td>Nototropsis emiliae</td>
</tr>
<tr>
<td>Channel darter</td>
<td>Percina capilata</td>
</tr>
<tr>
<td>Sauger</td>
<td>Percina capilata</td>
</tr>
</tbody>
</table>

The northern madtom (Noturus stigmosus) is a small, bottom-dwelling catfish that is sensitive to poor water quality.

The eastern sand darter (Ammocrypta pellucida) is a small member of the perch family. It lives almost exclusively in sandy-bottomed areas, where it likes to completely bury itself. Its translucent body and burrowing nature afford it camouflage from predators.

The Detroit River International Wildlife Refuge

The Detroit River International Wildlife Refuge is North America’s first international wildlife refuge and joint habitat management project. Public Law 107-91 established it in the U.S. on December 21, 2002. This was a landmark event in the quest to protect, manage and restore the biologically significant ecosystem of the lower Detroit River, often referred to as the “Conservation Crescent.” The new refuge presents an opportunity for dynamic partnerships between the U.S. Fish and Wildlife Service and governments, industries, local communities and various agencies and organizations.

Two separate laws in the U.S. established an acquisition boundary for the Refuge which stretches nearly 40 mi from the mouth of the Rouge River south to the Michigan/Ohio state line and includes the lands east of Interstate 75 and Jefferson Avenue. This area covers riverfront, islands, shoals, marshes, and coastal wetlands along the Detroit River and western Lake Erie. Initially, the former Wyandotte National Wildlife Refuge made up most of the new Refuge. More recent additions include Mud Island, Calf Island and a 152-acre parcel in Monroe County. In addition, a cooperative management agreement has been signed with DTE Energy’s Fermi II Nuclear Power Facility to manage over 600-acres of habitat on that site at the newly established Lapeognus Beach Unit of the Refuge. This landmark agreement doubled the amount of property under the jurisdiction of the Wildlife Refuge. Due to the unique nature of this urban Refuge, property donations, acquisitions and cooperative agreements are essential to its expansion within the designated area.

The lands of the refuge have a long and colorful history. During the prohibition era of the 1920s and early 1930s, Mud Island was a center of illegal alcohol transport, or “rum-running.” National Steel Corporation purchased the island in 1945 from the U.S. government. The Army Corps of Engineers has used the island as a disposal site for dredged material from the Rouge River bottom, so the island’s size has increased over the years. In 1962, Mud Island’s size was increased by the addition of material dredged from the bottom of the Trenton Channel. Currently it is an 18.5-acres (7.4-ha) island with 71.5-acres (28.6-ha) of submerged aquatic shoals. National Steel donated the island to the U.S. Fish and Wildlife Service on June 14, 2001.

Grassy Island was a favored whitefish spawning area in the 1800s. Records show the fishery on the island employed 30 men, working day and night from September to November to harvest 45,000 adult whitefish per spawning season. The island was used mainly for navigation purposes until 1961 when it was designated as a national wildlife refuge because of its natural resource values. The abundant beds of wild celery surrounding the island attract thousands of diving ducks during their spring and fall migrations. Bald eagle, lake sturgeon, spotted turtle, osprey and common tern are rare species that have been identified at the refuge.

The dominant features of these Detroit River islands are hardwood forests, swamps, lakeplain prairie and various types of wetland, most importantly Great Lakes coastal marsh. Mammals found on the islands include coyote, gray fox, white-tailed deer, raccoon, woodchuck, muskrat, rabbit, voles and mice. Overall, the new refuge will conserve, protect and restore habitat for 29 species of waterfowl, 65 kinds of fish and 300 species of migratory birds along the lower Detroit River and western Lake Erie.
Riparian zones are the areas along the banks of rivers or streams. These zones serve as an important transitional area and buffer between water and land.

Because riparian zones include both land and water, they are rich with diverse plant communities that are adapted to fluctuating water levels, nutrient rich soils and warm microclimates common to riparian lowlands.

These plant communities, along with moisture variations and natural floating objects such as tree limbs and leaves, provide habitats, and fluid movement corridors for a wide variety of aquatic, avian and terrestrial fauna, especially reptiles and amphibians.

Today, natural buffers of vegetation along watercourses are important habitats. They provide a migratory corridor for wildlife in an increasingly fragmented natural landscape. Streamside vegetation also helps to both retain water and maintain good water quality. In contrast, in landscapes where forests and wetlands have been removed, streams often dry up in late summer and have poor water quality. Water that does remain has a higher temperature and lower dissolved oxygen content, impairing biological communities.

What’s in a River?

**Riffles**
Riffles are shallow areas with faster flows where rocks break the surface and aerate the water. They are important spawning grounds for fish.

**Runs**
Runs are fast, deep areas where the water surface is turbulent but rocks do not break the surface.

**Pools**
Pools are wide, deeper areas with slow currents that occur between riffle-run complexes and are favored habitats of fish.

**Floodplains**
Floodplains are lands surrounding a stream that are periodically covered with water. They are important for absorbing excess stormwater and reducing stream-bank erosion.

**Meanders**
Meanders are bends in stream channels. They form naturally as streams flow through floodplains. They help reduce downstream flooding by using the energy of water to create longer streams with more erosional and depositional areas. Meanders increase the quantity and quality of stream habitats.
Many of the smaller endangered and threatened fish species of Michigan, such as redside dace and silver shiner, live in the watersheds of southeastern Michigan. Populations of those fish declined because urbanization degraded their waterways. Preserving the remaining pristine headwaters and improving habitat in the lower reaches of rivers is key to maintaining the presence of the fish in the state. Undeveloped headwater areas are important sources of diverse aquatic species that may re-colonize degraded reaches downstream once water quality improves.

River systems in southwestern Ontario also support a great diversity of fish. The Thames River supports nearly two-thirds of Ontario’s known fish fauna. The Sydenham River supports eight fish species at risk. Twenty-three species of minnows, such as the pig nose, have been identified in Essex County’s many creeks and small rivers; the highest minnow diversity recorded for any region in Canada. Restoring and maintaining the health of the tributaries will help to ensure a diverse fish community remains.

Unfortunately, changes in riparian zones, such as the clearing of streamside vegetation, have altered the habitat and dried out the vegetation; pollution and increased water temperatures lowering the suitability of rivers and streams to support diverse fish populations.

The tributaries that flow into the Lake Huron to Lake Erie Corridor are generally too small for large fish but provide habitat for smaller fish species such as darters and minnows. Ironically, the Corridor’s watersheds supported a diverse fish fauna. River systems in southwestern Ontario also support a great diversity of fish. The Thames River supports nearly two-thirds of Ontario’s known fish fauna. The Sydenham River supports eight fish species at risk. Twenty-three species of minnows, such as the pig nose, have been identified in Essex County’s many creeks and small rivers; the highest minnow diversity recorded for any region in Canada. Restoring and maintaining the health of the tributaries will help to ensure a diverse fish community remains.

The银沙银（Notropis photogenis）是一种小型、细长的鱼，喜欢在较大的河流系统中较安静的池塘。流经走廊的流域位于北美分布的北部。这种小鱼由于栖息地的丧失而变得罕见。

The Lake Huron to Lake Erie Corridor is characterized by tremendous aquatic biodiversity. From tiny plankton to giant lake sturgeon, many different types of creatures are connected to one another through the aquatic food chain.

Sport fish are abundant and the bald eagle has returned to shorelines in the region. But despite humans’ efforts to protect water quality, prevent habitat loss and guard against invasive species, many aquatic organisms continue to decline. Some are close to extinction. More actions to protect and restore wildlife habitat are critical to ensuring the aquatic communities of southeastern Michigan and southwestern Ontario remain healthy and diverse. To learn more about how to help protect and restore rivers, lakes and streams contact your local watershed organization listed in Appendix C.