

City of Montague Wildlife Management Plan

Introduction

This plan is an addendum to the City's Master Plan and Recreation Plan as many of the recommendations of this plan enhance goals in these documents, both of which outline the importance of natural resources. The protection and wise management of these resources directly impacts City owned facilities (parks, natural areas) and landscaping amenities (roadside trees and formal landscape); as well as privately owned properties. As such, the City recognizes that an integral part of managing natural resources is the protection and management of wildlife; which utilize and share these areas with the citizens and visitors of the City.

The White Lake area has experienced significant population growth in previous years that has resulted in close interactions between humans and wildlife, both wanted and unwanted. The purpose of this document is to establish plans to manage wildlife occurring in the City while providing humans with positive interactions with wildlife and increased recreational opportunities for the public, all while promoting the areas economic viability.

This Wildlife Management Plan was prepared by the Muskegon Conservation District with assistance from City staff and includes basic recommendations to restore, preserve, and enhance species assemblages. This management plan provides a brief history and description of the area, along with an outline to be used to develop plans to achieve general fish and wildlife goals while also providing economic and recreational benefits for the community. As conditions change in the White Lake area, the management plan is intended to be altered in succession with these changes.

Background

The White Lake area was valued by Native Americans due to its ideal location and its abundance of natural resources. As human populations increased and their impact on natural resources increased there was an associated shift in the abundance of species assemblages of the fish and wildlife. This shift started in earnest with logging throughout the area and began the first stages of shoreline hardening, waste disposal, wetland filling, and aquatic substrate alteration. This was followed by intense residential development along the shoreline, along with industrial development of the land which altered and eliminated critical fish and wildlife habitat within the White Lake area. Prior to these changes the White Lake area supported a diverse system of shoreline habitats, including coastal wetlands, freshwater marshes, wetland bays, and upland habitats. However, since habitat has changed with human alteration starting in the 1850's and accelerating over the past 50 years, species assemblages have gradually changed as well, increasing fragmentation and degradation of natural habitats and decreasing fish and wildlife populations. These changes in turn affect the public's social, recreational, and economic interactions with fish and wildlife in the area.

Many of the original habitats in and around White Lake have been lost due to the reduction of native vegetation. Within the aquatic environment, the loss of rooted plants is dramatically

affecting the sustainability of many areas for aquatic insect, fish, and reptile populations. White Lake has lost a majority of its transitional aquatic habitats, limiting survival of certain fish species due to the loss of spawning habitats and feeding areas. Aquatic habitats have been lost due to multiple causes, including dredging, harvesting of aquatic plants, and the use of chemical herbicides used to maintain recreational use of the waterways. Meanwhile, habitat loss within the area of land adjacent to the water has also been significant, including the fragmentation and separation of the aquatic environment from upland areas. These shoreline areas, including wetlands, are unique in the benefits to the aquatic environment through water treatment processes and the unique components they provide to wildlife. These areas are important to many rare and endangered species, as well as to common species (songbirds, turtles, salamanders, mink) for reproduction, growth, and survival. The loss of native vegetation has become so prevalent that the mere combination of habitat alteration and the loss of native species pave the way for exotic species to thrive and create a positive feedback loop that further degrades the environment.

There is a recent resurgence of interest in habitat restoration in the White Lake area. Since 2005, the White Lake Shoreline Habitat Management Plan facilitated a strategic plan to achieve specific fish and wildlife goals aimed at delisting two impairments (*Loss of Fish and Wildlife Habitat* and *Degraded Fish and Wildlife Populations*) associated with the lake's industrial history and Area of Concern designation. Utilizing previous information on the area, critical and degraded habitats were identified to be protected and restored within the lake. Following this effort, in 2008, the White Lake Restoration Blueprint was created to provide an overview of acreage, shoreline footage, ownership (public vs. private, number of landowners), habitat condition, and outlined the basic restoration activities which needed to take place for ongoing protection and conservation.

Land Use

The White Lake community is experiencing the same urban and industrial sprawl as neighboring cities. Development in West Michigan continues to advance north from Muskegon and Grand Rapids along with the continued attraction to the White Lake area as a tourist destination. Alterations to wildlife habitat due to urban development and commercialization continue even today. The continued changes in the landscape are impacting the ecological health of the system and altering natural processes. Habitat loss continues as a local natural resource issue and if unmitigated will degrade unique habitats, convert wetlands, and separate upland and aquatic habitats.

Current Wildlife Status

The White Lake area supports a large number of wildlife species due to the unique habitat assemblages that remain. Settled on the shores of White Lake, the cities of Whitehall and Montague are composed of environments ranging from lacustrine to upland forest, providing habitat for a range of important fish and wildlife species. Although many exotic species exist, many native species are still present and by following these management regimes they can thrive in the environment provided. The White Lake area and City have shown their dedication to the environment through recent restoration efforts in the White Lake area. To further this effort, the City wishes to continue efforts that emphasize the importance of restoring fish and wildlife populations as a means to promote the economic vitality and recreational opportunities that natural resources offer.

THREATENED OR ENDANGERED FISH, WILDLIFE, AND PLANT SPECIES

Threatened and endangered species are protected at both the state and federal level in Michigan. Currently in the White Lake area there are three endangered species, one threatened species, and one candidate species. The endangered species include the Indiana bat (*Myotis sodalis*), Karner blue butterfly (*Lycaeides melissa samuelis*), and the piping plover (*Charadrius melodus*). The threatened species is Pitcher's thistle (*Cirsium pitcheri*) and the candidate species is the eastern massasauga (*Sistrurus catenatus*).

Indiana Bat

The Indiana bat is a small mammal weighing on average about one-quarter of an ounce and having a wingspan of 9 to 11 inches. The Indiana bat travels south in the winter to hibernate in caves or cave like structures allowing them to survive during the winter when their target prey species of insects are not present. In the summer months, bats fly north and inhabit areas similar to habitats found in the White Lake area, targeting areas that include forested habitats, which include dead trees that they use for roosting. The presence of the Indiana bat provides a significant ecological service and benefit to the community by providing insect control; eating half of their bodyweight in insects each night. Currently, it is believed that under a half million Indiana bats are left on the earth; their decline caused by a suite of issues. The major impact appears to be the loss of critical cave habitat used for hibernation in the lower Midwest and a continued decrease in mature forests that contain appropriate habitat for roosting and raising young. In addition to this, white nose syndrome, a fungal disease, has killed over a million bats since its discovery in 2006 and a solution has yet to be found to address this new and unique problem. The Indiana bat may be found throughout the more forested tracts of land, adjacent the shoreline of White Lake, and along stream corridors throughout the City.

Recommendations:

- Educate the public about the life history, benefits the bats provide, and their role in protection and management of necessary habitat.
- Manage available habitat by protecting and providing roosting areas.
- Minimize pesticide use in areas frequented by bats such as parks with woodlots and in public areas near/adjacent to woodlots.

Karner Blue Butterfly

The Karner blue is a small inconspicuous butterfly with a wing span approximating only one inch. The male and female Karner blue butterfly are distinctly different in appearance but each display a unique color scheme that can be used to identify them from other butterflies. The Karner blue butterfly has two generations per year, one early spring generation from the overwintering eggs and one late summer generation that lay the next seasons overwintering eggs. One of the reasons Karner blue numbers are declining is their unique food requirements; caterpillars require leaves of the wild lupine plant and adults feed on the nectar of certain flowering plants. As urbanization occurs in the areas where Karner blues exist, habitat is lost from deforestation and disturbance, which have a negative impact on the survival and spread of wild lupine. The City has contains appropriate habitat along the western boundary with Montague Township, at the southern end of the City and throughout the bike trail corridor.

Recommendations:

- Preserve and restore required savanna habitat by providing wild lupine stands with natural disturbance regimes.
- Purchase areas that may host appropriate habitat for long term protection.
- Educate the public about the species and their habitat needs and what they can do to protect the species.

Piping Plover

The piping plover is a migratory shorebird that inhabits wide-open beaches with little cover. The piping plover has a sand-colored upper body and a white underside, except during breeding when adults obtain a black spot on their head and breast. Piping plovers use wide, flat, open, sandy-gravel beaches with very little grass or other vegetation and nest in areas around Lake Michigan. The diet of piping plovers is very diverse and they can eat a variety of what is present on the beaches including insects, spiders, and crustaceans. In the winter, plovers migrate south exiting the White Lake area. The piping plover was listed as endangered in 1986 when only 16 breeding pairs were observed in the Great Lakes. The biggest threat to the piping plover is their nesting areas lost to development and water level alteration. In addition to this, piping plovers are very sensitive to human interaction and will leave nesting areas if people or other predators are present. Plovers are likely to occur at the City's Medbery Park along the shoreline of Lake Michigan if appropriate habitat exists.

Recommendations:

- Work with natural resource agency to determine if appropriate habitat exists at park.
- Protect critical nesting areas by preventing development in nesting areas and use signage to discourage public use in these areas.
- Control predator interactions by minimizing populations near nesting areas or providing cages over individual nests.

Pitchers Thistle

The Pitcher's thistle is an herbaceous plant that reaches around 3 foot in height and occurs anywhere from open beaches to vegetated dunes in the Midwest and in the White Lake area. The Pitcher's thistle is a flowering plant with off-white or pink flowers and white hairs and spines on its leaves. The Pitcher's thistle is a short lived species and produces seed once during its lifetime after five to eight years. The biggest threat to the Pitcher's thistle is shoreline development that both demolishes current habitat and fragments remaining populations. In addition, beach grooming and beach traffic by humans can ruin remaining populations. Furthermore, exotic nuisance species such as phragmites can crowd out native plants, such as the Pitcher's thistle. Pitchers thistle may occur within the boundary of the City's Medbery Park as appropriate habitat exists and its presence has been documented in the immediate area.

Recommendations:

- Work with natural resource agency to determine if species exists in the park.
- Discourage development or habitat alteration of areas containing Pitcher's thistle.

- Require use of designated walking paths in areas containing the plant to prevent trampling and implement active management of these areas to maintain populations.
- Remove stands of non-native plants and re-establish native plants as exotics, such as spotted knapweed, will further degrade habitat.

Eastern Massasauga

The eastern massasauga is a small venomous snake that averages two feet in length and is characterized by its heart-shaped head and gray/ brown body with large brown blotches on the back and sides, and rattler on its tail. Massasaugas live in wet areas, including wetlands and along shorelines of lakes and rivers. These snakes hibernate either underground or in logs. Depending on food availability and habitat, massasaugas bear young every year or every other year. When food is especially scarce, they may only have young every three years. A massasaugas diet consists of small rodents, frogs, and other snakes, which they hunt by sensing the heat and vibrations of their prey. The current distribution of the eastern massasauga is scarce and it is generally found in isolated populations. Massasaugas, and snakes in general, have experienced declines as from direct interactions with humans as they are often feared and looked as a nuisance species which have led to people killing snakes they encounter. This direct interaction in turn has led to sharp declines in populated areas. In addition to this, habitat destruction from urbanization, to wetland destruction and water level alteration have ruined and fragmented remaining populations. Massasaugas have appropriate habitat and may have isolated populations around White Lake in undisturbed shoreline, wetland, and riverine areas.

Recommendations:

- Manage areas utilized by the massasauga and prevent development and fragmentation in and around wetland areas.
- Educate the public on the life history of the massasauga, how to manage to protect them, and how to avoid harmful interactions with the snake leading to the prevention of mortality caused by humans.

EXOTIC SPECIES

One of the largest threats to habitat outside of general loss from human impacts has come from invasive exotic species in both the terrestrial and aquatic systems. These species are considered to be one of the greatest dangers to ecosystems as they easily take over native species and decrease overall species diversity. Exotic species often overwhelm a new system since their predators are not present to keep them at a non-invasive level. This absence of predators allows uncontrolled population increases, destabilizing the native food web. Changes in habitat and the food web have eliminated many native species in White Lake, and reduced the ecological diversity.

As exotic species have spread throughout the White Lake area, the habitat for native species is limited and further altered, creating habitats more suitable for other exotic species to be able to invade and further weaken the ecosystem.

General Recommendations:

- Educate the public about each exotic species and what they can do to prevent the spread and abundance of these species.
- Develop an early detection program to identify species and areas of concern and raise awareness among City regarding their identification and treatment.
- Decrease numbers of exotic species through organized removal methods . Work with natural resource agency to integrate large-scale control program and ensure private landowners have appropriate information to treat and manage species.

Phragmites

Phragmites australis is a tall and stout perennial grass that can grow to heights of 59 feet or more. The flower heads are dense, fluffy, purple or gray in color, and 5.9 to 15.7 inches long, which flower from July to October. Usually found in dense thickets growing in or near shallow water. These thickets displace native wetland plants, alter hydrology and block sunlight to the aquatic community. These plants can spread by rhizomes, broken live rhizome segments, and seeds making this plant extremely hard to eradicate.

Once detected, a MDEQ permit should be acquired if in standing water during time of treatment and should be treated immediately during late summer to early fall with an MDEQ approved aquatic herbicide at the label approved rate for the plant. Site checks should continue for the next few years to insure that new infestations do not occur at the site.

Japanese Knotweed

Polygonum cuspidatum is a dense growing shrub reaching heights of 54 feet. The semi-woody stem is hollow with enlarged nodes similar to bamboo and invades disturbed areas with high light. Reproduction occurs manly by rhizomes or fragments but not significant by seed. The dense patches shade and displace other plant life and reduce wildlife habitat.

Once detected, it should be treated immediately during late summer or early fall with a site appropriate approved herbicide at the label approved rate for the plant. When dealing with older stands it is suggested to do a foliar treatment, followed by a cutting of the dead stems late fall to early spring to allow for easy access and treatment of new growth. This new growth should be allowed to reach roughly 3 feet before treatment to allow for a better uptake of the herbicide. This can take multiple seasons to control.

Oriental Bittersweet:

Celastrus orbiculatus is a deciduous, woody, twining vine that can get to 8 inches in diameter and climb to 60 feet high in trees. This extremely shade-tolerant vine can be found in grasslands, open woods, woodland edges, undisturbed forests, roadsides and fencerows girdling trees and shrubs. Reproduction is by copious seed production and the spreading of rhizomes that can form new stems. Has bright yellow leaves and showy fruit in late fall, which makes it easy to spot when most

native plants have dropped their leaves for the season.

Once detected, you can treat using two different methods depending on density of the infested area. If dealing with a low density stand it is best to cut and then paint the stumps with an undiluted appropriately approved herbicide within five minutes of the cutting during late summer to early spring. Vines left hanging in the canopy will deteriorate and fall down in two to three years. When dealing with high density and few desirable natives, it is more beneficial to do a foliar spray after spring sap flow and then treat any new sprouts as they are spotted.

Garlic Mustard

Alliaria petiolata is an herbaceous, biennial forb that is an aggressive invader of wooded areas that grows to three feet tall. It can be easily recognized by a garlic odor that is present when any part of the plant is crushed and by its strongly toothed, triangular leaves. A high shade tolerance allows this plant to invade high quality, mature woodlands, where it can form dense stands that will shade out native understory flora and inhibit seed germination of other species by producing allelopathic compounds. Reproduces mostly by seed and will produce a basal rosette the first year and then flowers the second year.

Once detected after monitoring forest edges, paths and floodplain areas, determine what permits, if any, are required and the appropriate herbicide for treatment. Pulling seedlings is most useful when dealing with only a few plants, otherwise focus on second year plants by pulling before seed is produced or use herbicide in early spring or fall while native plants are dormant. Flower heads must be removed to prevent seed development when hand pulling and the heads need to be burned or taken to a landfill to prevent accidental spread. Tamping the soil after any treatment will minimize recolonization.

Narrowleaf and Hybrid Cattail

Typha xglauca is a sterile hybrid cross between Narrowleaf cattail, *Typha angustifolia*, (exotic) and Broadleaf cattail, *Typha latifolia*, (native). These exotic cattails grow 4 to 12 feet tall in marshes, lakes, streams, ditches and wet depressions. Reproduces by way of seed establishment on bare soil, rhizomes, and fragmentation.

Eliminating Narrowleaf and Hybrid cattail is impractical but can be controlled to acceptable levels. Prior to treatment the species should be clearly identified as the desirable native Broadleaf cattail should be protected. A MDEQ permit should be acquired if in standing water during time of treatment. Water level manipulation, if possible, to at least 3 to 4 feet with an approved aquatic herbicide treatment and cutting before flowering give the best results. This cuts off oxygen to roots and killing the plant. Otherwise, a foliar application of approved herbicide will thin the stand.

Other Exotic Species of Concern

Rusty crayfish (*Orconectes rusticus*) has a brown body and get up to six inches in length with claws. They eliminate vegetation that provides cover for fish and habitat for invertebrates, which is an important food for fish and waterfowl.

Zebra mussels (*Dreissena polymorpha*) can be 1 to 2 inches long with color patterns ranging from striped shells to dark or light shells with no stripes with a flattened underside. One female can produce more than one million eggs in a year. They create strands that can attach to any surface, which can cause major issues with the blocking of pipes of power plants and water-treatment facilities. They also affect water quality by their decomposing bodies, waste and filter-feeding ability, which disrupt fish-spawning habitat and cause water to have a foul odor or taste.

Quagga mussels (*Dreissena bugensis*) have color patterns that vary from black, cream, or white bands with dark concentric rings on the shell and can reach up to 1.5 inches in length. They can filter phytoplankton from the water, decreasing the food source that zooplankton rely on, which alters the overall food web. Their filtering creates waste that creates a foul environment and can contain toxic pollutants that can be passed through the food chain.

Black locust (*Robinia pseudoacacia*) is a nitrogen fixing, deciduous tree that can reach 40 to 82 feet in height and 12 to 24 inches in diameter that can be found in old fields, prairies, disturbed forests and woodlands. This tree reproduces by seed, sprouts from roots, and forms natural clones, making it a challenge to manage.

Spotted knapweed (*Centaurea stoebe*) is a herbaceous biennial or perennial that can reach 2 to 4 feet tall. This plant is considered carcinogenic therefore, gloves, long pants and sleeves are suggested when handling. Mainly spreads by seed, with a lesser spread by lateral roots. This plant kills native microbes in the soil, making it hard for native plants to compete with this invader.

Emerald ash borer (*Agrilus planipennis*) is a golden-green or brassy color with metallic emerald green wing covers that reach ½ inch in length as an adult. The adults leave a D-shaped exit hole (3-4mm in diameter) in the bark and the upper third of the ash dies back.

Oak wilt (*Ceratocystis fagacearum*) will usually move from diseased oaks to healthy oaks through root grafts, which most root grafts form between oaks of the same species. This can also spread by way of sap-feeding beetles, which is why one should avoid unnecessary pruning from April thru July when most of the beetles are active.

Tree of Heaven (*Ailanthus altissima*) is a deciduous tree that can reach 40 to 65 feet tall and have a diameter of 24 to 40 inches. With its allelopathic properties and reproduction by seed and root suckering, this tree can be a challenge.

Beech bark disease affects American beech (*Fagus grandifolia*) trees by way of a scale insect and three species of fungi that will give the tree a woolly, white and waxy covering, which is secreted by the insect and the fungi shows as a bleeding spot on the tree.

NUISANCE SPECIES

As the species composition of wildlife has changed over the past century there has been a gradual transition to more “common species”, and especially those that can readily adapt to urbanization. This transition has led to some species, native and introduced, that have adapted more readily and have become a nuisance to the community and have dramatic impacts on local natural resources.

White-Tailed Deer

Over the past decade White-tail deer (*Odocoileus virginianus*) have become an increasing problem in the City and yet rural areas populations are managed and kept in line by controlled recreational hunting. And although populations as a whole may not be increasing in all areas the increase in the urban environment is largely due to limited or no hunting in for social and safety reasons. With the restrictions on hunting, deer have often found safe haven and lost their fear of humans in many populated areas and have found urban areas to be ideal due to the ample food in landscapes and gardens. And, although bedding and roaming habitat may be minimal and fragmented in these areas, deer have learned to take advantage of small pockets of woods for cover and bedding while move freely in and out of the city limits. Larger tracts of land immediately outside the City, with low hunting pressure and higher acreages, are acting as a population center to regenerate and spread into the more urbanized areas. The biggest problems with deer colonizing these urban areas are the increase in the number of car-deer accidents, increased incidence of Lyme disease within shoreline communities, damage to native habitat areas, and damage to private and public landscaping.

Recommendations:

- Discourage foraging deer by eliminating food sources and adding plants that are known to be deer resistant.
- Encourage alternatives such as fencing off gardens, allowing dogs to chase deer out, and the use of repellents to discouraging a deer’s presence.
- Develop an ordinance to prohibit feeding and establishment of “bait” piles within the City.
- Work with Michigan DNR to implement a management strategy within the City and surrounding townships through controlled and targeted hunting.

Canada Geese

The population of Canada geese (*Branta canadensis*) in Michigan went from near extinction to over abundance in the last forty years. Geese are herbivores and thus manicured areas near shorelines created by humans become ideal areas for geese to nest and forage. Canada geese nest in the early spring and spend their summer around these same habitats. Geese within urban areas have few predators other than foxes, coyotes, and raccoons, which will prey on the young. The greatest problem with geese has been the fecal matter they leave behind in places like beaches, yards, and golf courses. Not only is this aesthetically unpleasing, if numbers are high enough, fecal matter can elevate the levels of bacteria in the water leading to a closure of public beaches and unsanitary conditions at private sites.

Recommendations:

- Discourage feeding of waterfowl at parks and other areas where interactions may occur using signage.
- Establish native plant buffers at problem sites by hindering access between forage areas and water as geese are less likely to enter an area they cannot see through or past (in fear of an awaiting predator).
- Utilize predator decoys along shorelines and open areas to discourage use. Movement of decoys and use of multiple decoy types discourage geese becoming habituated.

Raccoons and Opossums

Opossums (*Didelphis virginiana*) and raccoons (*Procyon lotor*) are nocturnal omnivores that will eat almost anything and den in any place they can find cover. In the urban setting, these animals find plenty of food from many sources such as trash bins and gardens; areas that are easily accessible. Raccoons and opossum can cause many different problems in urban settings due to their wide variety of diet. First, they can make a large mess when breaking open trash bins and destroying garden crops and flowers. Both species can be dangerous to humans if close interaction occurs and in some cases spread disease if bites occur. Of greatest concern is their denning in homes, garages, and outbuildings as these areas also have high concentrations of fecal matter increasing the likelihood of parasite transmission and roundworm infections.

Recommendations:

- Exclude these animals from forage areas removing access to areas such as gardens, enclosing small animal pens, and removing access to trash receptacles.
- Develop ordinances that address securing buildings from wildlife inhabitation.
- Remove problem individuals from the area through live trapping and coordinate with local control authorities to relocate or euthanize these individuals.

Feral Cats

Feral, stray, and pet cats are all members of the same species; they are all domestic cats. But stray cats and feral cats are also different from each other in a very important way—in their relationship to and interactions with people. The term “socialized” is used to describe cats that are friendly towards *people*—or cats that enjoy companionship with people in their homes. Pet and stray cats are socialized to people. Feral cats are not socialized to people. While they are socialized to their colony members and bonded to each other, they do not have that same relationship with people. Regardless of their relationship and interactions with people each of these cat types can have impacts on native bird and mammal populations if they reside or spend time outside “hunting”; especially in localized areas. As predators, cats have a propensity to hunt and their impact on native species is part of their natural history and not necessarily the fault of the individual cat. The impact on native species is thus caused by their human caretakers and their neglect, irresponsible care, abandonment, and/or intentional release to the outdoors.

Recommendations:

- Work with local organizations and individuals to create a Trap-Neuter-Return program.
- Provide information to the public and residents of the City regarding appropriate ownership and care of cats.
- Develop ordinances that address residents responsibility for owning a cat.

FISHERIES MANAGEMENT (GENERAL)

The sport fishing and charter boat industry provide a significant boost to the economy in the White Lake area. White Lake supports a variety of sport fish including walleye, yellow perch, small and large mouth bass, northern pike, bluegill, black crappie, and white sucker, as well as migratory species such as salmonid species from Lake Michigan to the White River. The fish community of White Lake has slowly changed throughout the years with the loss of the native Great Lakes spotted muskellunge over 60 years ago, along with the establishment of exotic salmonid runs in the White River in the late 1900's. The walleye population is strong, yet population production continues to be supported by a Michigan Department of Natural Resources fish culture program. White Lake's fisheries priority should lie in the continued effort to remove fish consumption advisories and eliminate population declines. The collapse of sport fishing would lead to a substantial economic loss for the entire White Lake community and a reduced "quality of life" to residents.

Another element greatly impacting fisheries is the alteration of habitat used for breeding of certain stages in the life cycle. Habitat alteration can be from competition for space with exotics or through human impacts like dredging, aquatic plant removal, and structural alteration. Exotic species have had drastic impacts on White Lake fisheries with alewife, white perch, zebra and quagga mussels, Eurasian watermilfoil, and round goby, which are becoming firmly established in White Lake. These new species have led to a complicated change in the fishery by changing the food web structure, and outcompeting natives for food and habitat. Additional changes in habitat can be attributed to decreased water quality, including sedimentation and impacts from improper herbicide applications throughout the White Lake watershed. Habitat loss is also occurring in the deeper portions of White Lake from depleted oxygen concentrations during the summer caused by excessive algae blooms. Overall, the loss of habitat may have the greatest impact on sustaining fish populations in White Lake.

White Lake continues to have dramatic changes in fish populations due to habitat alteration, where native species, established exotics, and new exotic arrivals are in competition with each other. Many of these exotic species in the White Lake area are spreading rapidly and will only be controlled through the use of integrated pest management. These impacts, combined with limited recreational use by boaters and swimmers due to the increased "weed" growth and decreased aesthetics, are seriously damaging the White Lake Community. The costs to manage this issue will increase with each succeeding year and each additional exotic species.

Recommendations:

- Control exotic plant species abundance and spread through multiple techniques including mechanical removal, chemical control, and public education.
- Control the spread and transport of exotic fish, crustaceans, and invertebrates by increasing public education.
- Increase water quality and lake and wetland habitat by following the goals set forth in both the White Lake Community Action Plan and the White Lake Shoreline Habitat Management Plan.
- Develop a long term monitoring protocol to assess the status of fish populations within White Lake.

WETLAND MANAGEMENT (GENERAL)

The White River Watershed is a unique system for the Great Lakes because of the presence of various wetland and shoreline features. A wetland is any area characterized by plants and soils that are adjacent to water, underwater, or have wet conditions during at least part of the year that absorb, filter and clean water. Wetlands are extremely important to maintaining hydrologic stability through flood prevention, groundwater recharge, and slowing the movement of water within the landscape. Wetlands adjacent to lakes buffer the energy transported through wave action, while shoreline vegetation prevents shoreline erosion. Wetlands include areas along streams and rivers within the watershed, and provide viable shoreline corridors for wildlife movement. Shoreline and wetland areas are not only unique in what they provide in aquatic benefits, but also from the biological standpoint. These areas contain many species of plants and animals in the White Lake area. This habitat is not only critical for rare species, but to the common species that use these areas for reproduction, growth, and survival. Wildlife that commonly use wetland areas include ducks, geese, shorebirds, songbirds, birds of prey, fish, frogs, salamanders, snakes, turtles, snails, mussels, insects, crayfish, mink, and muskrat.

Loss or alteration of shoreline and wetland habitat surrounding White Lake is one of the greatest concerns for local conservationists and resource managers. The loss of these habitats will lead to reproductive declines for many wildlife populations. Too few of these critical areas are left in the condition that benefits both the environment and people. Historically, many wetlands were dredged, drained, and filled to provide valuable farmland. Even today this viewpoint prevails with the continued loss of wetlands, decreasing the general aesthetics, and consequent recreation and tourism. A majority of White Lake's shoreline and wetland habitat has been fragmented from seawall construction and land development. This type of fragmentation eliminates and disconnects important spawning and nursery areas for many species of fish and wildlife. Development around White Lake, once primarily seasonal homes, with minimal year-round use, has left approximately 15% of the original shoreline in a relatively natural state. As homes have slowly changed to largely permanent residences, more and more of the shoreline is altered. Changes in shoreline vegetation and use have increased with recent low water levels as people see the opportunity to claim more beach. During low water levels the increased vegetation along the shoreline helps to improve wildlife habitat. During low water, exposed bottomlands should be left alone to allow vegetation growth and dormant seeds to establish and increase habitat diversity. A

natural shoreline is the best scenario for wildlife preservation in both high and low water level years. In addition to this, if development must occur on or near the shoreline, developers should work to have minimal impacts on the surrounding shoreline environment.

Recommendations:

- Develop and adopt a local wetlands ordinance to ensure development adequately protects wetlands and shoreline areas.
- Educate the public on the benefits wetlands and encourage landowners to maintain the health of their wetlands and remove barriers like seawalls causing fragmentation of these habitats.
- Follow steps outlined in the White Lake Shoreline Habitat Management Plan to conserve, preserve, and restore shoreline and wetland habitat; including adoption of a local wetlands ordinance.
- Partner with local conservation agency to purchase and permanently protect wetland habitat throughout the City.

RECREATIONAL OPPORTUNITIES

There are many areas of public land for use such as parks, boat launches, and beaches used for a variety of recreational purposes in the White Lake area. In addition to these, recreation via private land in the area provides many activities such as hunting, fishing, boating, swimming, and various other activities. These opportunities bring with them a large economic benefit to the area. To further these interactions while preserving management goals, recreation should take place in a beneficial manner to the surrounding environment. Promoting practices such as low impact recreation and altering public lands to account for environmental sustainability will not only benefit the current economy but will also help wildlife management further down the road.

Recommendations:

- Educate the public about the surrounding natural resources and the impact they can have through multiple resources such as signs, pamphlets, and other outreach program.
- Increase the land available for public use through land acquisition.
- Encourage sustainable practices on public parcels such as sustaining native flora and fauna.