



Natural Features Inventory

Master Land Use Plan



INTRODUCTION TO NATURAL FEATURES

The purpose of performing the City of Muskegon Natural Features Inventory is to assess the City's current natural features and address their value to the City to assist in appropriate regeneration and development efforts.

The City's location on one of Michigan's largest natural harbors is a splendid and unique amenity. This setting of freshwater, coastal dunes, natural harbor, inland lake, rivers, streams, and wetlands is an exhibition of a diversity of natural features, areas, and resources that are not usually found in mature urban centers, and are unique to the entire world.

Muskegon Lake is actually a drowned river mouth and is over 4,100 acres in size. The Muskegon Lake, Muskegon River, and their associated wetlands are classified as significant systems by the U.S. Fish and Wildlife Service. The City of Muskegon is the largest City on Michigan's West coast. It is also situated on the largest inland lake that has a deep water port, with access to Lake Michigan. This port is the State's only foreign trade zone.

Coastal freshwater marsh areas along Muskegon Lake and the Muskegon River are significant migratory and spawning areas which were severely diminished during logging and industrial eras. The marsh areas and their significance are now returning somewhat as the region turns more to service and tourism industries. Muskegon Lake and environs is an internationally and federally designated

Area of Concern (AOC). A major goal of the Remedial Action Plan (RAP) calls for shoreline reclamation and reestablishment of native fresh water coastal marsh.

Muskegon's historical urban development, particularly the development associated with industry has affected the natural resources of the City of Muskegon. Some resources, such as Muskegon Lake, and portions of it's shoreline have been physically impacted with fill material, channelization, and pollution . Some features, like Fourmile Creek, have received much less human impact, and remain much as they were in the 1600s.

At time of settlement, Muskegon Lake was a pristine, drowned river valley located at the mouth of the Muskegon River. The lake was characterized by large marsh areas which surrounded the lake. The original character of the marsh can be visualized by examining the wetland features of the State of Michigan Game Area located upstream of Muskegon Lake.

The City of Muskegon includes the entire southern shoreline of Muskegon Lake and a portion of the northern shoreline along the channel in the vicinity of Muskegon State Park. The southern shoreline was highly modified during the mid to late 1800s, during Muskegon's lumbering era. Much of the native marsh along the southern shore was replaced by shipping docks created from lumbering by-products and native fill. By reclaiming land from the marsh and lake, the shipping docks extended out to the deeper water necessary for larger Great Lakes shipping vessels. During the early 1900s, the saw mill and lumber industry was replaced by industrial development,





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which brought large factories to the shoreline.

The City of Muskegon's natural features can be broken into five (5) primary groups: lakes/lakeshore, dunes, wetlands, rivers/streams, and woodlands. Natural "subareas" that exhibit high quality native or reestablished habitats have also been identified. Each of the features and areas are illustrated on the Natural Features Inventory Map and are described in the following subsections. Recommendations are presented in the final section of this Plan.

NATURAL FEATURES

The City's natural features have been divided into five (5) primary categories for this Plan.

They include:

- ◆ Lakes/Lakeshore
- ◆ Dunes
- ◆ Wetlands
- ◆ Rivers/Streams
- ◆ Woodlands

Lakes/Lakeshore

Muskegon Lake

Muskegon Lake has been central to the history and development of the City. Currently, it provides access to docks by Great Lakes shipping vessels, thriving fisheries, and recreational watercraft.

Muskegon Lake will continue to be an important consideration for future development along the City's approximate 8.6 miles of shoreline.

Muskegon Lake supports a valuable sport fishery consisting primarily of perch, walleye, large and small-mouth bass, sunfish, northern pike, crappie, bullhead, sucker, steel head, brown trout, chinook, and coho salmon. The lake serves as a breeding, migratory, and wintering habitat for a wide variety of waterfowl.

Most of the southern shoreline of Muskegon Lake has been significantly altered from its original condition by filling of the lake and surrounding marshlands. Today, the southern shore is a series of docks, bays, seawalls, and fragments of undeveloped shoreline. The fragments of undeveloped shoreline have been altered to varying extents by humans, but many areas currently serve as valuable wildlife habitat and corridors (Day & Associates, 1995). To revitalize the shoreline, several former industrial and dock sites have been converted to recreational areas, and several vacant parcels have been primed for future redevelopment.

Because land was reclaimed along the southern shoreline of Muskegon Lake, the water depth increases more rapidly than along the northern shoreline. Several private and public marinas provide mooring and slips for the many watercraft which utilize the lake. Muskegon Lake is a favorite harbor for both power boaters and sailboats, as it provides access to Lake Michigan as well as adequate space for boating within the lake. The outlet of Muskegon Lake has been channelized with





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sea walls, and the channel is protected by the breakwater built in the 1920s. The City includes the north side of the channel and a portion of Muskegon State Park.

The large dune known as Pigeon Hill was removed and leveled during earlier sand mining activities south of the channel. Currently, part of the former Pigeon Hill area is being developed as a marina with condominiums. Large portions of the former dune area remain undeveloped, and should be managed as valuable natural areas. Wildlife usage in the undeveloped areas (and the condominium development area) is high. The wildlife includes raccoons, Whitetail deer, muskrats, Green and Blue Heron, and various waterfowl. Deer are known to swim across the channel to access the former Pigeon Hill area from the Muskegon State Park which is located on the north side of the channel.

A recent study of Muskegon Lake, Muskegon Lake Wildlife Habitat Assessment (Day & Associates, 1995), identified fourteen (14) distinct natural areas along the shoreline of Muskegon Lake. Eight (8) of the natural areas are within the City of Muskegon corporate

limits. They are illustrated on the Natural Features Inventory Map and are described below:

1. **Muskegon State Park, immediately north of the channel.** This area is characterized as Marsh/Foredune/Backdune Complex. The area serves as valuable wildlife habitat, which has been preserved in a predominantly original state. The area is a high quality natural dune area which should remain protected.
2. **Former Pigeon Hill area, south and east of Harbour Towne Condominiums and Marina.** This area is characterized as Foredune Complex. This area has reestablished itself as a natural area which supports native dune vegetation and contains isolated wetland areas. The area serves as valuable habitat for wildlife, including deer, mallards, teal, muskrats, raccoons, Herons, fish, and other waterfowl.
3. **The Cottage Grove Public Access area, west of the S.D. Warren property on Lake Shore Drive.** This area is characterized as Shrub Willow/Isolated Marsh Complex. The area provides some wildlife habitat, but is isolated and very narrow. This length of shoreline is also a natural shoreline/littoral zone, one of the very few remaining on the south side of the lake. The shallow, natural shoreline provides habitat for aquatic plants and fish.





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4. Ruddiman Lagoon Outlet, southwest side of stream. This area is characterized as Scrub-shrub Community consisting mostly of short shrubs, trees, and brush. The area provides habitat for wildlife, especially birds and small animals. The Ruddiman Lagoon outlet area is limited as a wildlife corridor due to its isolation.

5. Shoreline, Northeast of Former Amoco Oil tank farm property. This area is characterized as Shrub Willow/Isolated Marsh Complex. This area is one of the longest sections of undeveloped shoreline. The shoreline is separated from the bluff by the Chesapeake Ohio Railroad. This area also provides wildlife habitat, but would be considered a marginal wildlife corridor, due to its isolation from other habitat areas and its narrowness.

6. Western Avenue area. The area at the western end of Western Avenue has historically been used for industrial manufacturing and shipping. An area near the western edge of the peninsula is a natural area. This area is characterized as Old Field Community. Some of this area has been developed as a marina facility.

7. Large field and marsh, Northeast of Fisherman's Landing. This area is characterized as Old Field/Woodlot Community. This area provides abundant habitat for wildlife and also serves as a wildlife corridor area with the former wastewater treatment plant

property.

8. Southwest side of causeway, South of North channel of the Muskegon River. The area lies across the causeway from Veterans Memorial Park. This area is characterized as Shrub/Old Field/Marsh Community. The area serves as habitat for wildlife, but is limited as a wildlife corridor due to the isolation of the area by the causeway and the power plant property. Migration between natural areas in this vicinity by small animals is difficult and dangerous.

Each of the eight natural areas have unique qualities with respect to vegetation and wildlife utilization. These areas by themselves are valuable natural features, but the potential for expansion of greenbelts and buffers along Muskegon Lake is considerable. Linking of these natural areas by habitat enhancement on connecting vacant parcels and along the future Muskegon Lakeshore Trail can increase both their functional value as a natural area and their recreational value to public users. The Muskegon Lakeshore Trail, and expansion of the greenbelt across vacant parcels may be the best practice for enhancement and protection of





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the Muskegon Lake shoreline.

Additional opportunities for enhancement of the greenbelt is recommended by implementing a simple tree planting program. Several City parcels, such as each public watercraft launch site, contain adequate space for additional trees. These trees may also serve as vision barriers between these recreational areas and existing industrial and railroad properties. These visual buffers would greatly increase the aesthetics at these locations.

Muskegon Lake is an internationally and federally designated Area of Concern (AOC), due to concerns of potential environmental impacts on the Great Lakes from historical, municipal, and industrial discharges, and non-point pollution. As an AOC, Muskegon Lake remains the subject of a Remedial Action Plan (RAP - originally prepared in 1987 and subject to continual updating) that includes guidelines for mitigating identified environmental concerns. One of the most important features of the on-going RAP process is participation by the Muskegon Lake Public Advisory Council (PAC), a coalition representing the general public, environmental groups, government, business, and industrial interests. The PAC is involved in the on-going process of identifying problems, and defining and implementing beneficial remedial actions.



In summary, Muskegon Lake is a substantial natural feature, which is the largest of its kind in Michigan. The coastal setting of the City on Muskegon Lake and Lake Michigan offers incredible views, recreation, and educational and conservation potential due to its rebounding water quality and redeveloping coastal marshlands. As the City continues its revitalization effort, Muskegon Lake should remain a primary consideration. Water quality and natural areas around the lake are primary factors to the quality of the lake as a natural feature, and should be protected and enhanced as such.

Lake Michigan

The City of Muskegon has approximately 2.5 miles of Lake Michigan shoreline. The lakeshore, within the City, includes natural beach and engineered areas. Lake Michigan is an important natural feature for the City as it provides recreation for residents and tourists, a great sport fishery, and a means of shipping materials to and from the City of Muskegon via the Great Lakes. Pere Marquette Park, Kruse Park, and the Muskegon State Park provide public beach access for the enjoyment of the lakeshore. The breakwater structures and channel provide protected access to between Lake Michigan and Muskegon Lake. Parking at the seawall near the waterworks building provides an unobstructed view of Lake Michigan from





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automobiles.

Lake Michigan is a natural feature, that will continue to be an important amenity for the City. Water quality and enjoyment of Lake Michigan is partially controlled by the water quality of Muskegon Lake, but is also influenced by every river and City located along its shore. By enhancement and protection of Muskegon Lake and its tributaries, the City will continue to be a good steward of Lake Michigan.

Dunes

A vast area of sand dunes can be found along the Lake Michigan shoreline within the City limits. One former large sand dune, Pigeon Hill, was entirely removed by sand mining operations. A portion of the former dune has been redeveloped as a condominiums and marina while a portion has remained undeveloped and provides valuable wildlife habitat.

In areas which have not undergone sand mining operations, roads, parks, and residences have been built. Most of the dunes have been developed as residential areas with single family homes. Some of the dune areas have been classified as "Critical Dune Areas" under Act 451, Part 353. Most development activities within "Critical Dune Areas" currently require a Department of Environmental Quality permit. The City of Muskegon is given an opportunity to respond to the permit applications to enforce any local ordinances or rules regarding building within the dunes. The City of Muskegon may use this opportunity to regulate and protect its dunes, as it feels is appropriate. Specific ordinances or guidance regarding density,

access, slope, setbacks, and vegetation removal will standardize the City's view of and ability to regulate dune development.

The dunes are a part of a unique freshwater sand dune complex along the western shoreline of Michigan. The dunes are fragile features that are ever changing with time. They are important buffers from Lake Michigan and are ecologically significant. Their protection, through nondevelopment or limited development according to strict zoning, is recommended.

Wetlands

The largest wetland areas found in the City are located along the Muskegon River system, adjacent to the Muskegon State Game Area, along the Muskegon Lake shoreline, in the Ruddiman Creek floodplain, in the Four Mile Creek floodplain, in the Ryerson Creek floodplain, and in the former Pigeon Hill sand mining area. Each of these areas are colored light blue on the Natural Features Inventory Map. The wetlands of specific stream corridors are further described in the Rivers/Streams section.

Muskegon Lake, at the time of settlement, was surrounded by marshlands. It is expected that the lake was extremely productive, and otters could be seen feeding in the marshes with eagles hovering above to capture a unweary fish. Today, after much of the coastal marshes have been replaced by fill material or dredged away, the lake is beginning to return to it's natural state in the remaining shallow areas. This transition can be attributed to many things, but the primary reasons are a decrease in heavy industry around the





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lakeshore and an increase in service and tourism industries. Residents are also becoming good stewards and are enjoying the rewards of a cleaner, more natural lake.

Wetlands are very important in their function to retain and filter sediment, nutrients, and other pollutants from storm water runoff. Wetlands are high productivity habitats for a variety of plants and animals. The wetland resources of the City are also an important aesthetic and educational resource. The wetlands are integral portions of greenbelts within the City. Enhancement of riparian buffer



zones, stormwater management, and upland management practices will lengthen the usefulness of the wetlands, by slowing the eutrophication process. If wetlands become choked with sediments and experience increased plant growth, they age prematurely and lessen their capability to filter and retain sediment, nutrients, and pollutants.

RIVERS/STREAMS

One River and four creeks transect portions of the City of Muskegon. The Muskegon River, Fourmile Creek, Ryerson Creek, Little Black Creek, and Ruddiman Creek provide excellent existing greenbelts within the City. These river and stream corridors host a wide diversity of plants and animals, including fox, rabbit, deer, songbirds, racoon, waterfowl, Green and Blue Heron, eagles, and muskrat. There is great potential for expansion, and even connection of these greenbelts to enhance and connect key wildlife habitat.

Floodplains are important physical features that are generally narrow to broad, nearly flat areas along rivers or streams. These low relief areas in the valleys of streams frequently provide important natural retention during heavy rains and snow melts, and generally have remained undeveloped. They support good habitat generally and a unique diversity of plants and animals. Land within 100-year floodplains has been delineated by the Federal Emergency Management Agency (FEMA). A 100-year floodplain is defined as an area within





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which there is a 1 percent chance in any year of a 100-year flood occurring, or that in every 100 years there is a 1 percent chance that the water will rise to that elevation. The Floodplain Inventory Map shows the location of the 100-year floodplain around Muskegon Lake, Lake Michigan and the river and stream corridors. Floodplains are generally considered unsuited to most types of development, though passive recreational uses can be appropriate.

The Muskegon River

The Muskegon River is a valuable natural resource and scenic amenity to the City of Muskegon, and has a total watershed area of 2,660 square miles. The river provides an important source of recreation, partially due to it's fisheries and opportunities for wildlife viewing. The river system provides habitat for a large diversity of plants and wildlife and is nationally known for it's highly prized crop of walleye, steelhead, and salmon.

The Muskegon River has three branches which enter the northeastern end of Muskegon Lake. The north branch of the Muskegon River delineates the City of Muskegon Corporate Limit from the City of North Muskegon in the vicinity of Veterans Memorial Park. The south and middle branches flow together in the vicinity of the old wastewater treatment plant, and enter Muskegon Lake approximately 4,000 feet south of the north branch.

The area between the branches, adjacent to the Muskegon State Game Area, is an extensive marsh that exists in a partially modified condition. The marsh is habitat

for a great diversity of wildlife, including eagles, Green and Blue Herons, egrets, swans, Canadian geese, and muskrats. The primary human impact to the marsh has been from fill placed along the margin of the marsh. The fill supports roads and railways which connect Muskegon and North Muskegon, the power plant, and the former wastewater treatment plant. The marsh has also been modified by utilities and an area formerly used as the City's dump.

The water quality of the Muskegon River directly affects the quality of water found in Muskegon Lake. Sediment and other non-point source pollutants in the Muskegon River can increase the eutrophication rate, or aging process of Muskegon Lake. The Muskegon River is slowly filling and aging the lake with sediment and accelerated aquatic plant growth from non-point source pollutants such as nitrates and phosphates (fertilizers).

The primary water quality issues for the Muskegon River are hydrocarbons from petroleum facilities, sediment from erosion, and other nonpoint source pollutants. However, only a small portion of the river transects the City of Muskegon, and most sediment and other non-point source pollution occurs outside the City's limits. The City of Muskegon is limited in its ability to control and decrease upstream impacts, but can continue to be a good steward of its portion of the river and associated marsh.

Fourmile Creek and Sandford's Bayou

Fourmile Creek is approximately 3.8 miles long from its headwaters in Muskegon





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Township, where it begins as an intermittent stream near Hall Road between Mill Iron Road and Dangle Road, to its end at the South Branch of the Muskegon River. Two sections of the creek fall within the City of Muskegon Corporate Limits. The two sections combined, one approximately 3,500 feet and the other approximately 4,000 feet long, account for approximately 1.45 miles of the length. Fourmile Creek flows through the campus of Muskegon Community College and golf course, and the ponded area known as Sanford's Bayou, all within the City limits. The predominant land use along Fourmile Creek is residential. Outside of the City, Orchard View High School and the General Dynamics facility are located adjacent to Four Mile Creek. The creek corridor is deep (in most areas), isolated, well buffered, and great for recreation.



for wildlife eastward to the Muskegon Community College campus. The floodplain of Fourmile Creek widens westwardly from the U.S. 31 crossing. As the floodplain widens, it is covered by a large cattail marsh. The marsh is separated into west and east portions by the Getty Street crossing. Westward from the Getty Street crossing, the floodplain transitions from the marsh to Sanford's Bayou.

East of U.S. 31, Fourmile Creek lies in a deep ravine, with striking topography. The stream valley is heavily wooded, and provides very productive woodland habitat

Sanford's Bayou is a large ponded area within the floodplain of Fourmile Creek. Portions of the bayou are shallow and subject to increased eutrophication by sediment and other non-point source pollutants. The Sanford's Bayou area is an important part of the Fourmile Creek greenbelt because the bayou offers different ecological characteristics, thereby increasing the value to plant and wildlife diversity. The danger of sediment and other non-point source pollutants is that the bayou will shallow prematurely and this ecological diversity will be lost. Riparian buffer zones, upland management practices, and





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stormwater management can dramatically increase the quality of Sanford's Bayou and Fourmile Creek as Natural Features.

Although Fourmile Creek is crossed several times with roadways, it remains very natural. Riparian buffer zones along the stream corridor are highly productive wildlife habitats and should be preserved as such. The floodplain marsh and Sandford's Bayou act as a sediment basin, trapping sediment, nutrient, and other pollutants. West of U.S. 31, Fourmile Creek and Sanford's Bayou are shallow surface water bodies with associated wetlands, and are sensitive to increased eutrophication. The primary concern for Fourmile Creek is sediment and other non-point source pollutants. It is recommended that the Fourmile Creek corridor become better understood with respect to water quality, wildlife, and habitat so that zoning may be developed for the protective use and conservation of the resources.



enters the City limits at the U.S. 31 crossing, and contains one intermittent tributary to the north which is entirely within the City limits.

This tributary enters the north side of Ryerson Creek across from Steel School.

Between the U.S. 31 and Getty Street crossings, the floodplain widens to the west. As the area broadens, the floodplain consists of a marsh. The marsh is covered primarily with cattails and some willows. Between the Getty Street and Wood Street crossings, the floodplain consists of a similar cattail marsh with some ponding along the main stream channel.

Between Wood Street and its outlet to Muskegon Lake, Ryerson Creek has been highly modified and channelized. The channelized area consists of land which was filled for Green Park, the Farmer's Market, and stream crossings for the Chesapeake Ohio Railroad, Business Route 31, Yuba Street, and Ottawa Street. The stream segments of Ryerson Creek east of Wood Street are in a mostly natural state, and provide quality wildlife habitat. The segments of Ryerson Creek offer an excellent opportunity for a protected greenbelt. Currently, these segments offer wildlife habitat, but do not serve as a

Ryerson Creek and the Smith-Ryerson Playfield Pond

Ryerson Creek is approximately 4.1 miles long from its headwaters in Muskegon Township where it begins as an intermittent stream near Dangle Road. Of the approximate 4.1 miles of Ryerson Creek, the western 2.1 miles are within the City of Muskegon Corporate Limits. Ryerson Creek





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quality wildlife corridor due to the many culverted stream crossings. Eliminating or reconstructing some crossings to allow migration under the crossings is recommended and should be evaluated further.

The predominant land use along Ryerson Creek is residential. Commercial developments in the Apple Avenue and U.S. 31 area are also adjacent to Ryerson Creek. The primary concern for Ryerson Creek is sediment and other non-point source pollutants. Oil and grease from commercial parking lot storm drains, fertilizers, and sediment pollution are the main current water quality concerns for Ryerson Creek. The stream bed is characterized as mostly sandy where it enters the City to west of Getty Street.

The Smith-Ryerson Playfield Area Pond is a small ponded area within the floodplain of Ryerson Creek, near Wood Street. The Smith Playfield ponded area is an important part of the Ryerson Creek greenbelt because it offers different ecological characteristics that increase the diversity of plant and wildlife. The ponded area contains a diversity of fish and wildlife, including carp and waterfowl. Currently the pond is very shallow and subject to rapid eutrophication by sediment and other non-point source pollutants. The danger of sediment and other non-point source pollutants is that the bayou will shallow prematurely and this ecological diversity will be lost. Riparian buffer zones, upland management practices, and stormwater management can increase the quality of the pond area as a Natural Feature.

Between Smith-Ryerson Playfield/Wood Street, and the outlet to Muskegon Lake, the stream is choked with sediment, trash, and becomes foul smelling. The application of natural riparian buffer zones and storm water management are important factors in the preservation and enhancement of this segment of Ryerson Creek as a Natural Feature.

Ryerson Creek and its floodplain marsh are shallow surface water bodies. They are sensitive to increased eutrophication, and directly affect the water quality of Muskegon Lake.

Little Black Creek

Little Black Creek transects a section of the City before flowing through the City of Muskegon Heights and into Mona Lake. The section which flows through the City is almost entirely within industrial and commercial areas, but mostly protected by extensive wooded buffer zones. Street crossings are found at Roberts Street, U.S. 31, Black Creek Road, and Sheridan Road. As Little Black Creek flows through the City, it is contained within a ravine, without a well developed floodplain, except in the vicinity of Mercy Hospital. In the vicinity of Mercy Hospital, a small marsh has developed where the stream widens.

The portion of Little Black Creek west of U.S. 31 has excellent value as wildlife habitat and as a wildlife corridor. Whitetail deer can be found west of Roberts Street and are anticipated to utilize the woodlands which continue west to Getty Street. The area east of U.S. 31 contains considerably more wildlife habitat. In the area east of





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U.S. 31, Little Black Creek has adequate natural buffers between industrial buildings and the creek, making it an excellent greenbelt and wildlife corridor.

The primary concern for Little Black Creek is sediment and other non-point source pollutants. Oil and grease from commercial/industrial parking lot storm drains, pollutants from other discharges, fertilizers, and sediment pollution are the main potential and current water quality concerns for Little Black Creek. A petroleum facility outside the City adjacent to the creek may adversely impact the stream. The application of natural riparian buffer zones and storm water management plans are important recommendations in the preservation and enhancement of Little Black Creek. Impact along Little Black Creek, although limited within the City of Muskegon, affects the water quality of Mona Lake which outlets to Lake Michigan.

Little Black Creek and associated woodlands represent a large area of natural woodland habitat, which has great value for wildlife viewing and nature walks. This area should be preserved and enhanced as a valuable greenbelt within the City.

Ruddiman Creek and Lagoon

Currently, Ruddiman Creek is approximately 1.2 miles long from its headwaters to its outlet into Muskegon Lake, including Ruddiman Lagoon. Two additional tributaries empty into Ruddiman Lagoon, and are tributaries to the overall Ruddiman Creek system. The creek formerly reached further east, but has been filled and contained in a subsurface drainage system. The actual water shed of

Ruddiman Creek includes portions of the City of Muskegon, City of Muskegon Heights, City of Roosevelt Park, and the City of Norton Shores. Stormwater drainage and discharges from each of these cities influence the water quality and overall value of Ruddiman Creek as a Natural Feature.



Ruddiman Creek formerly received industrial and residential septic discharges from portions of each City prior to implementation of the Muskegon County Wastewater Treatment system. Complete conversion of the system is ongoing, and illegal hookups continue to be isolated and corrected. A continued systematic system of investigation and correction of the problem is recommended. In addition to the discharges, residual petroleum impact from area facilities and pipelines, erosion and sediment, and other non-point source pollutants continue to present water quality problems for Ruddiman Creek.

The floodplains of Ruddiman Creek and it's tributaries are wooded, and adjacent land use is primarily residential, with some commercial and industrial usage. The floodplain of Ruddiman Creek begins to widen to the west from the Barclay Street crossing to the Glenside crossing. The floodplain is not very wide, but does





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support some floodplain wetlands, consisting primarily of cattail marsh. West of the Glenside crossing, the Ruddiman Creek floodplain opens into the Ruddiman Lagoon.

Ruddiman Lagoon is a ponded portion of the floodplain of Ruddiman Creek. Ruddiman Creek, along with two additional unnamed drainages/tributary streams, empty into the southeastern half of Ruddiman Lagoon. The lagoon is regulated by its outlet at the northwest end where it is constricted and flows under Lake Shore Drive. The Ruddiman Lagoon narrows and outlets to Muskegon Lake at its Northwestern end at Lake Shore Drive. The stream flows northwesterly, from the Lake Shore Drive crossing, approximately 600 feet, into Muskegon Lake.

The water quality of the lagoon is primarily influenced by Ruddiman Creek. The lagoon has received pollutants from the stream historically, and continues to receive



high levels of bacteria. The lagoon is a natural feature that provides valuable wildlife habitat, and acts as a greenbelt. The lagoon area is limited as a corridor to

Muskegon Lake by its outlet beneath Lake Shore Drive.

Ruddiman Lagoon's water quality will continue to be influenced by the water it receives. Stormwater management, continued storm and septic sewer separation, and sound upland management practices offer greatest (current) control on the water quality. Some impacts from residual petroleum and heavy metals may remain for decades, while the system purges itself. Riparian buffer zones can expand and enhance the Ruddiman Lagoon and Ruddiman Creek area as an important greenbelt. This buffer will help protect the lagoon's water quality from upland activities such as fertilizing. Fertilizer compounds which runoff into the lagoon will only increase the rate of eutrophication. Currently, the lagoon acts as a chemical sink ,or a buffer, between Ruddiman Creek and Muskegon Lake. Therefore the water quality of both Ruddiman Creek and Ruddiman Lagoon directly affect the water quality and recreational enjoyment of Muskegon Lake.

Despite water quality impacts, Ruddiman Creek and the Ruddiman Lagoon area provides numerous quality scenic views and recreation opportunities, and serve as valuable wildlife corridor and habitat area. Remedial action and natural purging of pollutants in the Ruddiman Creek system will be ongoing. The application of natural riparian buffer zones, storm water management, and sanitary sewer separation are important factors in the preservation and enhancement of Ruddiman Creek and





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Ruddiman Lagoon. Improvement of water quality within the Ruddiman Creek and Lagoon will increase the functional value of the Natural Feature. The water quality is important to the creek and lagoon as well as Muskegon Lake.

Woodlands

As is the case in most urban centers, areas exhibiting significant tree cover include parks and other City owned land, cemeteries, ravine systems abutting creeks and streams, and residential areas, commercial corridors, and the core Downtown. However, the City of Muskegon contains three large areas of substantial woodlands and woodland habitat. The areas are associated with Little Black Creek, Four Mile Creek, and the critical dune area near Bronson Park. Each of the three woodland areas appear on the Natural Features Inventory Map.

Little Black Creek Woodlands

An especially aesthetic and large tract of woodlands follow Little Black Creek through it's entire route across the City. The width and continuity of this woodland provides a natural greenbelt, with substantial wildlife habitat. Whitetail deer utilize the woodlands as far west as the portion between Roberts Street and Getty Street, an area surrounded by significant commercial and industrial development. Protection of this woodland greenbelt will ensure the longevity of this valuable amenity.

Fourmile Creek Woodlands

The Fourmile Creek valley between U.S. 31 and the Muskegon Community College Campus contains a beautiful woodland area, approximately a square quarter mile in size. The deeply cut ravine offers exceptional wildlife habitat, while generally poorly suited for development. The area offers excellent recreational and educational opportunity, as well as acting as a valuable component to the Fourmile Creek greenbelt.

Lake Michigan Dune Woodlands Near Bronson Park

The woodlands located on the lakeward side of the foredunes near Bronson Park, is the largest remaining section of natural dune woodland habitat remaining within the City limits. The uniqueness and scarcity of this ecosystem, as well as along the entire Lake Michigan shoreline, causes this



area to be an important Natural Feature. These woodlands, as well as the dunes themselves, should be developed carefully to not destroy their ecological importance and the natural protection they provide from Lake Michigan.





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In addition to the three woodland areas, trees are an important aspect of the Downtown historical district. Many of the facades are completed by mature trees. A recommendation to include tree preservation in the historical district will ensure that this important aspect of the City will remain intact.

other Environmental Groups where common interests exist.

Additional neighborhoods with mature and historic trees provide quality aesthetic habitats for birds, squirrels, and raccoons. A tree inventory identifying and characterizing the woodland resources of the City could be used to identify these areas. Once identified, recommended tree preservation zoning ordinances could be applied to the areas.

CONCLUSIONS/ RECOMMENDATIONS

Several specific recommendations are presented to preserve, enhance, develop, create, and use the natural resources of the City. The recommendations have been summarized into seven primary actions: Habitat Plan Development and Implementation; Integration of Natural Features with Recreation and Leisure Planning; Water Quality and Subwatershed Plans; Generic Zoning and Design Criteria for Natural Features and Natural Areas; Development of City Stormwater Management Requirements and Possible Modifications for Sensitive Natural Areas; Preservation and Conservation of Natural Features and Natural Areas; and Working with the Muskegon Lake Public Advisory Council, Natural Resource Conservation Service & Soil Conservation District, and





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SEVEN PRIMARY ACTION/POLICY RECOMMENDATIONS COMMON TO ALL NATURAL FEATURES AND AREAS

1. Habitat Plan Development and Implementation.

Several areas, which are now, or could become, Natural Areas, have great potential for improved wildlife habitat and native vegetation. Habitat improvement with native plants, will increase the areas value for wildlife and provide an amenity to the City and metropolitan users. A plan should be developed specifically to define the areas where habitat could be improved and exactly how they could be improved. The plan would describe what kinds of habitats would be created and evaluate what funding sources and cooperating groups are available to assist.

2. Integration of Natural Features and Areas with Recreation and Leisure Planning.

The natural amenities within the City are unique and are not duplicated elsewhere. The system of Natural Features and Areas should be focal points of recreation and leisure, especially along the lakeshore and along stream corridors. The Muskegon Lakeshore Trail will specifically link Natural Features and Areas and provide an opportunity for access to scenic views and recreational activities.

3. Development of Water Quality and Subwatershed Plan.

Development of a water quality and subwatershed plan is critical for determining specific actions or policies the City can initiate to increase water quality within each subwatershed and Muskegon Lake. The Plan would include but not be limited to identifying specific concerns for water quality improvement, buffer zone improvements, critical stormwater management areas, recreational opportunities, and habitat enhancement areas. The water quality and subwatershed plan will support regulations set forth in the General Zoning and Design Criteria for the lakes and stream corridors. Such zoning and design criteria may be very different from one subwatershed to another, depending on past and current adjacent land use, pollution history, and human impacts such as filling or clearing within floodplain and riparian zones.



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SEVEN PRIMARY ACTION/POLICY RECOMMENDATIONS COMMON TO ALL NATURAL FEATURES AND AREAS

4. Generic Zoning and Design Criteria for Natural Features and Areas.

All of the Natural Features and identified Natural Areas within the City are deserving of protection because the cumulatively make up a natural setting which is very unique. Different zoning and design criteria would apply to dunes, wetlands, streams, woodlands, and lakes. In general, within these different areas, zoning mechanisms such as Natural Feature Overlay Zoning Districts and development standards, Planned Unit Development Standards, site plan review, cluster development regulations, building height limits, Special Use Standards will be beneficial. Existing minimal standards applicable to Natural Features and resources do not enable the City to take full advantage of it's oversight authority. Establishment of these regulations for the Natural Features and Areas will protect and improve the natural resources and the scenic amenities within the City.

5. Development and Enforcement of City Stormwater Management Requirements and other Possible Modifications for Sensitive Natural Areas.

Development and/or revision, and enforcement of stormwater management practices may reduce the amount of pollutants entering waterways through illegal sanitary connections, parking lot and street runoff, and industrial discharges. Along with future enforcement of stormwater management practices, and possible retrofit of existing systems, elimination of curb and gutter in Planned Unit Developments or retention/detention ponds at commercial and industrial facilities are some possibilities.

6. Preservation and Conservation of Natural Features and Areas.

Many natural or potential Natural Areas around the City, have extreme ecological value. These areas should be acquired by the City solely or with potential conservancy groups, and placed in a conservancy program. These areas would potentially receive development limited to passive use recreational activities and educational facilities/activities. A specific plan should be developed, identifying such parcels and preliminary plans for their potential use, preservation, and enhancement.



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SEVEN PRIMARY ACTION/POLICY RECOMMENDATIONS COMMON TO ALL NATURAL FEATURES AND AREAS

7. Working with the Muskegon Lake Public Advisory Council, Natural Resource Conservation Service & Soil Conservation District, and other Environmental Groups where common interests exist.

Some groups are completing water quality analysis, cleanup and awareness programs, or other assessment, protection, and enhancement projects. Many of these projects are aligned with common goals and objectives of the City, related to protection, preservation and use of its Natural Features. These groups may also assist in community awareness programs. Many City and metropolitan residents are not fully aware of the Natural Features within the City. Community awareness will make people aware of the amenities they have in their “back yards” and what they can do to assure their preservation and quality.

Six of the seven primary recommendations have been expanded in the following specific recommendations. The final recommendation for working with the PAC, NRCS & SCD, and other environmental groups does not warrant additional specific recommendations. Many specific

opportunities for working together will be realized as portions of the plan are completed. Some recommendations can't be fully defined until recommended plans have been created, further addressing specific aspects of individual natural features or areas.





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1. HABITAT PLAN DEVELOPMENT AND IMPLEMENTATION SPECIFIC RECOMMENDED ACTIONS/POLICY

Muskegon River

The former City dump now a compost recycling area, has been altered greatly, but due to it's adjacent wetlands, offers an opportunity for valuable habitat improvement. Many birds and mammals that utilize the marsh need upland breeding and loafing habitat. A plan for secondary land use of the altered area that includes native plant species, grasses, trees, and shrubs, will provide such habitat and restore the aesthetics of the area.

The area of the former waste water treatment plant, between the middle and south branch of the River offers opportunity for habitat restoration. Currently, low areas have revegetated with wetland species. The areas that are currently manicured around the pond and upland could be revegetated with native tree and shrub species, providing valuable habitat and a nature area for the study of native plants. The habitat enhancement could dramatically improve the aesthetics of the area.

Ryerson Creek

Opportunities for habitat enhancement exist in the riparian buffer zone along Ryerson Creek in the vicinity of Smith-Ryerson Playfield and Green Acres Park. Use of native plants (trees, shrubs and ground cover varieties) would increase the aesthetics of these areas as well as provide additional habitat. The additional habitat would be useful breeding and loafing habitat. Less desirable, invasive species currently found could be replaced by native, desirable, plants.

Ruddiman Creek and Lagoon

Opportunities for habitat enhancement exist in the riparian buffer zone along Ruddiman Creek and Lagoon. Specifically, the manicured lawn space along the lagoon could be reduced and replaced by native plants. A portion of the lawn could be replaced by a wood chip nature trail with lagoon viewing points. This would increase wildlife habitat, create a wider riparian buffer zone, and decrease the effects of stormwater runoff from manicured areas without dramatically decreasing the park's recreational value. Use of native plants (trees, shrubs and ground cover varieties) would increase the aesthetics and provide additional breeding and loafing habitat.



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1. HABITAT PLAN DEVELOPMENT AND IMPLEMENTATION SPECIFIC RECOMMENDED ACTIONS/POLICY

Muskegon Lake and Lakeshore

Opportunities for habitat enhancement occur along nearly the entire shoreline. In each of the eight (8) Natural Areas, some habitat enhancement may be valuable. However the primary habitat enhancement efforts should be within all of the altered areas which connect the Natural Areas. This would provide a less dissected greenbelt around the lake.

The Muskegon Lakeshore Trail will work well with this recommendation because it will offer excellent opportunities for native plant habitat along nearly it's entire route. Implementation of a general recommendation to plant native tree, shrub, and herb species along the trail, extensively when possible, will increase the aesthetics along the trail and provide habitat and a greenbelt around the lake.

Other specific areas where habitat improvement with native species are recommended include public launch sites, especially the Grand Trunk, Fisherman's Landing, and Hartshorn Marina sites. These areas are mostly open, with very little or no habitat for wildlife. In areas such as Fisherman's Landing, planting areas with trees and other cover will serve as aesthetic breaks from railroad or industrial properties.

Heritage Landing, Terrace Point, and other vacant former industrial properties have excellent potential for habitat enhancement. A focus on landscaping with native plants will add to the aesthetic, recreational, and educational quality of the lakeshore, and wildlife habitat along the lake. An increase of birds, butterflies, and other small animals would be anticipated with increased native habitat.



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1. HABITAT PLAN DEVELOPMENT AND IMPLEMENTATION SPECIFIC RECOMMENDED ACTIONS/POLICY

Wetlands

Develop and implement a plan to increase wetland habitat and native vegetation for disturbed areas which have been filled or impacted adjacent to wetlands. Created and enhanced wetland habitat on disturbed areas, especially around current surface water, may provide this additional wetland habitat. There may be opportunities within the City for expansion of wetlands or reclamation of filled wetland areas.

Such areas may be on the former Continental Motors property, the small waterway between the YMCA and Heritage Landing, Muskegon Lake west of the Port City Princess docking facility (by Waterfront Center), the area west of the Cole's Marina facility, the former Amoco property, and the former waste water treatment area. Some of these areas have known contamination, so potential mitigated or created wetland should have an assessment completed prior to agitating soils or groundwater which may release pollutants. The assessment will also identify the potential positive affects the wetlands may have on impacted areas. The wetlands will capture impacted sediment as well as filter sediment and other nonpoint source pollutants before entering Muskegon Lake.

Woodlands and Trees

Develop and implement a plan to increase habitat and native vegetation for disturbed areas which have been filled or impacted. The plan should include tree planting recommendations for areas along Muskegon Lake, such as Fisherman's Landing and the public launch site near the Grand Trunk Railroad dock. Both areas have considerable potential for additional trees. Additional trees and native ground cover will serve as habitat and natural buffer. The trees will also serve as important aesthetic buffers, separating recreational areas from industrial and railroad properties. Several City owned parcels, and numerous private parcels, have large areas of manicured lawn and decorative landscaping, however, native shrubs, grasses, and trees should be promoted where possible.

Dunes

Develop and implement a plan to increase habitat and native vegetation for beach and dune areas which are maintained but do not have direct use. These areas may include unused portions of Pere Marquette Park that are groomed by removing excess sand. Establishment of dune grass on such areas may offer an increased aesthetic value to the lakeshore.



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2. INTEGRATION OF NATURAL FEATURES AND AREAS WITH RECREATION AND LEISURE PLANNING SPECIFIC RECOMMENDED ACTION/POLICY

Muskegon River

The former City dump, due to its large upland area and adjacent wetlands, offers excellent opportunity for recreational secondary land uses specifically centered around existing adjacent habitat and wildlife. A wildlife observation tower, parking, and some picnic facilities would lend access for all people, including handicap access, to enjoy the wetland habitat and the wildlife. Currently such access is very limited.

The area of the former waste water treatment plant has excellent recreational potential. Currently, many people fish and launch small boats on the parcel. The parcel contains a pond, manicured lawn, and Natural Area, in addition to the former waste water treatment plant. Habitat enhancement, with recreational facilities such as picnic area, nature trail, observation platform, etc., can add to enjoyment of the area. An old greenhouse and the settling and aeration tanks, could possibly be used as native plant and fish rearing facilities for local conservation groups.

Ryerson Creek

The Smith-Ryerson Playfield area currently boasts extensive recreational opportunities for the area, and The Ryerson Creek floodplain and riparian zone offer good habitat and support a diverse assemblage of wildlife species. The potential for combining natural features with recreation and leisure is good. Primitive trails used by local residents, primarily children, offer excellent potential for expansion. The trails should be widened, leveled, and covered with wood chips. Such a nature trail could be more widely used by all ages and provide greater access to wildlife viewing. Viewshed/wildlife observation points and/or small picnic areas may also enhance the enjoyment of the feature. As with Fourmile Creek, the potential for a long loop trail along the length of Ryerson Creek would increase access to, and enjoyment of the entire Ryerson Creek greenbelt.

The plan should assess potential use and enjoyment of a fishing/viewshed platform on north side of the pond. The Smith-Ryerson Playfield will continue to develop as a recreational center, with potential additions of trails and enhanced habitat, increasing its value as a natural feature and amenity.





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2. INTEGRATION OF NATURAL FEATURES AND AREAS WITH RECREATION AND LEISURE PLANNING SPECIFIC RECOMMENDED ACTION/POLICY

Fourmile Creek

The north side of Sandford's Bayou and Fourmile Creek , and potentially the south side, offer an excellent location for a nature trail with wildlife and viewshed observation points. In addition, people currently fish near the outlet of Sandford's Bayou. Such trails would provide access for multiple use and enjoyment of the natural area. Much of the creek and greenbelt currently has somewhat limited access. A loop trail, west of US 31, would provide approximately a 3 mile hike with incredible views and wildlife viewing. The plan should incorporate wildlife viewing and scenic views locations, with a nature trail system along the bayou. Increase access for picnics and fishing on Sandford's Bayou.

Little Black Creek

The Little Black Creek greenbelt provides an excellent opportunity for recreation and leisure, especially by industrial and commercial workers during lunch times. Many people utilize the former railroad grade as a path to walk, jog, or bike during lunch. If trails were developed and some potential parking and picnic areas were created, they may be widely used by both area workers as well as all people on weekends and evenings. The greenbelt has the largest area of connected woodlands and tree canopies in the City, with unique wildlife viewing possibilities.

Ruddiman Creek and Lagoon

Explore the possibility of creating new trails, and enhancing existing primitive trails to nearly level, five-foot wide paths along Ruddiman Creek, tributaries, and the lagoon. Many people enjoy walking the existing trails created by children. If the trails were better developed and made in loop fashion, utilization and enjoyment of these Natural Features may be increased. Excellent recreation opportunities already exist at McGraft Park, the trails would add to the park and lagoon area with minimal funding and resources. Enhanced habitat along these trails, will promote breeding and loafing and increased usage by wildlife. The plan should incorporate wildlife viewing and viewshed locations with a nature trail system along the lagoon, Ruddiman Creek, and the tributary which borders McGraft Park.



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2. INTEGRATION OF NATURAL FEATURES AND AREAS WITH RECREATION AND LEISURE PLANNING SPECIFIC RECOMMENDED ACTION/POLICY

Lake Michigan

Lake Michigan is already a main focus of recreation in the City. Pere Marquette Park and Bronson Park are heavily used in the summer for beach recreation activities. The Muskegon Lakeshore Trail provides increased enjoyment and safe pedestrian travel along nearly the entire lakeshore. Boats and fisherman will continue to utilize Lake Michigan as a valuable amenity.

Muskegon Lake and lakeshore

Consistent with the Master Plan for the Muskegon Lakeshore Trail, Muskegon Lake will be accessible by more people. The Trail will provide multiple viewsheds, lake access points, and recreation areas. Completion of the trail will be the greatest link, recreationally between natural areas. A major undissected greenbelt will be created along the lakeshore will be created with enhanced vegetation.

Wetlands

Current and potential created wetlands provide a visual, recreational, and educational amenity. The wetlands around Muskegon Lake, adjacent to the Muskegon State Game Area, and within the stream floodplains, provide wonderful habitat for wildlife. Trails and parks which provide access to these features are important. McGraft Park, Smith-Ryerson Playfield, and the former wastewater treatment area already provide access to wetlands. A future park and/or wildlife observation area on the former landfill area north of the causeway would provide much needed access to viewing of the marshlands adjacent to the Muskegon State Game Area.

Woodlands and Trees

Develop and implement a plan to incorporate wildlife viewing and viewshed locations, nature trails, and habitat enhancement with future recreation and leisure planning efforts. The Little Black Creek woodlands offer an excellent opportunity for a woodland nature trail within the City. A nature trail through portions of the three major woodland areas would increase the value of these amenities through passive recreational and educational uses.



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3. DEVELOPMENT OF WATER QUALITY AND SUBWATERSHED PLAN SPECIFIC RECOMMENDED ACTION/POLICY

Muskegon River

The plan would identify any potential actions and/or policy that the City might use to improve water quality within the river floodplain. With only a limited portion of the river which is within the City, the primary value of the plan would be in cooperation with other habitat enhancement or preservation assessments and projects.

Ryerson Creek, Fourmile Creek, and Little Black Creek

The water quality and subwatershed plan would identify specific concerns for water quality improvement, recreational opportunities, and habitat enhancement areas. The subwatershed plan could support action and policy set forth in the zoning and design criteria to be created for the stream corridors. Clear understanding of the water quality issues and recommended policy and action is vital to increasing water quality in Muskegon Lake and the streams themselves.

Ruddiman Creek and Lagoon

Development of a subwatershed plan would be helpful in identifying specific concerns for water quality improvement, recreational opportunities, and habitat enhancement areas. The subwatershed plan could support regulations set forth in generic zoning and design criteria for development within the Ruddiman Creek corridor. Ruddiman Creek water quality issues are among the most important, due to current use restrictions by the Muskegon County Health Department.

Muskegon Lake

A water quality and subwatershed plan would incorporate a vast amount of existing data and specifically identify those areas around the City's shoreline where water quality is currently being compromised. The areas may include sites of environmental contamination, storm sewer outfalls with remaining sewer connections, and tributary streams.



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4. GENERIC ZONING AND DESIGN CRITERIA FOR NATURAL FEATURES AND AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Muskegon Lake and Lake Michigan

The two lakes and their shorelines are very unique and are a central focus to the City's redevelopment and recreational efforts. Actions to be taken can include : Lakeshore/Natural Feature Overlay Zoning Districts and development standards, Planned Unit Development Standards, site plan review, cluster development regulations, building height limits, Special Use Standards. More stringent standards would provide required buffers, setbacks, density, stormwater management, and similar guidelines for the continued preservation and enhancement of the lakeshores as Natural Features.

Dunes

The City may further control the dune resource and their development by establishing guidance for, and exercising right to provide comments and regulate development of Critical Dune areas. The State law requires the Department of Environmental Quality to give local government the opportunity for such comment and regulation. Such guidance may include recommendations for avoidance, shared development, slope limitations, and density limits. Development of such Policy and regulations will, at a minimum provide uniformity to the review process and allow the City a basis for acting on concerns such as density and access.

Wetlands

The City should have it's own policy and development regulations for wetlands. The City's remaining wetlands are generally in areas not well suited for other development due to physical characteristics. The State of Michigan and Federal Government will allow the City to comment on projects. Wetland protection policy and development regulations would provide a uniform treatment of wetlands and allow the City to regulate construction in them. Not all permits from the State and Federal government allowing destruction of wetlands, require creation of mitigation wetlands and this could result in a net loss of remaining wetlands within the City.



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4. GENERIC ZONING AND DESIGN CRITERIA FOR NATURAL FEATURES AND AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Rivers and Stream Corridors

Each of the stream corridors and the Muskegon River are valuable to the overall Natural Features system within the City. Zoning and design criteria such as Natural Feature Overlay Zoning Districts and development standards, Planned Unit Development Standards, site plan review, cluster development regulations, building height limits, Special Use Standards should be instituted to provide for the continued protection of the resources. More stringent standards would provide required buffers, setbacks, density, stormwater management, and similar guidelines for the continued preservation and enhancement of the corridors.

Woodlands

Tree preservation plans may require developers and home owners to contact the City, prior to removing trees. The trees on the property could be inventoried and then steps such as avoidance, replacement, or trimming may be recommended by the City. A tree study of the City may reveal areas where this approach may be more valuable than others, such as historic districts, stream corridors, or other mature areas



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5. DEVELOPMENT AND ENFORCEMENT OF CITY STORMWATER MANAGEMENT REQUIREMENTS AND OTHER POSSIBLE MODIFICATIONS FOR SENSITIVE NATURAL AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Ryerson Creek

Investigate source of septic water near mouth of Ryerson Creek near Ottawa Street. There has been septic odor during various studies, including the preparation of this report, where the railroad tracks cross the creek.

Future enforcement of stormwater management practices, and possible retrofit of existing systems, may reduce the amount of hydrocarbon contaminants being introduced to the stream and Muskegon Lake. The feasibility for mechanisms such as elimination of curb and gutter or retention/detention systems in new developments should be addressed, as they may reduce the amount of runoff and nonpoint source pollution from residential areas.

Ruddiman Creek and Lagoon

Continued investigation, isolation, and correction of historic septic discharges to the storm sewer system are recommended. This is a key priority because the current health advisory for contact with Ruddiman Creek and Ruddiman Lagoon, due to high levels of fecal bacteria, is a limiting factor in the recreational use and enjoyment of the resource.

Ruddiman Creek and Lagoon have been impacted by oil and grease, likely due to area hydrocarbon facilities and pipelines, but also potential urban runoff from commercial parking areas. Future enforcement of stormwater management practices, and possible retrofit of existing systems, may reduce the amount of hydrocarbon contaminants being introduced to the stream and Muskegon Lake. Other possibilities such as elimination of curb and gutter or retention/detention systems in areas may reduce the amount of runoff and nonpoint source pollution from residential and commercial areas.

Muskegon Lake and Lakeshore

Design and implement a plan for systematic investigation, isolation, and correction of historic septic discharges to the storm sewer system. Determine the viability of incorporating an assessment of industrial discharge locations and concentrations, and determine if there are nonpermitted industrial discharges to the stormwater system.





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5. DEVELOPMENT AND ENFORCEMENT OF CITY STORMWATER MANAGEMENT REQUIREMENTS AND OTHER POSSIBLE MODIFICATIONS FOR SENSITIVE NATURAL AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Wetlands

Develop and/or revise, and enforce stormwater management practices. Stormwater management within the watersheds associated with wetland areas, may help to reduce sediment and other pollutants associated with residential uses and commercial parking lot runoff. A reduction of the pollutants will help increase water quality, and the wetlands longevity.



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6. PRESERVATION AND CONSERVATION OF NATURAL FEATURES AND AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Muskegon Lake and Lakeshore

Several parcels of land along the lake, especially these eight Natural Areas identified by Day & Associates, Inc., should be preserved. Preservation can be accomplished through zoning, and/or actual acquisition of the land. Preservation and enhancement can be in concert with development when done correctly, so one does not preclude the other. However, some areas such as the former Pigeon Hill area, Cottage Grove shoreline area, and Old Field Community northeast of Fisherman's Landing are areas where conservation and passive recreational usage is recommended. These parcels represent large, unique natural areas that serve as important wildlife habitat and open space.

Lake Michigan

Acquire/set aside areas for continued preservation and enhancement of the Lake Michigan Shoreline, including allowing the development of some small dunes with dune grass, between manicured beeches. This also applies to the north shore, which is less developed and has native dune aesthetics.

Dunes

Conservation of publicly owned property which contains dunes or Critical Dune areas is recommended. These areas represent the only areas where the City can maintain full control over the development and protection of the Dunes. This also applies to the north shore, which is less developed and has native dune aesthetics.

Explore the possibility of working with conservation groups to acquire parcels of dune area such as the large undeveloped portion of the former Pigeon Hill. Place the dune area in permanent conservancy for protection and passive recreational and educational uses.

Wetlands

The wetlands adjacent to the Muskegon State Game Area, is indistinguishable from the ones within the Game Area and therefore are functionally just as valuable. These areas should not be developed other than for passive recreational enjoyment as a wildlife habitat and as a ecosystem education opportunity.

Areas southwest of the causeway and along the south and middle branch of the river should also be set aside due to their general unsuitability for development and high value as natural areas/habitat.



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6. PRESERVATION AND CONSERVATION OF NATURAL FEATURES AND AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Fourmile Creek and Sandford's Bayou

The area along the north side of Sandford's Bayou and Fourmile Creek offers excellent potential for recreational use and enjoyment. As such, the possibility of acquisition and/or preservation of this area should be explored. Maintaining this area as a Natural Area has several possibilities for land use, while preserving it's value as a viewshed and natural wildlife area.

Where available, the Fourmile Creek floodplain and riparian zone should be preserved as an important greenbelt. This may include land acquisition, preservation, and or zoning controls.

Acquire/set aside areas for continued preservation and enhancement of the Sandfords Bayou and surrounding areas as an important part of the Fourmile Creek greenbelt. Sandford's Bayou is a beautiful surface water body, that currently has little or no access for it's use. Limited access is afforded by the north and south shorelines.

Ryerson Creek

The Ryerson Creek greenbelt has been protected by the City acquiring lands which contain the stream, floodplain, and immediate riparian area. Where possible, the City should acquire and set aside properties which encompass the Ryerson Creek floodplain and immediate upland area. This may also facilitate future conversion of primitive trails into nature trails along the floodplain.

Little Black Creek

The Little Black Creek greenbelt has value as an excellent wildlife habitat and corridor area. Land acquisition and/or preservation of it's entire length will continue to ensure it remains a viable habitat and corridor area, and may be a potential recreational area within the City some day. Currently, the associated land use along the creek is mostly industrial and commercial. These land uses actually enhance the Little Black Creek greenbelt, because not many people use the woods resulting in an area that is very quiet, and not disturbing to the animals during evening and night hours.



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6. PRESERVATION AND CONSERVATION OF NATURAL FEATURES AND AREAS SPECIFIC RECOMMENDED ACTION/POLICY

Woodlands

A tree inventory for the City of Muskegon to identify areas in addition to the three areas previously described should be completed. This survey may result in additional areas where tree preservation practices are desirable.

Evaluate the potential for a canopy corridor between Ryerson Creek and Fourmile Creek in the vicinity of Jackson Hill. There are existing woodland resources within the area, and protection and enhancement will connect the two greenbelts. If viable, tree preservation and enhancement could be used to ensure this area will remain a tree canopy corridor between the two greenbelts.

