

# Grand Lake and Coastal Watersheds

## Management Plan

A Plan to Protect the Water and Natural Resources in the Grand Lake Watershed and Adjacent Coastal Watersheds in Alpena and Presque Isle Counties.

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Prepared by:  
Northeast Michigan Council of Governments  
121 East Mitchell  
Gaylord, Michigan 49735  
[www.nemcog.org](http://www.nemcog.org)



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A PLAN TO PROTECT THE COASTAL RESOURCES

Presque Isle & Alpena Counties, Michigan

**Prepared by:**

Northeast Michigan Council of Governments  
121 East Mitchell Street  
P. O. Box 457  
Gaylord, Michigan 49735  
[www.nemcog.org](http://www.nemcog.org)

Richard Deuell, AICP – Project Manager and Lead Planner  
Kathryn Arnold - Water Resource Specialist

**Assisted by:**

**Water Resource Committee Members**

Terry Castro, Presque Isle Community Men's Club  
Robert Graham, Presque Isle Community Men's Club  
Frank Krist, Sanitarian for District Health Department #4  
Steve Lang, Presque Isle Harbor Association  
Bill Lewis, Citizen  
Jerry Meek, Alpena County Planning Commission  
Sally Mulka, Krakow Township Planning Commission  
Cynthia Paavola, Presque Isle Township Trustee, Presque Isle Twp. Planning Commission  
Pete Pettalia, Presque Isle Township  
Dan Rivard, retired engineer  
David Ward, Grand Lake Association  
Charles Winters, Presque Isle Township Planning Commission  
James Zakshesky, Presque Isle County Construction Codes

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# Introduction

## Background

Lakes provide aesthetic beauty, recreational opportunities and economic drawing power for both residents and visitors to the region. Lakes thrive on a delicate balance of physical, chemical, and biological facets, and alteration of the ecology of a lake or its watershed can result in a change of this delicate balance. Poorly designed development and overuse of lakeshore properties will result a decline in water quality. However, human presence in the lake environment can be one of minimal impact if management activities are practiced as a part of northern lake living.

Over one half of Presque Isle County's political boundary is defined by the Lake Huron Shoreline. Townships with coastal areas and inland lakes are seeing increased pressure for second and retirement home development. In the Presque Isle County Master Plan states, " Of these high growth townships, one common attribute is worth noting; namely, the presence of private property development on or near waterfront..... Not only is new residential development occurring in these townships, but homes that were previously used as vacation homes are being converted to year-round homes as homeowners retire and move north permanently."

In the eastern parts of Presque Isle County are Presque Isle Township and Krakow Township. Both are growing at rates greater than the County average. Presque Isle Township is the fastest growing community; receiving over one half of the County's population increase over the last decade. Grand Lake (5,822 acres), Long Lake (5,409 acres) and 41 miles of Lake Huron Shoreline are the reasons behind growth in both townships. Thompson's Harbor State Park and Michigan Department of Natural Resources own portion of the Great Lake's shoreline, the rest is in private ownership. Another driving force for growth in this part of the county is the Presque Isle Harbor Association. Subdivided in the 1970's, some 3000 lots were platted on the narrow stretch of land seated between the east shore of Grand Lake and Lake Huron. The development covers approximately 3000 acres of which 1500 acres are set aside as common space. Included in the association are parks on Lake Huron and Grand Lake as well as facilities such as clubs houses and an indoor swimming pool. Only 500 lots have been developed thus far, however, development rates are increasing compared to the first two decades of its existence.

Much of the area is part of a glacial sandy lake plain. Sand and other glacial deposits vary in thickness. Limestone bedrock is at or near the surface in large parts of Presque Isle and Krakow Townships. Stoneport Quarry is an active limestone mining operation, located in the land area between the eastern shores of Grand Lake and the Lake Huron Coast. An abandoned quarry called Rockport is located in the coastal watershed in the northeastern part of Alpena County. Geology and soils present severe building constraints in the area. The Northeast Michigan Karst Aquifer Protection Project identified eastern part of the County as highly sensitive. Grand Lake has glacial origins different than the numerous kettle lakes found further inland. Acting like a large bulldozer, the advancing continental glacier broke apart the level sedimentary bedrock and scoured out the long linear lake basin. There are several islands in Grand Lake. The sinkholes, exposed limestone bedrock, beach ridge and swale complexes, cobble and sand beaches, low dunes and extensive wetlands can be found in the townships. A number of threatened and endangered species can be found. The dwarf lake iris is so prolific in areas that some locals wonder how such a common species can be listed as globally rare.

## Grand Lake - Coastal Watershed Plan

Coastal ecosystems, both near shore land areas and water areas are biologically rich. In northeast Michigan, near shore land areas are post glacial lake plains, typified by water deposited sand and gravel overlaying limestone bedrock. Great Lakes marshes and bedrock shoals provide cover, feeding and spawning habitat for fish populations. Coastal ecosystems provide critical habitat for resident and migratory birds. Pine-oak and aspen-birch forests; hardwood and conifer swamps; coastal marshes and fens; cobble and alvar beaches; numerous bays and peninsulas and several uninhabited islands are home to a high number of threatened and endangered species.

Coastal zones are prime areas for a wide variety of outdoor recreation. Hunting, fishing, boating, paddle sports, birding and hiking are a few of the recreational activities pursued within coastal areas. Quality of the recreational experience is dependent upon the quality and condition of the natural resources. Healthy ecosystems are better places to hunt, fish and bird watch than degraded, exhausted environs. Along with being great places to recreate, shorelines and near shore land areas are in high demand for residential development. The challenge for communities along the Great Lakes coastal areas is to accommodate and guide growth in a manner that supports healthy ecosystems.

### Location and Regional Setting

Grand Lake is located in Presque Isle County in the Northeastern Lower Peninsula of Michigan. The watershed planning area includes the Grand Lake Watershed and several smaller coastal



watersheds from the outlet of Little Trout River south to the outlet of Long Lake. The planning area covers parts of Krakow, Presque Isle and Pulawski Townships in Presque Isle County, and Alpena Township in Alpena. While there is no incorporated city or village in the planning area, the Presque Isle Harbor Association functions as a community center. The Presque Isle Harbor Association (PIHA), when fully developed, will be the largest community in Presque Isle County.

### Plan Development

This project was funded in part under the Coastal Zone Management Act of 1972, as amended, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce and the Michigan Coastal Management Program, Michigan Department of Environmental Quality.

The purpose of this study is to provide a starting point for assessing the present condition of the Grand Lake Watershed and to utilize the results in pinpointing problem areas for immediate management implementation or future work. Before this study was undertaken, the quantity and quality of data available was very limited for Grand Lake. Managing water resources requires the use of complete and reliable information which necessitated filling the 'information void' with this intensive study.

The primary objective of the project is to develop a comprehensive plan which identifies Grand Lake's ecological values, potential and existing threats, and recommendations for long term protection.

## **Grand Lake - Coastal Watershed Plan**

The need to take a proactive approach to protecting the water quality is paramount. Krakow and Presque Isle Townships each administer their own planning and zoning. Information and recommendations compiled in the watershed planning process will help communities make better land use decisions. Communities, major landowners and associations have a history of internal planning. Coordinated planning between all of the players has been somewhat limited. One of the key elements of the planning process will be formation of a multi-jurisdictional committee. Bringing the players together at one table to guide the plan development will have long term benefits.

The Grand Lake Watershed is presently part of a rich and diverse ecosystem. An ecosystem is a complex set of relationships between the living resources, habitats, and residents of an area. It includes all aquatic and terrestrial plants and animals, microorganisms, water, and soil. Plant and animal diversity (biodiversity) enables ecosystems to adapt to unanticipated pressures such as climate change, pest infestations and flooding. All of the watershed's diverse organisms, from the tiniest plankton to the awe-inspiring 500 lb. black bear, depend on the its water resources. Still, it is important to remember that while the term "watershed" conjures visions of sparkling lakes and abundant, trout-filled streams, most of the area within a watershed is actually terrestrial. Biodiversity, both aquatic and terrestrial, is a key factor in environmental stability, and is essential to the health and livability of the Grand Lake Watershed.

Urban and rural land uses in the Grand Lake Watershed directly affect the water quality of the lake, its streams and the groundwater supply. Polluted runoff from a wide variety of sources can destroy fish and wildlife habitat, kill fish, amphibians, reptiles, and insects, degrade the quality of drinking water, clog harbors and streams with sediment, and reduce water-related recreational opportunities. Activities that remove and consume water, such as irrigation and industry affect lake levels and stream flow. Because land use and water quality are so inextricably entwined, it is essential for a sound watershed management plan to incorporate a holistic approach into its design in order to maintain and enhance the balance and diversity of the region. Implementation of both regulatory & non-regulatory management practices will enable watershed residents, planning commissions, and local government to work together to protect these vital resources.

### **Watershed Planning Steering Committee**

This plan was developed in partnership with the Grand Lake Watershed Planning Steering Committee, formed as part of this project. The steering committee served as an advisory group, meeting several times throughout plan development. Members included: Department of Environmental Quality-Coastal Zone Management, NEMCOG, Headwaters Land Conservancy, Presque Isle Township, Presque Isle Township Planning Commission, District Health Department #4, Presque Isle County Office of Soil and Erosion, Grand Lake Association, Presque Isle Harbor Association, Presque Isle Community Men's Club, local industry, businesses, private landowners and local media,.

The committee worked together to create a vision for the future of Grand Lake and smaller coastal watersheds. The plan includes a detailed non-point source inventory of the natural resources; evaluates the status of planning and zoning; identifies values and assets, issues and concerns and priority conservation areas, and includes recommendations for the protection of the ecological resources in the area.



## **Grand Lake - Coastal Watershed Plan**

An education and outreach effort will include several articles in the Alpena Newspaper and the Presque Isle Advance, posting of the plan on NEMCOG's web site and presentations to local groups, governmental units and/or organizations. An important step in implementing the plan will be to build local support for the recommendations and strategies.

### **Committee Members**

Terry Castro, Presque Isle Community Men's Club  
Robert Graham, Presque Isle Community Men's Club  
Frank Krist, Sanitarian for District Health Department #4  
Steve Lang, Presque Isle Harbor Association  
Bill Lewis, Citizen  
Jerry Meek, Alpena County Planning Commission  
Sally Mulka, Krakow Township Planning Commission  
Cynthia Paavola, Presque Isle Township Trustee, Presque Isle Twp. Planning Commission  
Dan Rivard, retired engineer  
David Ward, Grand Lake Association  
Richard Deuell, Northeast Michigan Council of Governments  
Kathryn Arnold, Northeast Michigan Council of Governments

### **Other Participants**

Pete Pettalia, Presque Isle Township  
James Zakshesky, Presque Isle County Construction Codes  
Charles Winters, Presque Isle Township Planning Commission  
Fred Gottschalk, HeadWaters Land Conservancy  
Brad Jensen, Huron Pines RC & D  
Matt Smar, MDEQ-Coastal Zone Management  
Bud Wegmeyer, Alpena County Board  
Scott Smith, Environmental Health Director for District Health Department #4

## Existing Conditions

### Demographics

The central focus of the plan is Grand Lake Watershed. Smaller coastal watersheds that separate Grand Lake watershed from Lake Huron are included as part of the study. The northwestern edge of the planning area, which is part of the narrow band of coastal watersheds, reaches into Pulawski Township. The southern most coastal watershed of Middle Lake extends south into Alpena County covering a small part of Alpena Township. Since much of the area has very limited development, the most of the demographics provided in this section are for Presque Isle and Krakow Townships. The significant development and population in Alpena Township is located outside the study area and inclusion of demographics for the Alpena Township would portray an unrealistic view of the watershed demographics.

### Population

Over one half of the population growth in Presque Isle County between 1990 and 2000 occurred in Presque Isle Township (see **Table 2.1**). Presque Isle Township experienced a 28.9 percent increase in population (379 persons). For the County's high growth townships, one common attribute is worth noting; namely, the presence of private property development on or near waterfront. The growth in Presque Isle Township most likely can be attributed to the waterfront development near Grand Lake, Long Lake, Lake Huron and the Presque Isle Harbor development. Not only is new residential development occurring in these townships, but homes that were previously used as vacation homes are being converted to year-round homes as homeowners retire and move north permanently. In contrast, Krakow showed an increase of populations of less than one percent. Census data clearly shows Presque Isle Township is the fastest growing coastal community in the study area. For example, Presque Isle Township is approximately 1/6 the population size of Alpena Township, yet it added 153 more people to its population than Alpena Township.

Unit of Gov.	1990	2000	% Change	# of persons
Krakow Twp.	617	622	0.8%	5
Presque Isle Twp.	1,312	1,691	28.9%	379
Presque Isle. Co.	13,743	14,411	4.9%	668
Alpena Township	9,602	9,788	1.9%	186
Alpena Co.	30,605	31,314	2.3%	709

Source: U.S. Bureau of the Census

## Grand Lake Coastal Watershed Plan

### Population by Age

An examination of age distribution in the planning area clearly shows the trends of northeast Michigan resort communities becoming retirement communities. In Krakow and Presque Isle Townships more than 50 percent of their residents were 45 years or older and approximately 25 percent of the population was 65 years and older in 2000 (see **Table 2-5**).

Unit of Government	0-4 yrs.	5-17 yrs.	18-24 yrs.	25-44 yrs.	45-64 yrs.	65 yrs & >	Total
Krakow Twp.	23	70	32	120	189	188	622
Presque Isle Twp.	56	240	74	341	574	406	1,691
Presque Isle Co.	692	2,327	935	3,229	4,008	3,220	14,411

Source: U.S. Bureau of the Census

### Estimated Seasonal Population

In 2000, as illustrated in **Table 2.3**, the Census showed that 33.1 percent of the housing units in the County were seasonal, while 57.9 percent of the housing units in Krakow Township and 51 percent of the housing units in Presque Isle Township were classified as seasonal. It is estimated that the small number of housing units in the Alpena Township portion of the study area would have a high percentage of seasonal units. By comparison 5.5 percent of the housing units statewide were classified as seasonal. The high percentage of housing units classified as seasonal use, reflects the influence of surface water resources in northern Michigan. Areas blessed with ample water resources serve as a tourism and recreation centers, and retirement communities. A decrease in percentage of seasonal homes in all the northern counties suggest that more retirees are moving to northern Michigan and converting their seasonal units into year round dwellings.

Obtaining accurate numbers of seasonal residents and tourists is difficult. Because the U.S. Census is conducted each decade in April, the numbers only reflect those persons who live in the County on a year-round basis. A rough estimate of the number of County seasonal residents can be calculated by multiplying the number of County seasonal housing units (3,278) by the County's average number of persons per household (2.3), for a total of 7,539 persons. In Krakow Township and Presque Isle Township seasonal units may add approximately 3000 people to the population. This figure does not include those seasonal visitors or tourists staying in area motels, campgrounds or family homes.

## Grand Lake Coastal Watershed Plan

### Housing

The number of residential housing units in the study area has been increasing at a rate greater than the population. This reflects the trend toward fewer persons per household. For example, between 1970 and 1990, Presque Isle County's total number of housing units increased by 11.1 percent, while the population during that same period increased by only 4.9 percent. In areas with a high percentage of seasonal housing units the contrast would be even greater.

Presque Isle Township has the largest number of seasonal housing units (814) within Presque Isle County, due to the presence of seasonal homes in the Presque Isle Harbor development and waterfront development adjacent to Lake Huron, Long Lake and Grand Lake. Seasonal housing units make up 51 percent of all housing units within Presque Isle Township. Bearinger, Bismarck, Krakow and Ocqueoc Townships also all have a greater number of seasonal housing units than occupied (year-round) housing units. All of these communities have significant amounts of surface water resources.

Unit of Government	Total Housing Units	% of County's Total Housing Units	Occupied Housing Units	Seasonal Housing Units	Seasonal Units as % of Municipality's Total Occupied Housing Units
Krakow Township	750	7.6%	293	434	57.9%
Presque Isle Township	1,595	16.1%	748	814	51.0%
Presque Isle Co.	9,910	100%	6,155	3,278	33.1%

Source: U.S. Bureau of the Census

### Residential Construction Activity

Residential building permits indicate construction activity within the Krakow Township, Presque Isle Township and the County for the past six years. The number of building permits issued per year for the construction has average 495 permits per year, as illustrated in **Table 2.4**. The table, however provides only the total number of building permits, and does not break the numbers into categories for new construction, additions, or accessory buildings. Of all the jurisdictions, Presque Isle Township has had the most building activity and annually accounts for 15 to 20 percent of the all the building permits in the County. Again, this represents a waterfront and resort type development.

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Jurisdiction	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Krakov Township	31	38	52	27	31	38	32	52	46	36
Presque Isle Township	84	89	94	100	93	82	79	97	87	66
Presque Isle County	452	503	574	477	498	467	453	499	449	393

Source: Presque Isle County Building Department.

### Income and Poverty

Income statistics in the 2000 U. S. Census actually reflect income levels for the year of 1999. Median income and per capita income in Presque Isle Township has consistently been higher than Krakow and Presque Isle County in 1990 and 2000 Census records. This is likely attributed to high amount of waterfront residential properties. In 1999, median household income for Presque Isle Township was \$44,671. This figure is \$5,500 higher than Krakow Township, \$13,000 higher than the County and a few dollars higher than the State as a whole. Median household income includes both family and non-family households. It is atypical for townships in northern Michigan townships to have higher median household and per capita income levels than the State.

This same atypical relationship holds true for the percent of families living below the poverty level. In 1999, 2.7 percent of the families in Presque Isle Township were living below poverty level. Whereas, 6.8 percent of the families in the County and 4.0 percent of the families in Krakow Township were living below poverty level. In the State as a whole, some 7.4 percent of the families were living below poverty level.

Income Type	Presque Isle Township		Krakov Township		Presque Isle County	
	1990	2000	1990	2000	1990	2000
Median Family Income	\$26,643	\$41,705	\$18,816	\$31,111	\$25,199	\$37,426
Median Household Income	\$28,705	\$44,671	\$22,961	\$39,125	\$20,941	\$31,656
Per Capita Income	\$12,101	\$23,938	\$10,043	\$20,979	\$9,654	\$17,363
% Families Below Poverty	8.7%	2.7%	13.9%	4.0%	10.9%	6.8%

Source: Table 9, Census of Population and Housing 1990 U.S. Census. Table DP-3, Profile of Selected Economic Characteristics, 2000 U.S. Census.

## Grand Lake Coastal Watershed Plan

### Summary

The watershed's population is growing and is predicted to continue to increase into the century. Trends show the greatest growth pressures for the area are in Presque Isle Township, which accommodated more than 50 percent of Presque Isle County's growth in the last decade. The extensive waterfront development and the Presque Isle Harbor Association development will continue to be the driving force behind anticipated population growth. Plans to accommodate this projected growth need to be undertaken in advance in order to provide adequate services, housing and infrastructure to the area's future residents.

Like most of the rest of the nation, the area's population is aging. As indicated, many of the housing units in the area are seasonal, meaning they are second and even possibly third houses of persons with primary residency in other vicinities. Many people, upon reaching retirement, spend a greater amount of time and often permanently move to houses that were previously secondary, seasonal homes. This scenario could result in an increase in demand for various services.

Increased development and the transition of weekend waterfront cottages into year round, often larger homes, can increase stressors to natural systems. Loss of wetlands, wildlife habitat and water quality can result if sustainable development standards are followed. To minimize nonpoint source pollution, natural drainageways should be maintained to filter surface run-off before it enters into water bodies. Larger homes and paved driveways equate to increased "hard surfaces" and result in increased run-off in the area waters. The need to maintain and re-establish lakeside greenbelts becomes even more important. On-site septic systems and water systems should be evaluated to assure they are up to current sanitary code. Proactively planning for communities' green infrastructure as well as its gray infrastructure (roads, water and sewer) and social infrastructure (hospitals and schools) is paramount to sustaining development and high quality resources in the watershed.

## Physical Characteristics

### Land Ownership

In order to assess the potential for protecting and enhancing water resources of planning area, it is important to compile information on land divisions, ownership type and protected lands. Public lands, non-industrial private lands and industrial/corporate lands were identified and mapped in **Figure 2.1** (see page 2-7). The largest single landowner is the State of Michigan (13,995 acres). State lands include Thompson's Harbor State Park in the northwestern parts of the planning area. The state park is a day use facility with minimal amenities. There are no camping facilities or drinking water sources. The ownership provides over 8 miles of undeveloped rugged shoreline and many miles of walking trails. Excellent examples of cobble beaches, low dunes, fens, shallow ponds, marshes, and forested wetlands can be found within the park. The other state ownership includes the Rockport properties in the southern part of the planning area. Rockport property offers sinkholes, nearly four miles of beaches, and an abandoned limestone quarry. The second largest landowner is Quile Corporation, operator of the Stoneport Quarry. Other large landowners are Presque Isle Harbor Development which owns over 730 acres of common lands available to Association members. Four hundred acres of USS Gary Corporation's large land holdings extend

## Grand Lake Coastal Watershed Plan

into the northwestern part of the planning area. Presque Isle Corporation land holdings are affiliated with the Stoneport Quarry Operation.

Ownership Type	Acres
State of Michigan	13955
Quile Corporation	5194
Presque Isle Harbor Association	732
USS Gary Corporation	408
Presque Isle Corporation	396
Presque Isle Township	158
Source: NEMCOG GIS Program	

With the exception of several small roadside parks/public access sites, the balance of the over 24,000 areas of the planning area is non-industrial private ownership ranging from subdivision lots to large tracts. Subdivisions are located along Grand Lake, Lake Esau, and the Lake Huron shoreline. The Presque Isle Harbor Association (PIHA) has 3000 residential lots with approximately 500 developed at this time. The association owns open space, club houses, neighborhood parks, and water access parks for landowners.

### Land Divisions

**Figure 2.1** shows parcel lines from the Township's parcel database. Approximately, 85 percent of the planning area is in tracts 20 acres and larger. These include public and private ownership. Small lots, less than five acres in size, tend to be located along the coast and in platted subdivisions.

### Land Use/Land Cover Characteristics

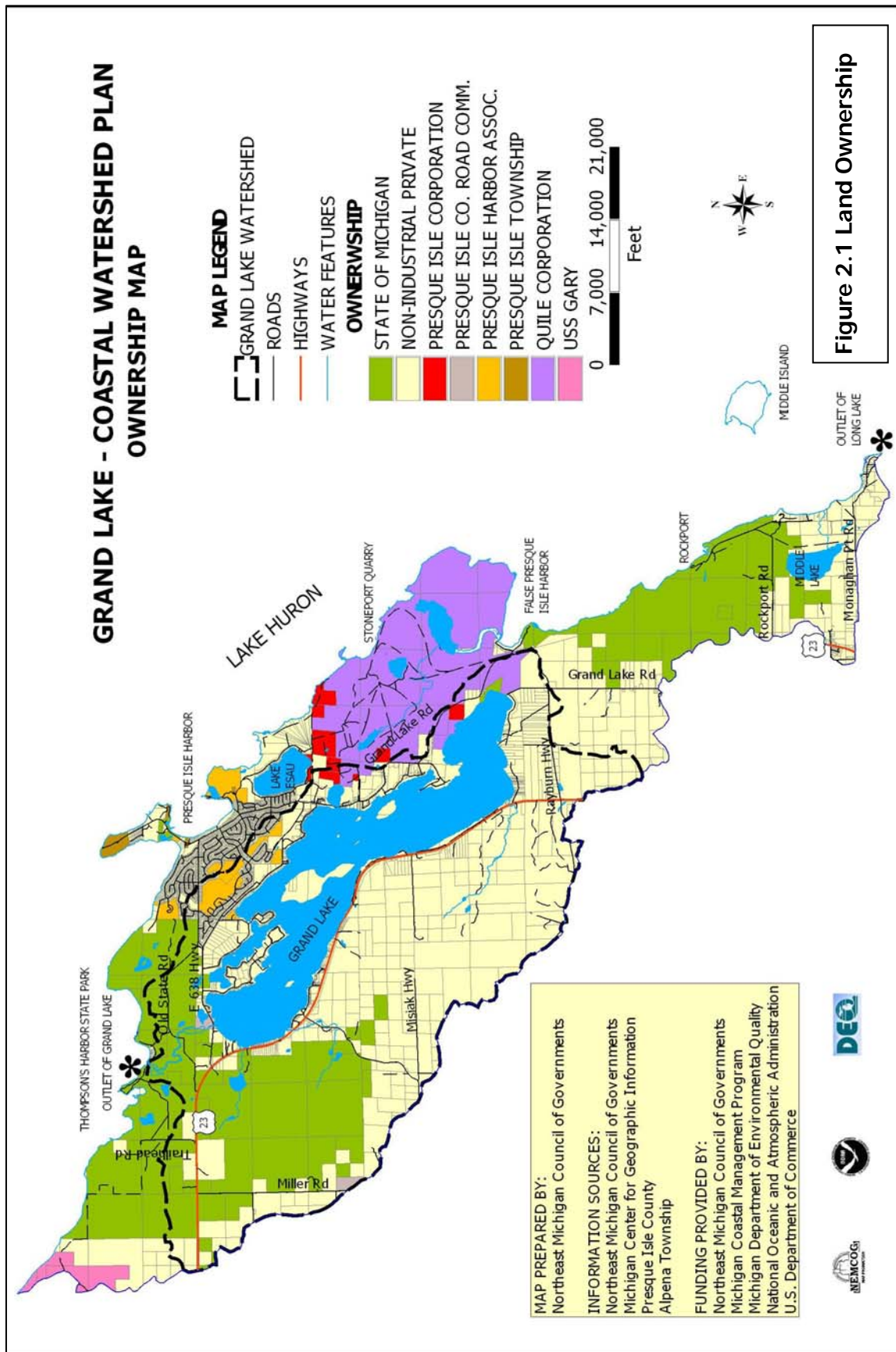
NEMCOG developed a Land Use/Land Cover map to evaluate development and resource conditions in the study area. The map was developed by updating older land use/cover data sets using 1998 color infrared digital orthophoto quads. Limited field checking further refined the maps. **Figure 2.2** is a color thematic map of the study area. Statistics are summarized in **Table 2.7** for the entire planning area and the Grand Lake Watershed. The write-up below reflects the entire study area.

#### *Residential*

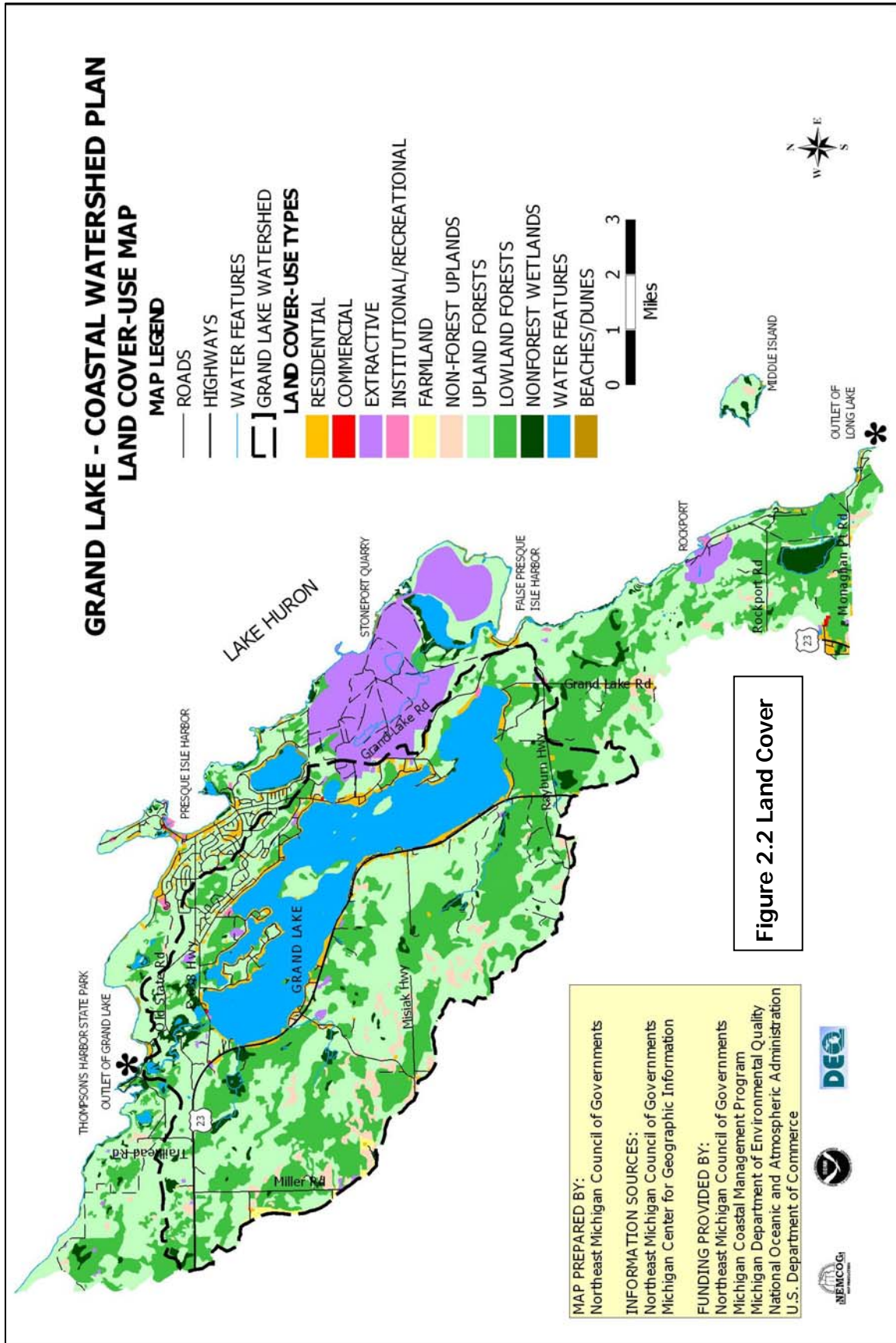
Single family residential accounts for all of the residential development in the study area. As can be seen on the Land Use/Land Cover Map, residential development is concentrated within subdivisions and small tracts along lakeshores and within the Presque Isle Harbor Association (PIHA). Residential development can also be found along roadways and scattered throughout the study area.

#### *Industrial/Extractive*

This category includes the active Stoneport quarry and inactive, state-owned Rockport quarry. Small barrow pits are mapped in this category. It is important to note the Stoneport quarry has expanded its quarry operation since 1998 (date of the digital aerial used to update the data sets).







## Grand Lake Coastal Watershed Plan

Other photos were used in an attempt to better define the extent of the quarry operation. The “foot-print” of the quarry has expanded to the west and north from 1998 boundary as well as covering much of False Presque Isle. Quarrying expansions to the north and west has further diminished the limited watersheds of Lake Esau, and Lotus Pond.

### *Institutional/Recreational*

This category includes parks, public access, public marinas, and public building. The PIHD clubhouses and parks are included in this category. The nearly 14,000 acres of State of Michigan lands are open for public recreation. However, these lands were mapped by their vegetation type and not land use category.

Land Use Category	Grand Lake Watershed		Grand Lake & Coastal Areas	
	Acres	Percent	Acres	Percent
Residential	1,201	3.9	1,754	3.4
Commercial	7	Less than 0.1	20	Less than 0.1
Industrial/Extractive	316	1.0	4,152	8.0
Institutional/Recreational	34	0.1	143	0.3
Farmland	150	0.5	155	0.3
Non-forested Uplands	1,042	3.4	1,428	2.7
Upland Forests	12,483	40.6	21,770	41.7
Lowland Forests	8,739	28.4	13,993	26.8
Wetlands	850	2.8	1,878	3.6
Beaches and Bedrock Surfaces	-	-	384	0.7
Inland Lakes	5,929	19.3	6,556	12.6
<b>TOTAL</b>	<b>30,751</b>	<b>100</b>	<b>52,232</b>	<b>100</b>
Source: NEMCOG				

### *Farmland*

Less than 1 percent of the land area is being farmed. This land is being used for hay production.

### *Non-forested Uplands*

The non-forested land category accounts for 2.7 percent or 1,428 acres of the study Area. This category consists of herbaceous open and shrub land.

### *Upland Forests*

The upland-forested lands cover 21,770 acres or 42 percent of the study area. Forest types include aspen-birch, oak, pine and northern hardwoods.

## Grand Lake Coastal Watershed Plan

### *Lowland Forests and Wetlands*

Wetlands include land that has sufficient water at, or near, the surface to support wetland or aquatic vegetation. These areas are commonly referred to as swamps, marshes and bogs. The wetland category comprises non-forested types such as lowland brush (tag alder and willow), wet meadows, fens, and marshes. Non-forested wetlands account for 1,878 acres or 3.6 percent of the Misery Bay study area. Lowland forests grow on soils with a seasonally high water table and are often classified as wetlands. Of particular note are the coastal fens found along the Lake Huron shoreline. Excellent examples can be found along Thompson's Harbor State Park, North Bay, Presque Isle Harbor, between North Albany Point and South Albany Point, between Bolton Point and Ferron Point, and Middle Island coastal areas.

Lowland forests include areas that support lowland hardwoods and conifers, such as northern white cedar, black spruce, balsam fir, elm, red maple, ash and aspen species. Lowland forests occupy 13,993 acres or 26.8 percent of the area. Two of the most important functions of wetlands are water quality protection and ecological corridors. As can be noted on the Land Use/Land Cover Map, major wetland areas are adjacent to rivers and creeks. This network of wetlands receives surface water and subsurface water discharge, creating the streams and creeks which in turn flow into area lakes. These interconnected resources exemplify how activities distant from major water bodies can still have an impact on the water quality.

### *Inland Surface Water*

Open water comprises less than 12.6 percent of the area. Water bodies include Grand Lake, Lake Esau, Lotus Pond, Middle Lake and many small ponds. The protected Bell Bay and Bell River between False Presque Isle and the mainland is included in the category. Lake Huron surface is not included in this statistic.

### *Beaches and Bedrock Surfaces*

Fluctuating lake levels of the Great Lakes combined with the shallow bays and gradual drop-off of the lake bottom greatly influences the extent of these categories from year to year and within a given year. Areas classified as beaches were delineated from 1998 aerial photos taken during Great Lakes high water cycle period. During low water periods, large areas of Lake Huron bottomlands are exposed. Transitional vegetation becomes established as more upland species like balsam poplar and northern white cedar migrate into dry emergent wetlands. In addition, annual plants and emergent vegetation become established on exposed bottomlands. This ever-changing environment creates a rich environment for coastal flora and fauna.

### Soil Constraints Analysis

When planning for types and intensity of land uses, sustainable development and protection of critical resources, soil types and slopes are important factors that determine carrying capacity of land. Construction of roads, buildings and septic systems on steeply sloped areas, areas with bedrock at or near the surface or areas with organic and hydric soils require special design considerations. In addition, costs for developing these sensitive areas are greater than in less constrained parts of the landscape. If developed improperly, the impacts to natural resources can be far reaching.

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The Natural Resource Conservation Service (NRCS) has completed detailed soil surveys of Presque Isle and Alpena Counties. A digital or computerized version of the soil survey maps was acquired from the Michigan Center for Geographic Information (CGI). Using information contained within the published soil survey books, a series of maps are presented that depict hydric soils and steep slopes, soils depth to bedrock, soils with building limitations and soils with septic system limitations.

### *Hydric Soils and Steep Slopes*

**Figure 2.3** is a color thematic map that classifies hydric soils and steep slopes. Lower density and less intensive development should be directed to these areas with severe building constraints. There are limited areas with slopes 15 percent or greater. These short-steep slopes are colored in red on the map. Hydric soils are saturated, flooded or ponded during part of the growing season and are classified as poorly drained and very poorly drained. Hydric soils have poor potential for building site development and sanitary facilities. Wetness and frequent ponding are severe problems that are difficult and costly to overcome. Areas with hydric soils are best suited for forestlands, wetlands, wildlife habitat, and wildlands recreation. Functioning as the backbone of a community's green infrastructure, these areas convey and retain stormwater runoff from developed lands. Hydric soils are associated with lakes and streams and when covered with natural vegetation, function as important water quality buffers. Sites with high water tables may be classified as wetlands and a wetlands permit would be required to develop these areas. The map shows extensive areas of hydric soils within the Grand Lake watershed. These wet areas are hydrologically connected to surface water resources either by streams, intermittent drainages or through subsurface water movement.

### *Building Site Development*

The USDA soil surveys rate soils for various uses such as building site development and identifies the limiting factors such as steep slopes or high water table. The rating system is slight, moderate and severe limitations. Using the rating system developed by USDA, soil limitations for buildings without basements have been mapped and are displayed in **Figure 2.4**. Areas with well drained soils and slopes less than 10 percent tend to have slight limitations for building development. Areas depicted as yellow on the map would be considered well suited for building development. Large areas within the PIHA development fall within this category. Areas with slopes greater than 18 percent, high water tables, bedrock near the surface, large stones and organic soils have severe limitations. Lands with severe constraints are quite extensive. Some 13,000 acres is considered to have severe building constraints because of bedrock near the surface. Some of those bedrock influenced areas also have constraints from high water tables.

### *Septic System Limitations*

Using a computer mapping system soil maps have been color coded to show areas with slight to severe septic system limitations as defined by the USDA Natural Resource Conservation Service. Criteria include depth to water table, wetness, filtering capacity, bedrock, large stones, and ability to infiltrate water. **Figure 2.5** is a septic system limitations map. Much of the study area is classified as having severe limitations. Clearly the greatest limiting factor is the prevalence of high water tables. Other severe limiting factors include bedrock and sandy soils with severe limitations due to poor filtration of septic effluents. Extensive areas of shallow soils over bedrock can be found west of Grand Lake, and the Rockport and Middle Lake area. Septic systems constructed in shallow soils and sandy soils combine with high water tables can negatively impact water resources particularly when close to lakes and streams. Limiting types and density of development or making



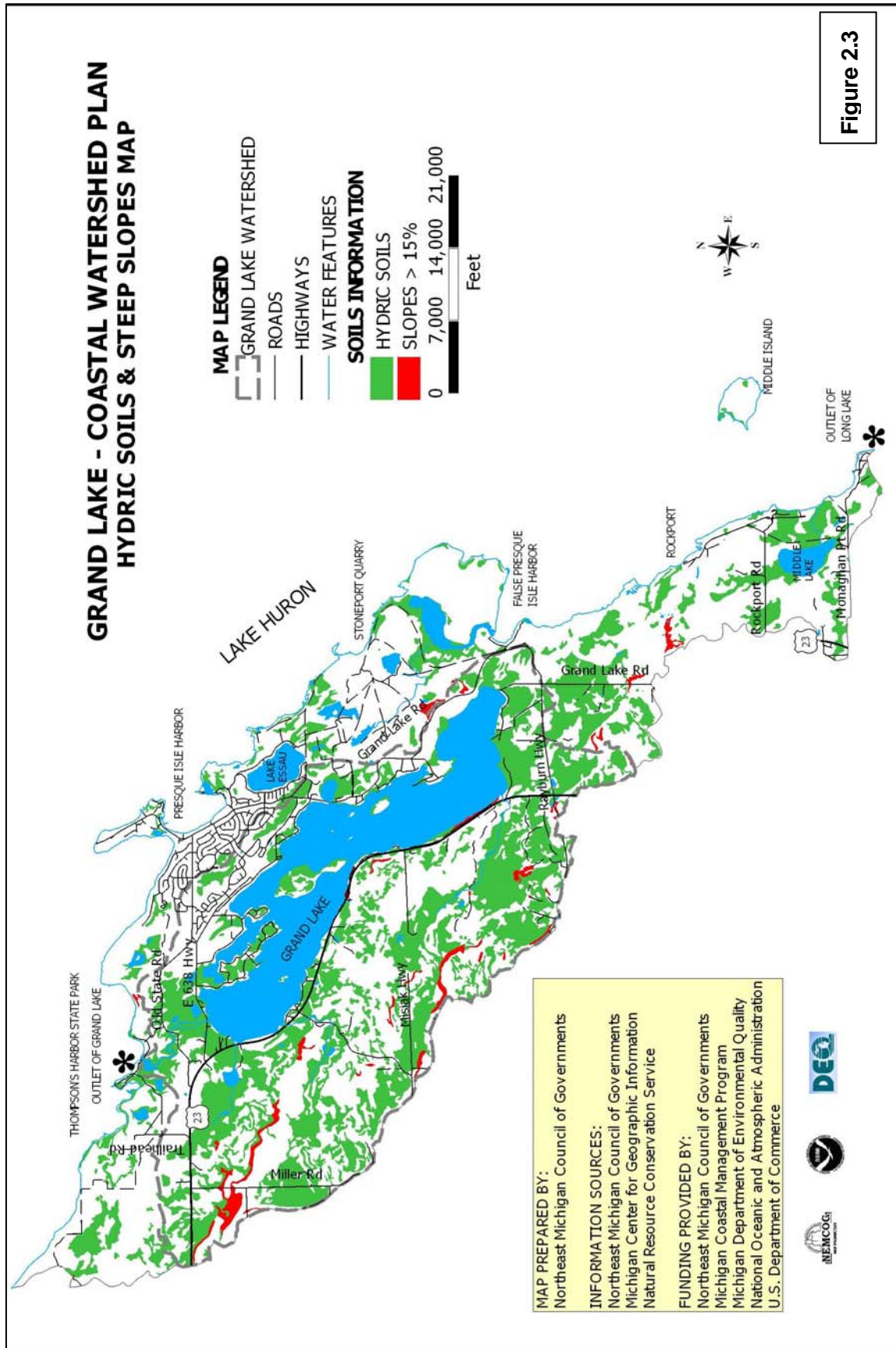


Figure 2.3

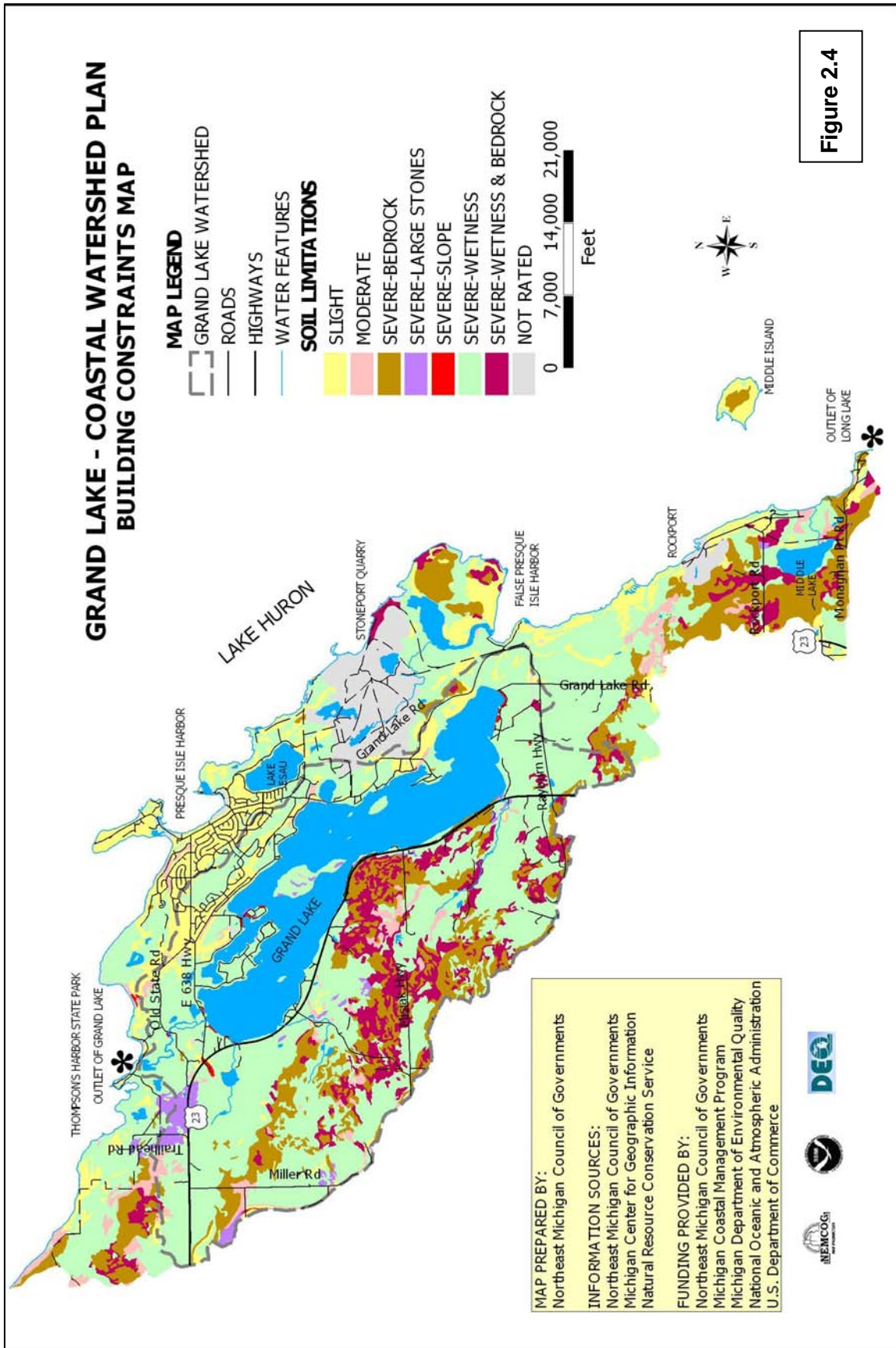


Figure 2.4

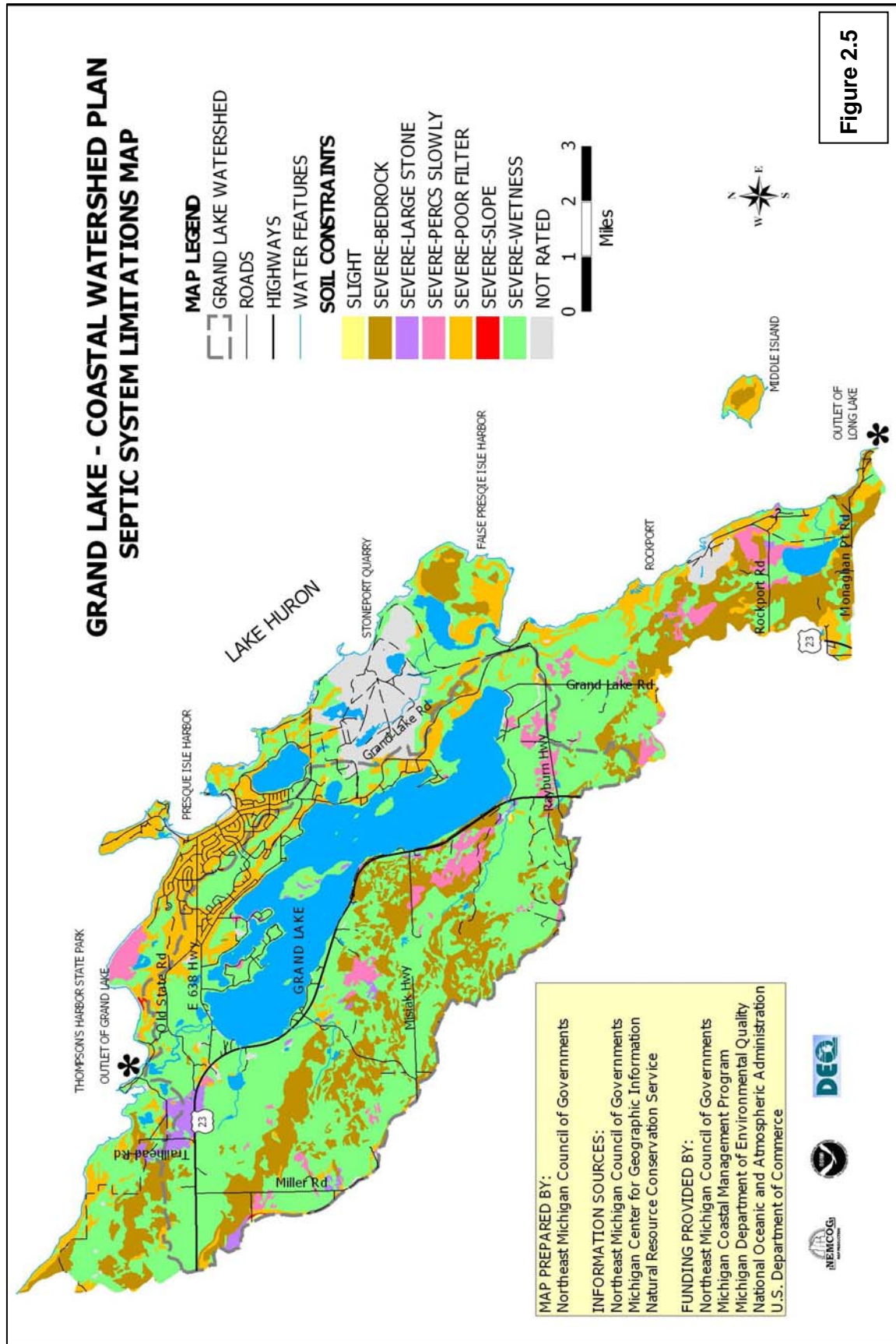
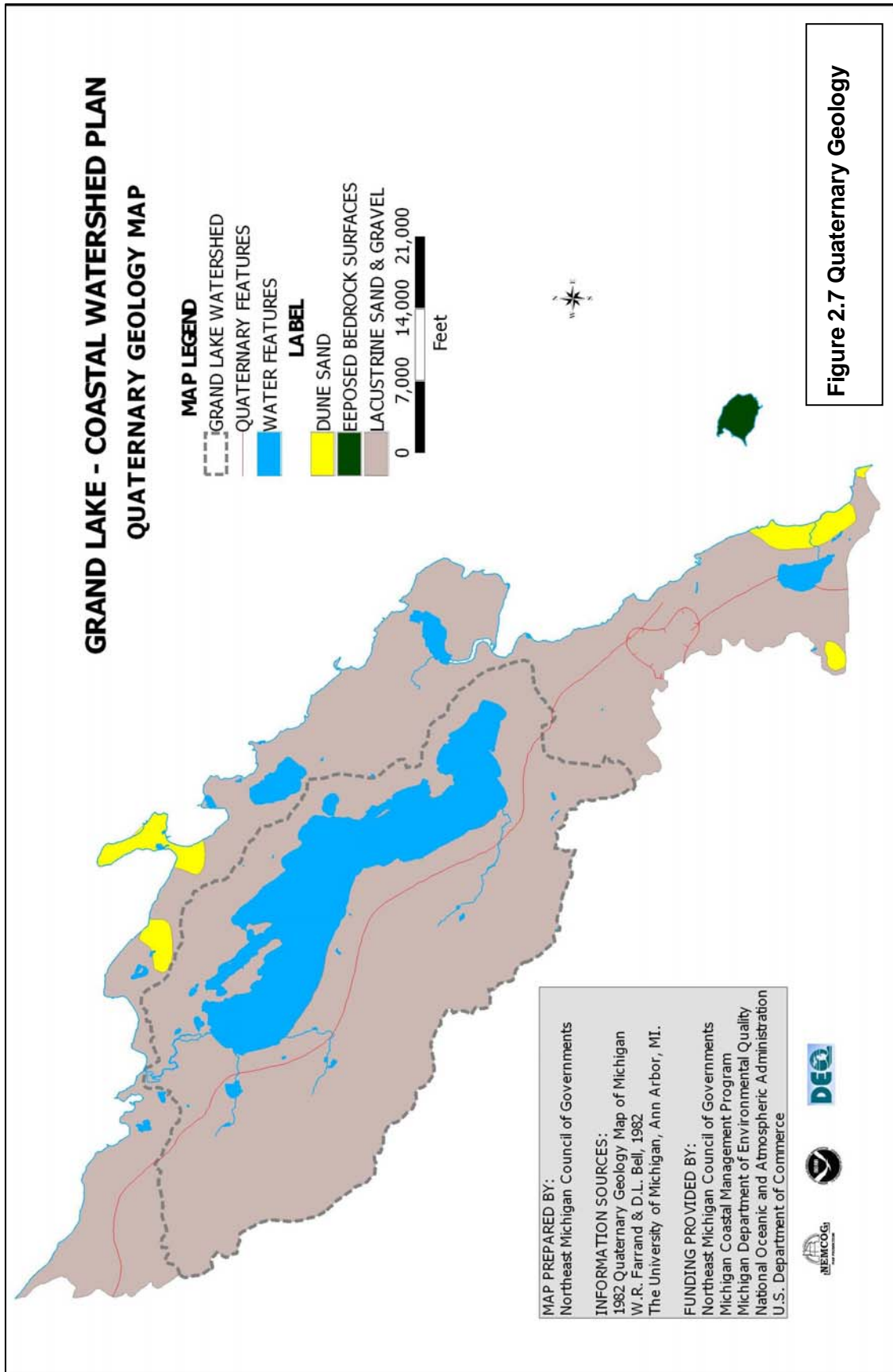


Figure 2.5





## Grand Lake Coastal Watershed Plan

As the continental glaciers melted and retreated from the landscape, deep basins carved out of bedrock filled with water. These emerging lake basins were the beginnings of our Great Lakes. During different periods, the pre and post glacial Great Lakes were both much higher and lower than the lake levels we have grown accustomed to in recent times. Geologists have identified and named the different post glacial great lake stages: Warren, Algonquin, Nipissing and Algoma. Landforms and soils adjacent to Lake Huron were heavily influenced by these different lake stages. Glacial Great Lake Warren formed at the front of the melting Huron glacial lobe around 12,000 years before present and was the most extensive, flooding the entire study area.

A two to eleven mile wide lake plain formed from lacustrine sand and gravel deposits runs along the coastal area of Alpena and Presque Isle Counties. The mantle of glacial deposits is very thin and as a result the limestone bedrock is close to the surface and outcrops are frequent. **Figure 2.7** (on the previous page) was generated from the Quaternary Geology of Southern Michigan (W.R. Farrand & D.L. Bell, 1982). The map classifies much of the study area as lacustrine sand and gravel, materials formed as beaches and near-offshore deposits in glacial great lakes. These deposits are primarily quartz sands with a calcium carbonate component ranging from minimal to a maximum of 40 percent. Beds or lenses of small gravel, rich in igneous and metamorphic rocks can be found in these lacustrine deposits. Deposits of muck, silt loam and sandy loam soils can also be found. The veneer of lacustrine deposits is discontinuous ranging from several feet thick to nonexistent. Limestone bedrock is at or near the surface with occurrences of alvar (limestone pavement), earth cracks, outcrops and sinkholes.

According to the map there are several areas classified as dune sand which consists of fine to medium sand deposits, chiefly quartz with some heavy minerals. These were created by wind action during the post glacial Lake Nipissing (605 feet above mean sea level) and Lake Algoma (595 feet) stages. The continental glacier provided the source, along-shore water currents and wave actions moved sands on shore and wind action piled the sands into low dunes. This process is still occurring today along undisturbed sections of the shoreline. Active low sand dunes can be found at several sites along the Lake Huron shoreline. Some of the best examples are Thompson's Harbor, North Bay, Presque Isle Harbor and Ferron Point.

### *Wooded Dune and Swale Complexes*

Receding post glacial Great Lakes created landforms known as dune and swale complexes. These landforms are restricted to the Great Lakes coastline and are quite rare, only 95 have been identified with 70 of those being located in Michigan. Dune and swale complexes are a series of alternating upland beach ridges and low wet areas that generally parallel the present day shoreline. These complexes can extend up to two miles from the coastline and took several thousand years to form. Running a line inland, perpendicular from the present day beach, each successive beach ridge and swale is older than the previous one. The wooded dune and swale complex is considered a distinct natural community in the Michigan Natural Features Inventory. Several fine examples can be found along the Alpena, Alcona and Presque Isle coastline. One minor formation can be found near Ferron Point.

### *Bedrock Geology*

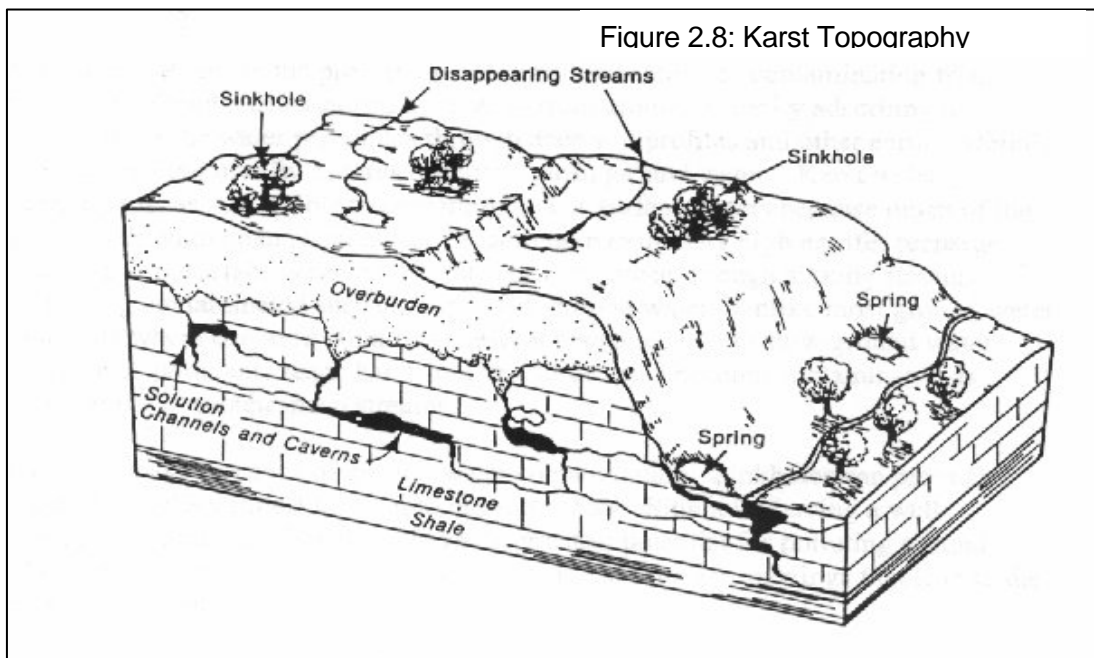
The limestone bedrock foundation of the islands and North Point defines the size and shape of these land features. Bedrock is near the surface on the islands and in the northern part of the study area. The presence of limestone bedrock at or near the surface influences the hydrology and

## Grand Lake Coastal Watershed Plan

vegetation of the area. Northern white cedar thrives on these shallow soils and is the common forest species on wet and dry sites.

Beneath the thin mantle of glacial deposits is sedimentary bedrock that was created during the upper and lower Devonian ages of the Paleozoic Era. The bedrock was formed in ancient seas, which covered the area some 345 to 405 million years ago. The shallow marine seas deposited layers of silt, clay, sediments, marine animals, plants, coral, and other calcareous materials. These deposits formed shale, limestone, and dolomite bedrock. The bedrock in the study area include Dundee Limestone, Bell Shale and the Traverse Group. Rich deposits of Dundee Limestone are mined and processed at the Lafarge facility called Stoneport located within the coastal watershed east of Grand Lake.

Limestone bedrock/karst geology greatly influences the surface drainage in the study area by impeding water percolation into the ground in some locations and by rapidly draining water through bedrock cracks at other sites. The bedrock cracks at the surface are called swallow holes. Large volumes of water can drain into these swallow holes entering the limestone bedrock aquifers of cracks and porous stone. Water flowing through fractured bedrock will slowly dissolve the limestone, enlarging the network of cracks into subterranean channel ways and caves. In some instances the rock above the cavern collapses forming sinkholes. "Karst" is the scientific term used to describe a type of topography this is formed in dissolved limestone, dolomite or gypsum and is characterized by sinkholes, caves and underground drainage systems. Karst is also a term used to describe a very distinct terrain as well as the process by which it formed. **Figure 2.8** illustrates karst features. The Rockport sinkholes are located in the southern part of the coastal watershed near the old Rockport quarry. The largest sinkhole forms a small lake, deep enough to support a fish population of pan fish and bass.



## Grand Lake Coastal Watershed Plan

### Natural Features Inventory

The following table is a subset of the Presque Isle and Alpena County Element Lists from the Natural Features Inventory. According to the Natural Features Inventory, "The lists include all elements (species and natural communities) for which locations have been recorded in MNFI's database. Information from the database cannot provide a definitive statement on the presence, absence, or condition of the natural features in any given locality, since much of the state has not

Scientific Name	Common Name	Type	Federal Status*	State Status**
<i>Adlumia fungosa</i>	Climbing fumitory	Vascular Plant		SC
Alvar	Alkaline scrub/grassland	Community		
<i>Armoracia lacustris</i>	Lake cress	Vascular Plant		T
<i>Astragalus neglectus</i>	Cooper's milk-vetch	Vascular Plant		SC
<i>Buteo lineatus</i>	Red-shouldered hawk	Bird		T
<i>Cacalia plantaginea</i>	Prairie indian-plantain	Vascular Plant		SC
<i>Calypso bulbosa</i>	Calypso or fairy-slipper	Vascular Plant		T
<i>Carex concinna</i>	Beauty sedge	Vascular Plant		SC
<i>Carex richardsonii</i>	Richardson's sedge	Vascular Plant		SC
<i>Carex scirpoidea</i>	Bulrush sedge	Vascular Plant		T
<i>Cirsium pitcheri</i>	Pitcher's thistle	Vascular Plant	LT	T
Cobble Beach	Cobble beach	Community		
<i>Cypripedium arietinum</i>	Ram's head lady's-slipper	Vascular Plant		SC
<i>Dendroica discolor</i>	Prairie warbler	Bird		E
Devonian earth history	Geographical feature	Geologic		
<i>Emydoidea blandingii</i>	Blanding's turtle	Reptile		SC
Fossils	Fossils	Geologic		
<i>Gavia immer</i>	Common loon	Bird		T
Great lakes marsh	Great lakes marsh	Community		
<i>Haliaeetus leucocephalus</i>	Bald eagle	Bird	(PS:LT,PDL)	T
<i>Iris lacustris</i>	Dwarf lake iris	Vascular Plant	LT	T
Karst	Geographical feature	Geologic		
<i>Mesodon sayanus</i>	Spike-lip crater	Invertebrate		SC
Northern fen	Alkaline shrub/herb fen	Community		
<i>Pinguicula vulgaris</i>	Butterwort	Vascular Plant		SC
<i>Prosapia ignipectus</i>	Red-legged spittlebug	Invertebrate		SC
<i>Pyrgus Wyandot</i>	Grizzled skipper	Invertebrate		SC
Rich conifer swamp	Rich conifer swamp	Community		
<i>Sistrurus catenatus catenatus</i>	Eastern massasauga	Reptile	C	SC
<i>Solidago houghtonii</i>	Houghton's goldenrod	Vascular Plant	LT	T
<i>Somatochlora hineana</i>	Hine's emerald	Invertebrate	LE	E
<i>Tanacetum huronense</i>	Lake Huron tansy	Vascular Plant		T
Wooded dune and swale complex	Wooded dune and swale complex	Community		

Source: Michigan Natural Feature Inventory, Michigan Department of Natural Resources, Wildlife Division  
 \*LE = Listed endangered, LT = Listed threatened, PDL = Proposed delist, PS = Partial status (federally listed in only part of its range), C = Species being considered for federal status.  
 \*\* E = Endangered, T = Threatened, SC = Special concern.

## Grand Lake Coastal Watershed Plan

*been specifically or thoroughly surveyed for their occurrence and the conditions at previously surveyed sites are constantly changing. The County Elements Lists should be used as a reference of which natural features currently or historically were recorded in the county and should be considered when developing land use plans. Included in the list are scientific name, common name, element type, federal status, and state status for each element."* Of the 51 elements listed in Presque Isle County, 33 have been found in the Grand Lake-Coastal Watershed Project Area. This clearly supports past research that has found Great Lakes coastal areas to be biologically rich with the high number of species and communities of special interest (rare, special concern, threatened and endangered). If extensive field surveys were conducted, it is expected a greater number of elements would be identified.

### National Wetlands Inventory

The U.S. Fish and Wildlife Service developed National Wetlands Inventory (NWI) program in the 1980's. Through this effort a national wetlands inventory map was compiled for Alpena and Presque Isle Counties. Digital data was acquired from the Center for Geographic Information, State of Michigan, and used to compile **Figure 2.9**. The map depicts forested and non-forested wetlands.

National Wetlands Inventory (NWI) digital data files are records of wetlands location and classification as defined by the U.S. Fish & Wildlife Service. The digital data as well as the hardcopy maps that were used as the source for the digital data are produced and distributed by the U.S. Fish & Wildlife Service's National Inventory project. The data provide consultants, planners, and resource managers with information on wetland location and type. The purpose of this survey was not to map all wetlands and deepwater habitats, but rather, to use aerial photo interpretation techniques to produce thematic maps that show, in most cases, the larger types that can be identified by such techniques. The objective was to provide better geospatial information on wetlands than found on the USGS topo-quads.

Forested wetlands are the most common wetlands type. The NWI classified nearly 16,000 acres forested wetlands. Poorly drained, lowland areas support northern white cedar, tamarack, balsam fir, black spruce, eastern hemlock, white pine, balsam poplar, trembling aspen, paper birch, black ash, speckled alder and shrub willows. Northern white cedar dominates the wetland areas where there is good lateral water movement in organic soils and shallow soils over limestone bedrock. Lowland forests are typically located adjacent to water features and function as riparian forests and water quality buffers. The network of lowland forests, associated with rivers and creeks, also function as wildlife corridors and the backbone of large regional ecological corridors. Lowland forests adjacent to rivers and streams may be prone to flooding during the spring snow melt, particularly when combined with heavy spring rains. The NWI identified some 1,500 acres of shrub-scrub wetlands and 800 acres of emergent wetlands. Land use planning activities should focus on protecting and preserving these limited and critical resources.



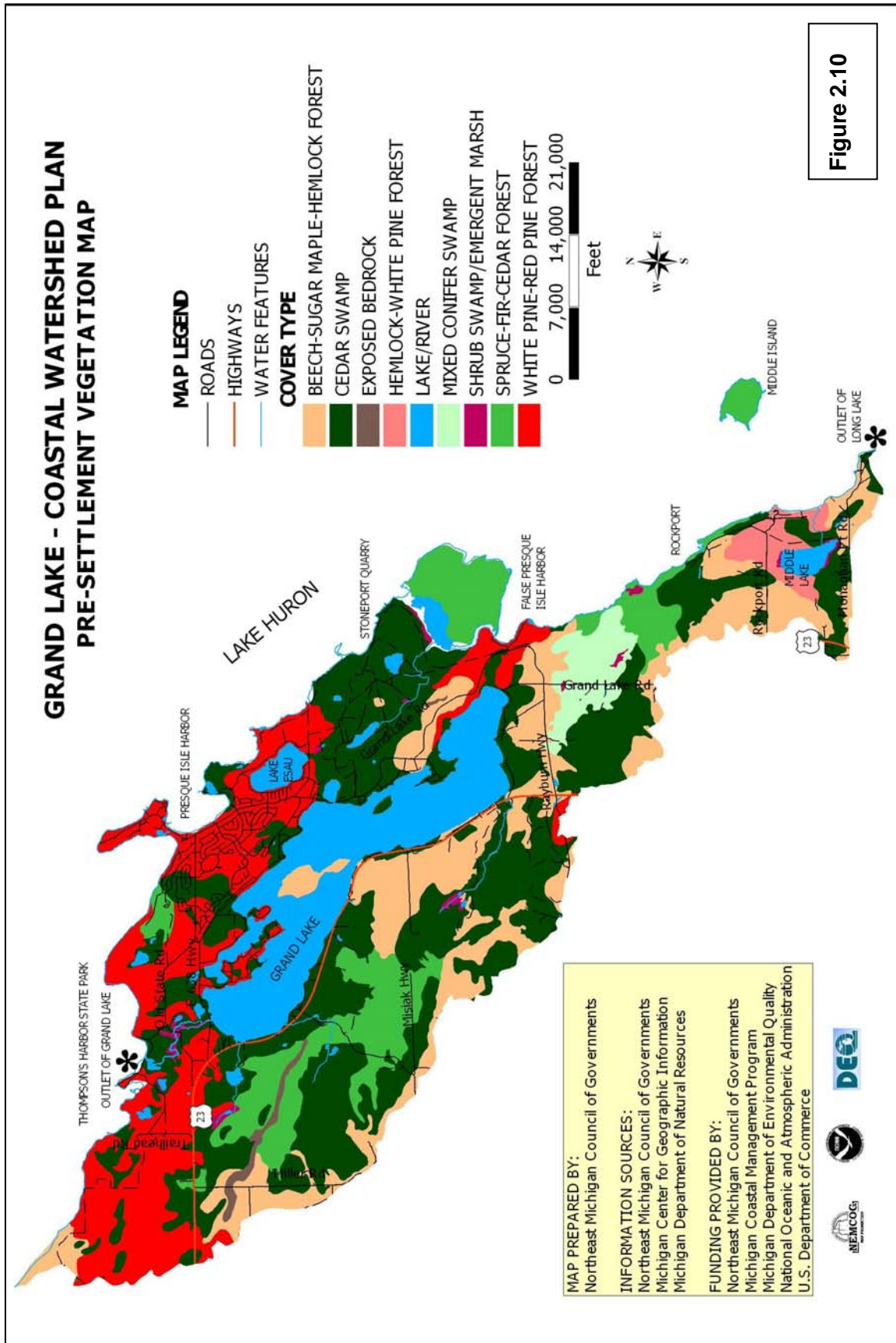


Figure 2.10

## Grand Lake Coastal Watershed Plan

### Pre-settlement Vegetation

The Michigan Department of Natural Resources has compiled pre-settlement vegetation maps of Michigan. The maps were generated from information contained in the first government land survey notes in the 1800's along with information such as current vegetation, land forms and soils (see **Figure 2.10** on the previous page). A review of the pre-settlement vegetation map shows extensive areas were covered by cedar swamps, mixed conifer swamps and spruce-fir-cedar forests (57 percent of the land area). Pine-hemlock forests and beech-sugar maple-hemlock forests covered 21 and 19 percent respectively, and were more common than today (see **Table 2.9**). Logging activities over the last century have altered forest types. For example, clear-cutting and wildfires increased coverage of aspen and oak forests and decreased acreage of northern hardwoods, pine and hemlock forests.

Cover Type	Acres	Percent
Beech-Sugar Maple-Hemlock Forest	8678	19
Cedar Swamp	18351	41
Exposed Bedrock	304	1
Hemlock-White Pine Forest	845	2
Mixed Conifer Swamp	1334	3
Shrub Swamp/Emergent Marsh	372	1
Spruce-Fir-Cedar Forest	5719	13
White Pine-Red Pine Forest	9323	21
Total	44925	100

Source: Michigan Department of Natural Resources



# Water Resources

## Groundwater

Maintaining high quality groundwater and surface water is vital to the long term sustainability of the community. Residents and visitors must rely on groundwater for drinking water. The Presque Isle Harbor Association (PHIA) operates and private community water delivery system. In 2005, an elevated water tank was constructed to enhance the delivery of water to PHIA residents.

Given the karst geology and sandy soils prevalent within the Grand Lake and coastal watershed, groundwater resources are considered to be highly vulnerable to surface contamination. The Northeast Michigan Karst Aquifer Protection Plan (Presque Isle Soil Conservation District, 1996) analyzed aquifer sensitivity in Presque Isle and Alpena Counties. The primary objective of the plan is to protect the area's drinking water by correcting the sources of pollution. A secondary objective is to increase awareness of the connection between different land use pollutants and drinking water in karst areas. According to the plan, "much of the project area is characterized by karst. Karst is defined as a type of topography that is formed over limestone, dolomite, or gypsum by dissolving or solution; and is characterized by sinkholes, caves and underground drainage through fractures in bedrock. Karst waters are just as susceptible to contamination as surface waters because much of the water moves through open channelways, resulting in extremely high aquifer recharge rates. Consequently, the shallow aquifers of the project area are extremely vulnerable to contamination from surface and subsurface sources."

The analysis considered soil permeability, drift thickness, drift lithology and karst features to determine aquifer sensitivity. With the exception of a small area east of Middle Lake, the project area is classified as sensitive. Groundwater in the sensitive area is considered to be at a higher risk to contamination from surface sources. According to the study, " District Health Department #4 has documented 490 cases where domestic water supplies have been adversely affected due to direct migration of pathogens (432), nitrates (54), hydrocarbons (2), sediment (2) from surface sources into aquifers through improper wells and karst features. In addition, although the cost of testing creates a lack of data, professional judgment is that pesticides, heavy metals and salts also have the potential to contaminate area aquifers. Prioritized pollutants are as follows: pathogens, nitrates, sediment, pesticides, hydrocarbons, salts, and heavy metals." The study further states, "There are four known sources of pollutants. These are agriculture including barnyards, feedlots, pastures, and croplands; residential including septic systems and abandoned wells; illicit dumps; and road corridors.

### Groundwater Recharge Areas

All residents within the watershed rely on groundwater for potable water. Groundwater supplies are replenished by infiltration of snow and rain into subsurface areas. Sandy soils have high infiltration rates. At the other end of the spectrum, clay soils and bedrock have very low infiltration rates. Deposits of sandy soils function as a community's primary groundwater recharge zones. Digital soils data was coded to display infiltration rates according to criteria from the Natural Resource Conservation Service (see **Figure 3.1**). Areas colored red have high infiltration rates and form the key recharge zone. These areas are located closed to the coast, eastern shore of Grand Lake and within the PIHA development. A community should take a proactive role in protecting its groundwater resources by incorporating wellhead protection regulations into its zoning ordinance.

## Grand Lake - Coastal Watershed Plan

Clay and loam soils and thin soils over bedrock have very low infiltration rates. Wetlands are groundwater discharge zones and therefore classified as having low infiltration rates. Areas of low infiltration rates are prevalent west of Grand Lake and within the smaller coastal watersheds. Low infiltration rates equate to high potential run-off rates. Along with permeability of soils, vegetative cover affects run-off rates, i.e. when natural vegetation is removed run-off rates increase, carrying greater amounts of soils and nutrients while increasing flooding.

### Surface Water Resources

Quality of life and economic base are directly linked to surface water resources. Maintaining high quality surface water is integral to the long term well being of the community. Streams and lakes provide scenic values and recreational opportunities for residents and visitors as well as critical habitat elements for a wide range of fish and wildlife species. In fact, development, tax base and economic base are directly attributed to the abundance of surface water resources in the study area.

The watershed plan covers Grand Lake Watershed and a number of smaller coastal watersheds that separate the Grand Lake Watershed from Lake Huron. The Grand Lake Watershed covers 30,753 acres, including 5,874 acres of surface water (see **Figure 3.2**). The combined coastal watersheds cover 20,706 acres. Within the smaller coastal watersheds, Lake Esau watershed covers 646 acres. This watershed has been greatly reduced in size by the Stoneport quarry operation, and both water quality and water quantity are major concerns for the watershed community.

Grand Lake has a surface area of 5821 acres and a maximum depth of 30 feet. Its lake shape factor (also known as the Shoreline Development Factor) of 3.59 shows a large amount of shoreline in relation to surface area. Round lakes have a factor of 1.00, while irregular shaped lakes with a much greater shoreline development potential have a factor of 4.00. According to the 1979 regional lake study<sup>3</sup> Grand Lake was classified as borderline between oligotrophic and mesotrophic. Grand Lake's TSI value of 41.42 was heavily influenced by the high Secchi transparency TSI of 50. The low Secchi transparencies of 6.9 ft. (spring) and 6.6 ft. (summer) may be attributed more to marl turbidity than to the phytoplankton (algae). No current data is available for Grand Lake.

Lake Esau has a surface area of 318 acres with a maximum depth of 26.3 ft. According to the 1979 regional lake study, Lake Esau is classified as oligotrophic with a combined 1ST value of 37.46 which ranked 4th out of the 51 basins sampled. Secchi disc measurements showed the disc clearly visible on the bottom at 26.3 ft. in spring, but in the summer the disc disappeared at 8.2. The decrease in water clarity was attributed to an increase in chlorophyll a concentrations and the marl formations.

Numerous small water bodies account for another 493 acres of surface water. The largest of the small features is Middle Lake with 239 acres of surface water. Middle Lake is a shallow basin and is classified as an emergent wetland in the National Wetlands Inventory. Of course the largest water feature is Lake Huron that bounds eastern side of the study area. Unspoiled beaches, low dunes and coastal wetlands abound along the coastline. Its presence influences climate, weather conditions, wildlife, and flora.

There are numerous small creeks and drainages. The named waterways include Warren Creek, Bell River, Schalks Creek, Schaut Creek, Middle Creek and the outlet of Grand Lake. No water quality data is available for the streams.

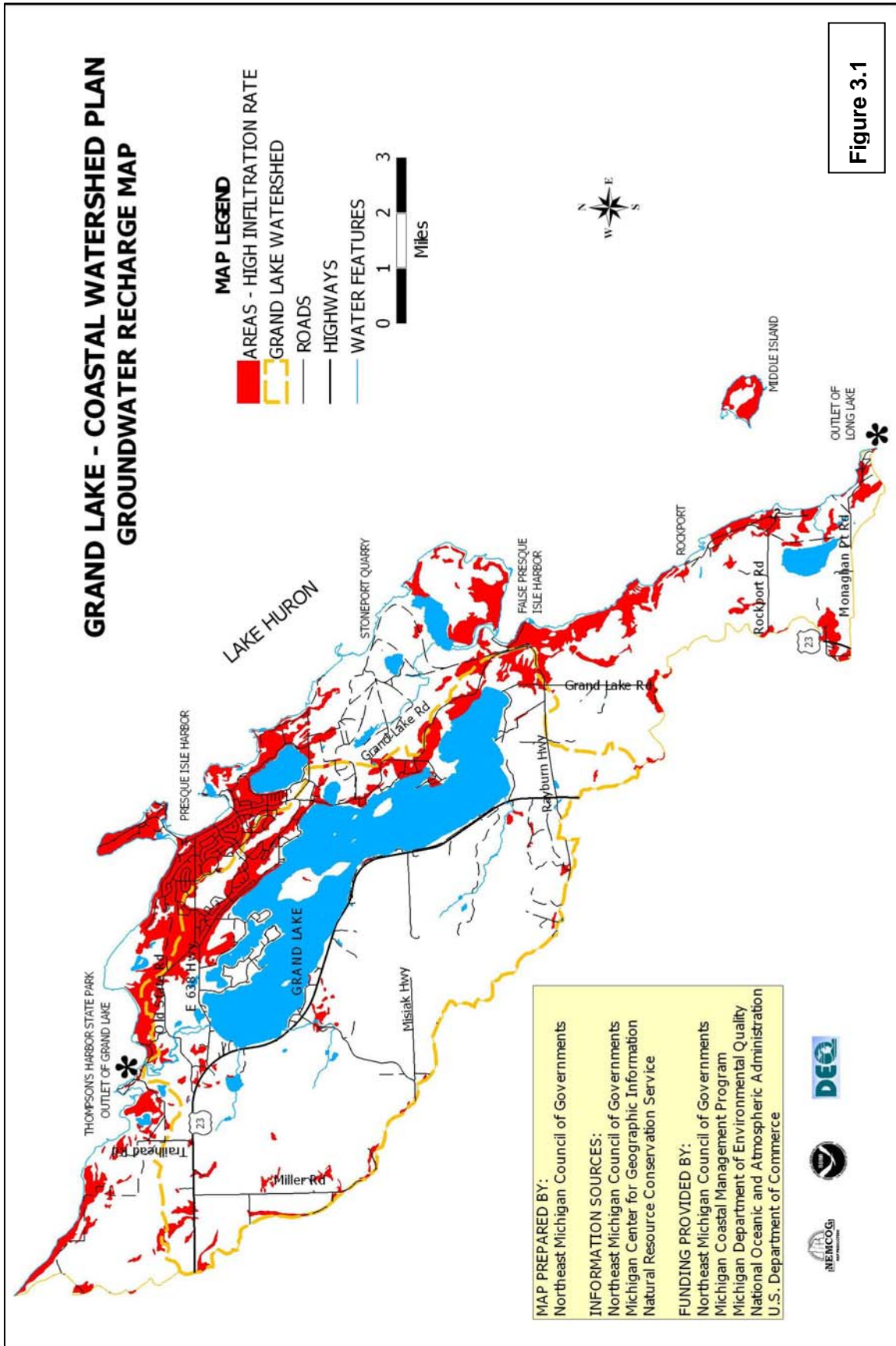
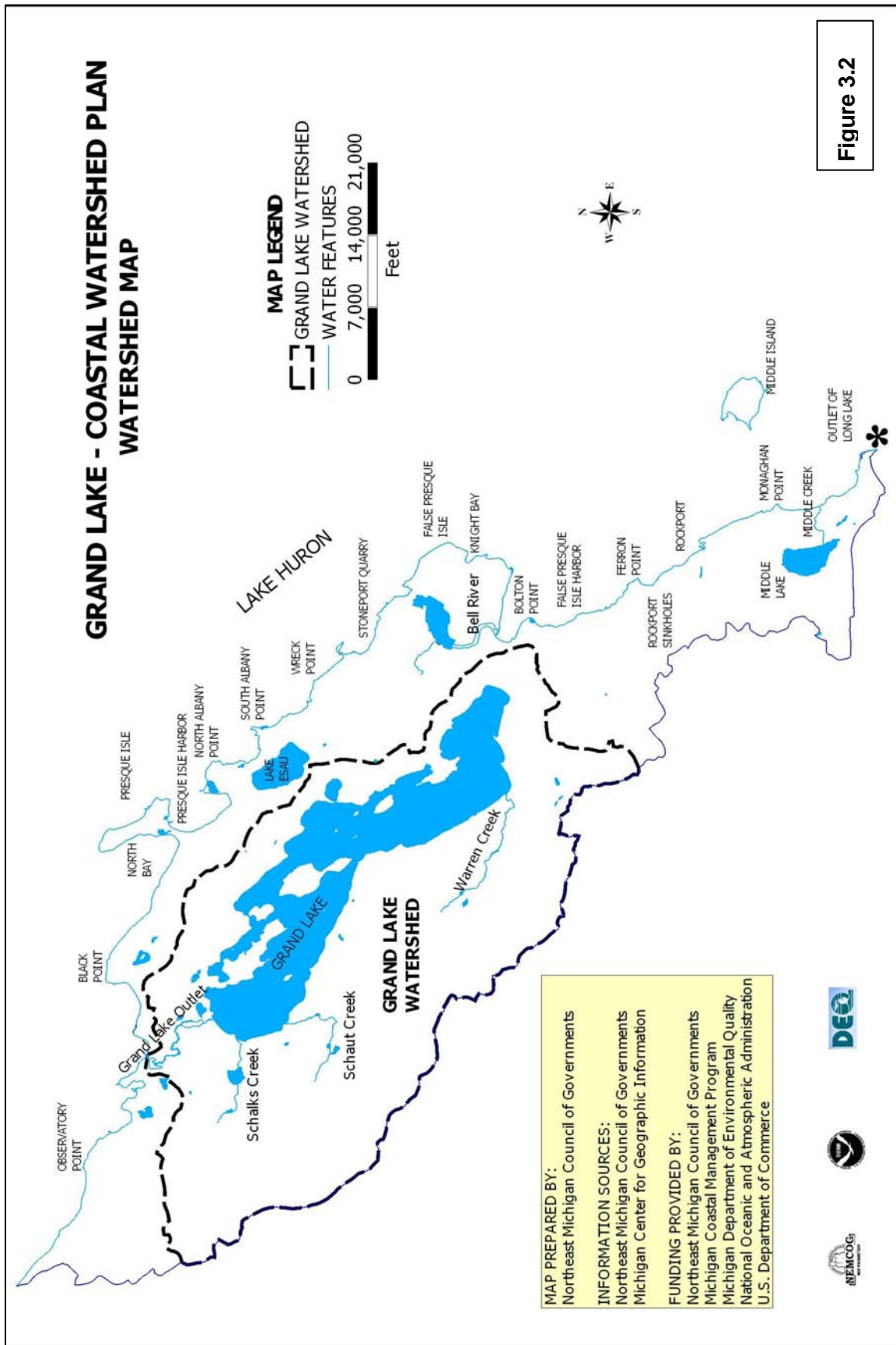


Figure 3.1



## Grand Lake - Coastal Watershed Plan

### Lake Levels

In a natural setting, where watersheds and outlets have not been altered by human activities, lake levels fluctuate from spring to fall and from year to year. Lake levels are tied to precipitation and evaporation rates. Human activities such as constructing dams, deepening outlet channels, increasing of impervious surfaces or even reducing watershed sizes by quarrying and redirecting water courses will impact lake levels. Legal lake levels have been established for Grand Lake and Lake Esau.

The U.S. Army Corps of Engineers have maintained lake level records for Lake Huron since 1900. **Figure 3.3** shows Lake Huron-Lake Michigan Lake levels from 1900 to 2000. During periods of high water levels, shoreline erosion problematic, particularly where development is close to the lakeshore and on bluffs. Coastal wetlands change in size and species composition as Lake Huron water levels rise and fall. During periods of low water levels, wetland herbaceous vegetation

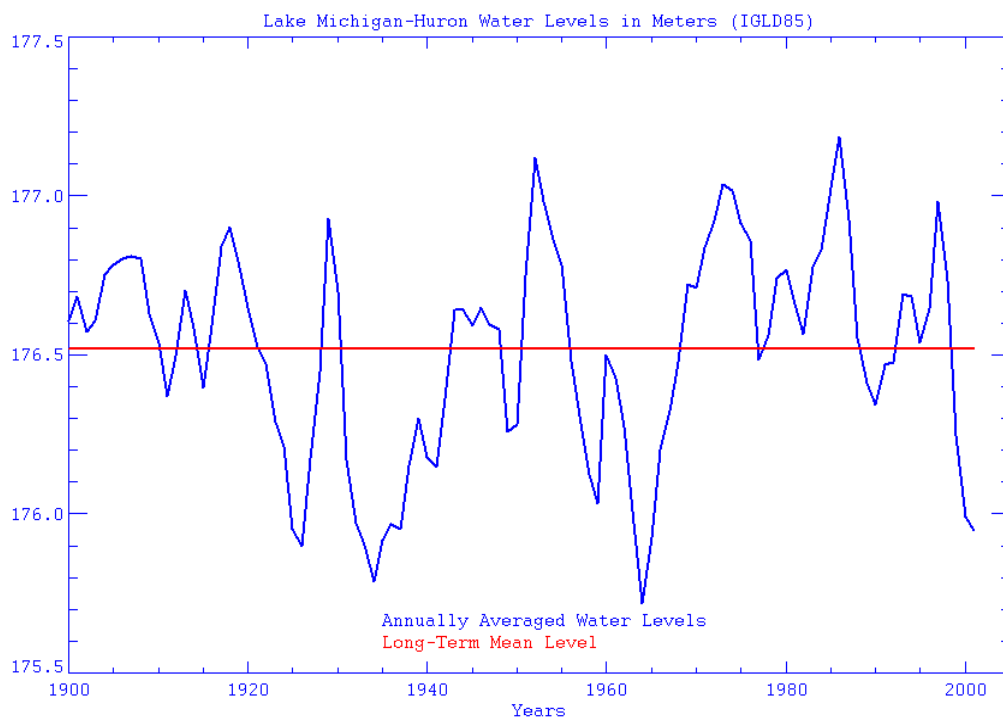


Figure 3.3: Lake Huron – Michigan Historic Water Levels

expands out into the exposed bottomlands. Woody plants such as northern white cedar and balsam poplar march outward from the forests edge onto now dryer sites. As the lake level rises, the newly established vegetation is inundated and the plant communities are pushed back inland. The flooded vegetation creates critical habitat for fish and wildlife, in addition to protecting shore areas from erosion. The ebb and of lake levels creates a constant see-saw of early succession plant communities along the zones. **Figure 3.4** from "Filling the Gaps" publication by Michigan Department of Environmental Quality<sup>4</sup>, depicts the fluctuations of lake levels and the ever changing coastal landscape.

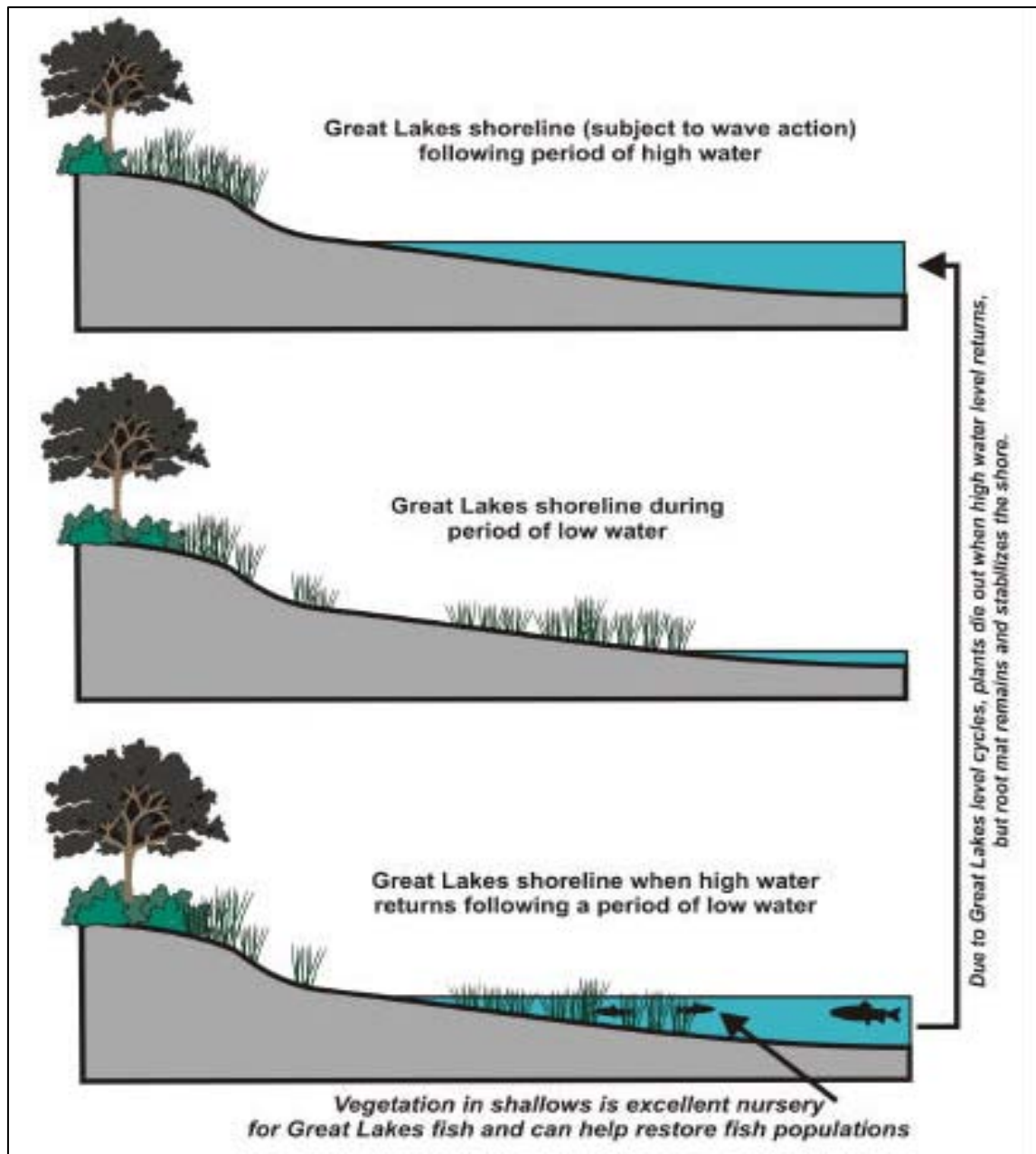


Figure 3.4: Josh Warbach, Planning and Zoning Center, Inc

Efforts to stabilize inland lake levels have resulted in the establishment of legal lake levels for Grand Lake and Lake Esau. A dam was constructed at the Grand Lake outlet in 1956. The dam was designed to increase the average lake level and to minimize large fluctuations of levels.

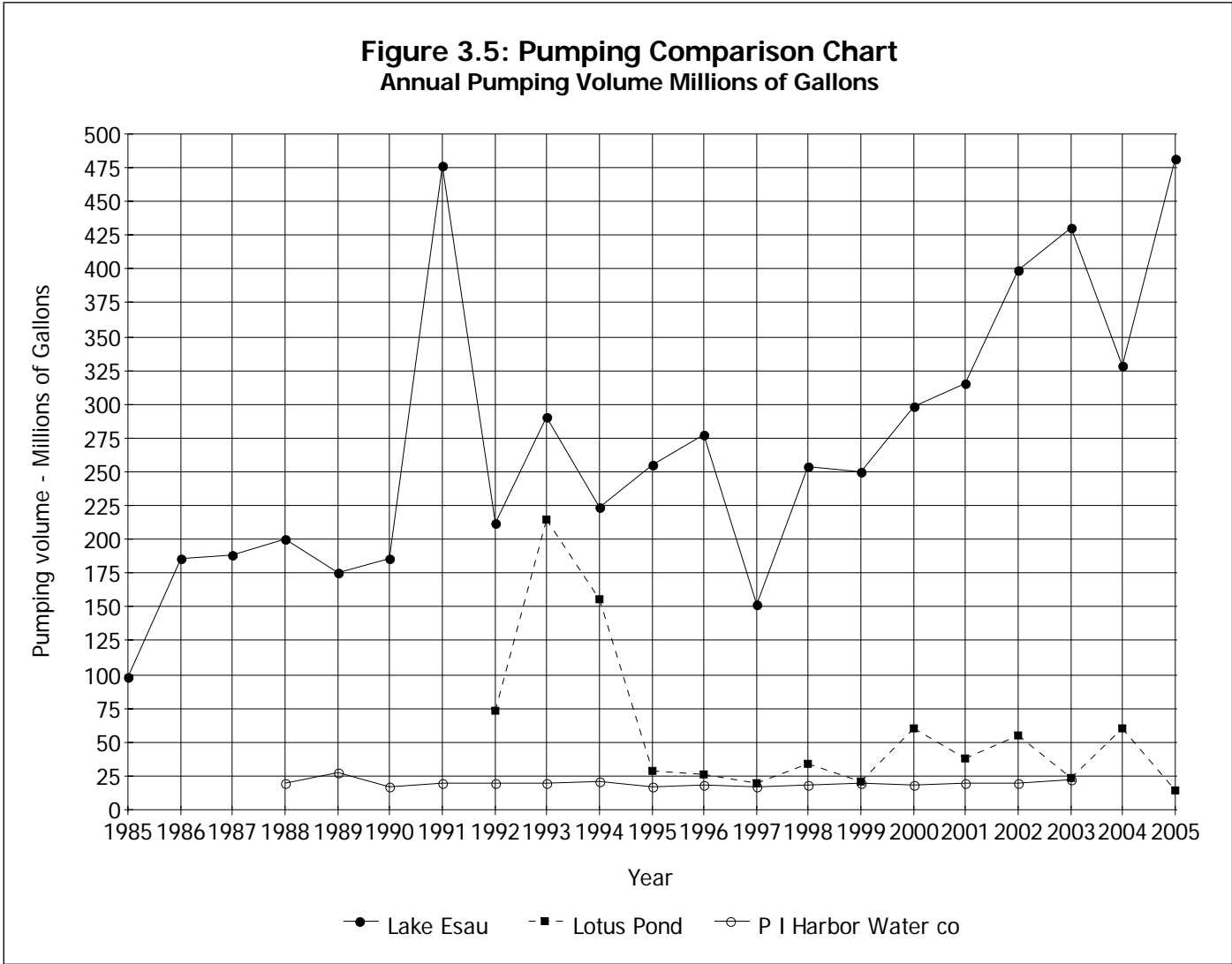
There have been concerns about falling lake levels in Lake Esau since the late 1970's. As lake levels continued to fall, concerned residents petitioned the Presque Isle County Board to establish a legal lake level. In 1984, circuit court action established the legal lake level for Lake Esau as 597 feet above

## Grand Lake - Coastal Watershed Plan

sea level. The following year, Presque Isle County and Presque Isle Corporation entered into an agreement that resulted in the quarry began pumping water from its de-watering process into Lake Esau. The agreement does not attribute causes for the falling lake level and allows the quarry to stop pumping with proper advanced notice. Annual pumping data for Lake Esau and Lotus Pond are displayed in a graph from "A Study of Grand lake, Lake Esau and Lotus Pond."<sup>5</sup> Pumping volumes have ranged from 100 million gallons per year to as high as 480 million gallons per year in 1991 and 2005 in order to keep the lakes at historic levels. **Figure 3.5** shows pumping volumes for Lake Esau, Lotus Pond and the Presque Isle Harbor Water Company.

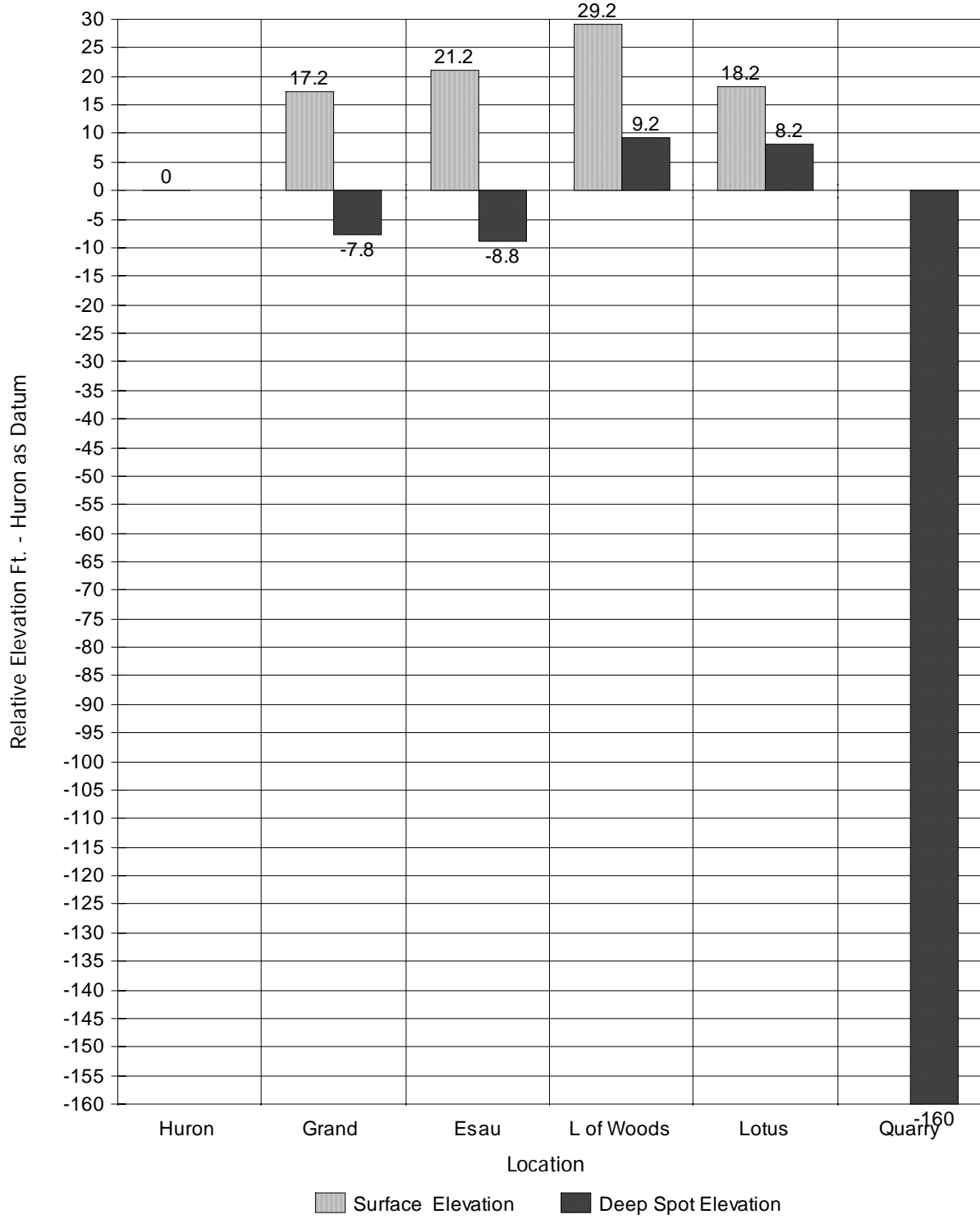
Lake Esau, fed by subterranean, bedrock springs and surface run-off, has is no inlet or outlet. The quarry operation has likely had an impact on lake levels by removing part of the watershed. Another concern that the mine operation has altered local aquifer systems can not be determined without an extensive and very expensive hydro-geological study. Empirical observations, such as water wells going dry, wetlands between the quarry and Grand Lake "drying-up" and underwater springs along the eastern shore of Grand Lake no longer noticeable, would indicate some relationship between the quarry depth/dewatering process and alteration of pre-mining groundwater aquifer systems. The quarry foot print has continued to expand towards the lakes, and is within 1,060 feet of Lake Esau, 425 feet of Lotus Pond and 1,500 of Grand Lake. Figure 2.16 depicts elevations of lake levels and lake bottoms in comparison to the mean Lake Huron level. As can be seen mining operations have quarried to a depth of 160 below the mean level of Lake Huron. This depth is over 150 feet below the bottoms of inland lakes. The elevation of the bottom of Lotus Pond is approximately eight above the mean Lake Huron elevation and the historic surface elevation is 18 feet above Lake Huron. The legal lake level of Lake Esau is 21 feet above Lake Huron, while the deepest part of the lake is nearly nine feet below the mean Lake Huron level. **Figure 3.6** shows the relative elevation of lake levels and lake depths in relation to the quarry depth and the mean Lake Huron water level.

The concern for local residents is what will happen to Lake Esau and Lotus pond, when the quarry stops pumping water into the lakes? Since the lake levels are artificially maintained, the obvious answer would be the levels would fall to undetermined levels. Additionally, when the quarry discontinues operation at some time in the future, and the dewatering process stops, the quarry will fill with water. The elevation of the water level in the abandoned quarry is up for debate. If seepage occurs from Lake Huron, or if the quarry was opened to Lake Huron, the quarry water level would reach equilibrium with Lake Huron. However, if there is a hydrological connection between the lakes and the quarry, and given the elevations of Lake Esau and Lotus Pond, relative to Lake Huron, equilibrium would result in water levels of the inland lakes being much lower than historic levels, see **Figure 3.6**.





**Figure 3.6: Elevation Comparisons**  
**Huron-Grand-Lotus-Esau-L/Woods-Quarry**



## Grand Lake - Coastal Watershed Plan

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<sup>3</sup> Northeast Michigan Council of Governments, A Water Quality Study of 48 Lakes in Northeast Michigan, 1979.

<sup>4</sup> Michigan Coastal Management Program, Filling the Gaps, Environmental Protection Options for Local Governments, K. Ardizzone and M. Wyckoff, 2003.

<sup>5</sup> Dan Rivard, DLR Inc. and William D. Lewis, A Study of Grand Lake, Lake Esau and Lotus Pond, Relating Water Levels, Climatic Data and Water Pumping Volumes Required to Maintain Water level in Lake Esau and Lotus Pond, 2006.

# Inventories

## Introduction

Nonpoint source pollution is pollution that occurs on land and is carried from its source into a body of water by precipitation, snowmelt, or wind. During periods of high runoff (rainstorms, snowmelts, etc.) contaminants such as fertilizers, sediments, nutrients, oil, grease, road salt and toxic chemicals are flushed from streets, parking lots, yards and farm lands. Nonpoint source pollution can find its way into a water system through various means. When streambanks and shorelines erode, sediments are deposited into lakes and rivers. Sediments and other pollutants can be washed into streams at road/stream crossings. Agricultural and residential areas contribute fertilizers and pesticides. In critical areas, impacts from these sources increase vulnerability of water resources to the effects of pollution. The pollutant-laden water can either move overland to the nearest lake, stream or wetland; or percolate through the soil into the groundwater. Storm sewers and drains, which increase with development, provide an even more direct route for runoff to reach the water resources. At present, the Grand Lake Watershed has a good water quality rating, but with the ever-increasing demands development puts on its water resources, great care will need to be taken to ensure continued high water quality.

To gather information regarding the state of the watershed several inventories were conducted during summer 2005. Sites of shoreline erosion, road/stream crossings, dams, and boat launch/public access sites were surveyed to determine the extent of pollutant loading and sedimentation occurring in the watershed. Materials used in the assessment of these features included topographic maps, MIRIS land use maps, plat books, aerial photographs, watershed maps, and county road maps. Water quality data and zoning ordinances were also used to supplement the spatial data. The field inventories were conducted by car, boat, canoe and/or by walking the watershed. The resulting data sets were used to determine which pollutants are threatening or impairing water quality in the Grand Lake Watershed.

## Critical Area

A critical area is defined as “that part of the watershed that is contributing a majority of the pollutants and is having the most significant impacts on the waterbody.” A critical area may also include an area that is specifically valued by the community (i.e. the habitat of an endangered species, a riparian corridor, headwaters etc.). Inventories for the Grand Lake Watershed were conducted in the watershed’s critical area and included features that are highly vulnerable to polluted runoff and erosion such as shorelines, wetlands, and steeply sloped areas. There are two rationales for defining the critical area of the watershed. First, areas adjacent to water bodies are most likely to be affected by adverse water quality. Second, narrowing the geographic scope allows pollution management efforts to be focused on areas that may be contributing the majority of nonpoint source pollution. Focusing on the critical areas within the watershed results in the greatest reduction of pollutants, saves time when conducting surveys and saves money.

## Grand Lake - Coastal Watershed Plan

USGS topographic maps and USDA Soil Surveys were used to delineate the critical areas. The following criteria were used to determine the scope of the critical area:

1. Areas within 1000 feet of Grand Lake.
2. Designated tributaries, including intermittent drainages.
3. Inland lakes within the watershed.
4. Contiguous wetlands, defined as being within 1,000 feet of Grand Lake, or within 500 feet of streams or lakes within the watershed.
5. Urban areas which drain to surface waters.
6. Contiguous steep slopes, defined as 10% slope or greater.
7. Areas of ground water recharge.

The Grand Lake Watershed is 78 square miles (50,000 acres) and the critical area that serves as the main focus of the plan is approximately 67 square miles (43,331 acres). **Figure 4.1** shows the entire critical area; **Figure 4.2** shows the critical area including features used to determine the critical area. Note that nearly the entire watershed is critical area.

### Agricultural Lands

There is minimal farming activity in the watershed study area. The Land Use/Cover Inventory identified 150 acres of farmland, which is located along the western border of the Grand Lake watershed. This land is being used for hay production. Farming activities are not within 2000 feet of a water body and therefore are not considered to have a potential non-point source impact to water quality.

### Road/Stream Crossing Inventory

A road/stream crossing site exists wherever a road or street and a stream intersect. These crossings can be major contributors of sediments and other pollutants to the water system. Dirt and gravel from shoulders of the roads, or from unpaved roads, can be washed into a stream. The resulting build up of sediments in the stream is called *sedimentation*. Although sediments entering waterbodies is a natural process, excess amounts can wreak havoc on the aquatic environment. Some detrimental effects of sedimentation are:

- ◆ Destruction of aquatic habitat and the extermination of aquatic wildlife
- ◆ Negative impacts on birds and mammals dependent on the aquatic environment
- ◆ Restriction of plant productivity due to reduction of sunlight penetration
- ◆ Warming of waters, which can lead to destruction of coldwater fisheries
- ◆ Release of nutrients into the water system, causing the stimulation of algae growth
- ◆ Introduction into the water body of harmful pesticides, toxic metals and bacteria which may adhere to the grains of sediment
- ◆ Disruption of the fish life cycle by affecting their ability to feed, spawn, and inhibiting gill function.
- ◆ Reduction of width and depth of the stream channel, and the potential increase in flooding events

## Grand Lake - Coastal Watershed Plan

The amount of sedimentation experienced by a water body depends on several factors, such as the length and slope of the approaches, steepness of the embankment, whether or not the road is paved, the amount of vegetative cover along shoulders and ditches at the site, and the runoff path. These factors need to be taken into consideration in the development of any plan proposed to reduce the rate of sedimentation at road/stream crossings.

### Methodology

The road/ stream crossing inventory was conducted in the summer months of 2005 by Northeast Michigan Council of Government (NEMCOG) staff. Road/stream crossing were located using topographical and county road maps. Photographs were taken of upstream, downstream, and left and right approaches at each site. Physical condition and measurements of the culvert, the roadway, the length and slope of approach, road width and surface type, stream depth and current, amounts and causes of erosion, and extent of vegetation were recorded. Using the data collected, each site was assigned a ranking of minor, moderate or severe based on a point system. Best Management Practices (BMPs) were determined according to the needs of each site. Sample inventory sheets and ranking sheets are included in **Appendices A** and **B**, respectively.

### Results

Of the fourteen road/stream crossings located in the watershed; five were inaccessible and nine were surveyed for signs of erosion (See **Figure 4.3**). The majority of sites ranked as *Moderate* contributors of sediments to the lake's tributaries, with two sites ranking *Minor*, and only one site was rated *Severe*. For a photo and detailed record of each site see **Appendix C**. BMPs were recommended for four of the sites; implementation of the recommended treatments would cost approximately \$70,000.

## Shoreline Surveys

During the fall of 2005, a shoreline greenbelt survey was conducted. Field visits and aerial photo interpretation techniques were used to conduct the survey. The Grand Lake survey was conducted by boat. Small lakes, creeks and developed areas of the Lake Huron shoreline were viewed from accessible locations. Aerial photo interpretation methods were employed to refine field surveys and inventory inaccessible locations. Shorelines were classified into four categories: undeveloped, developed good condition, developed fair condition and developed poor condition. **Figures 4.4** and **4.5** show the results of the shoreline condition survey.

A summary of the Grand Lake shoreline is provided in **Table 4.1** below. Nearly, 40 percent of Grand lakes shoreline is undeveloped. With the exception of the islands, much of the undeveloped lakefront property is low and likely wetlands. Approximately, 50 percent of waterfront properties were found to be lacking in adequate greenbelts. Thirty-one percent of the shoreline was classified as having poor greenbelt conditions. Lakeshore properties dominated by manicured, green lawns do not provide proper water quality buffers or needed wildlife habitat. Education programs should focus on these properties to restore wildlife habitat and water quality buffers.

## Grand Lake - Coastal Watershed Plan

		All Shoreline		Shoreline w/o Islands	
Undeveloped	Natural vegetation intact.	79,340 ft	39%	45,150 ft	28%
Developed Good Condition	Trees, shrubs and herbaceous plants covering much of shoreline; lawn not to waters edge.	28,619 ft	14%	25,462 ft	16%
Developed Fair Condition	Trees, shrubs and herbaceous plants present but mowed lawn covering less than 60 percent, no hardened shoreline.	32,602 ft	16%	32,408 ft	20%
Developed Poor Condition	Trees and shrubs limited, mowed lawn covers much of the lake yard; hardened shore of rocks, concrete or metal retainer walls may be present.	61,705 ft	31%	60,709 ft	37%
Source: Northeast Michigan Council of Governments					

### Summary of Surveys

Results of the inventories show that there is relatively little erosion occurring in the watershed. However a severe lack of greenbelts in the developed areas of the lake allows significant amounts of pollutants such as phosphorus and nitrogen to enter the lake. Below is a brief summary of the findings.

- At road/stream crossings, damaged, ineffective or perched culverts, embankment erosion and culvert outlet erosion were some of the factors impacting the watershed's streams. RSX Site #3 (ranked *Moderate*) and RSX Site #4 (*Severe*) in addition to contributing excess sediments are also "perched" (the bottom of the culvert is above the water level in a way that prevents fish passage) and should be replaced.
- Many of the access sites to Grand Lake are not paved, and heavy foot, boat and trailer traffic is taking its toll on the shoreline. The bank at Access Site #9 is eroded down to the waters edge, and the problem is compounded by undercut banks located approximately 50 feet from the access site. About 300 feet south of Site #9, Access Site #10 is also severely eroded. The rate of erosion at this site is accelerated by an unofficial ORV trail that cuts through the river to the far bank. Access Site #4 is unpaved and shows signs of fairly heavy use. This site slopes steeply to the lake, facilitating the rapid transfer of gravel and road salts to the lake following spring thaw or a rain event.
- Grand Lake Dam (Dam Site #1) is also used as a fishing site. A moderate amount of erosion is evident in several areas around the dam, and the site could benefit from one or more erosion control structures.

Sediments and nutrients are the pollutants of greatest concern in the watershed. To maintain the high level of water quality expected by the watershed community, best management practices will need to be implemented at sites of concern. Educating the public to the importance and benefits of greenbelts and shoreline buffers should be considered a priority component of the watershed plan.

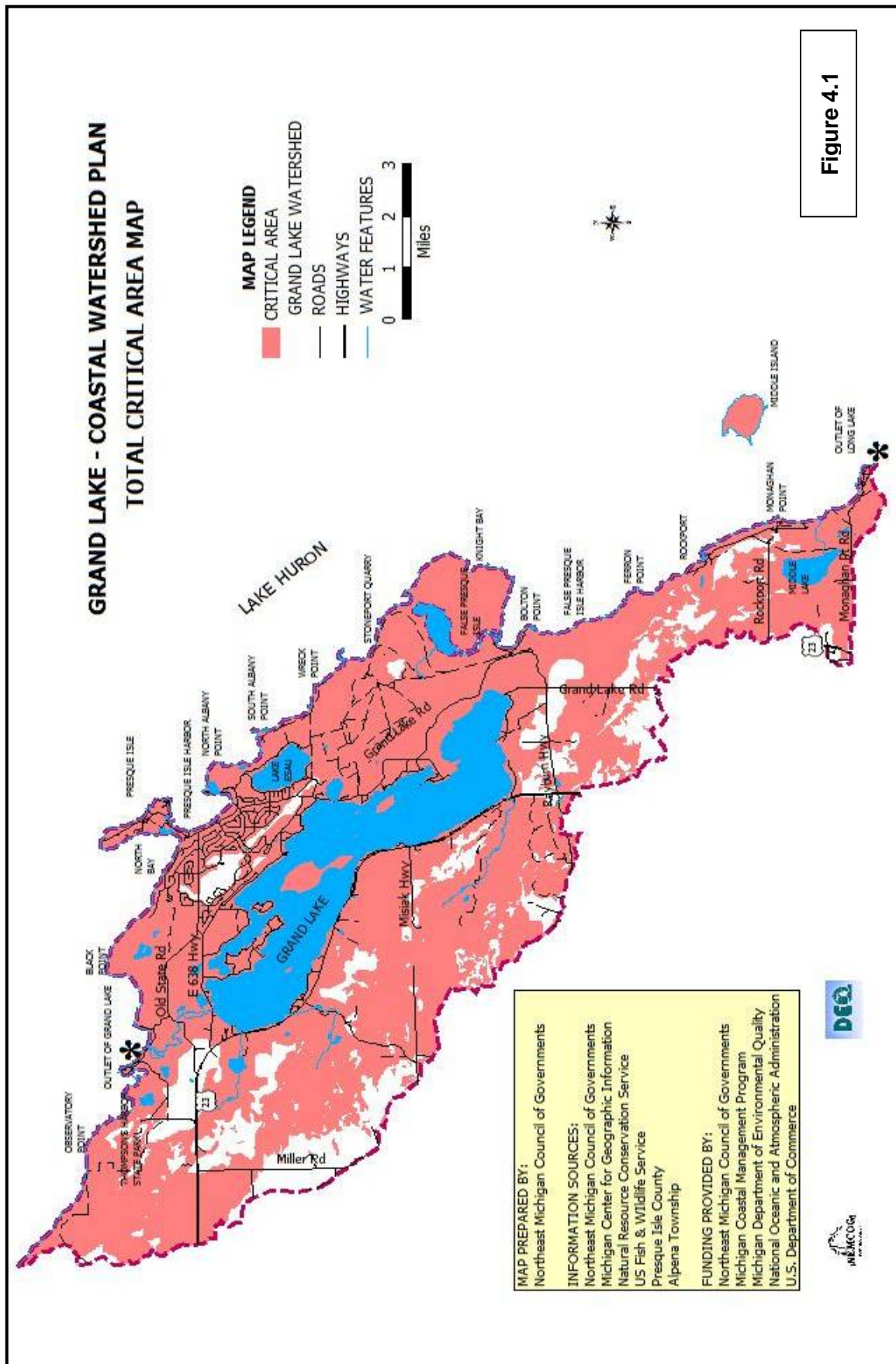
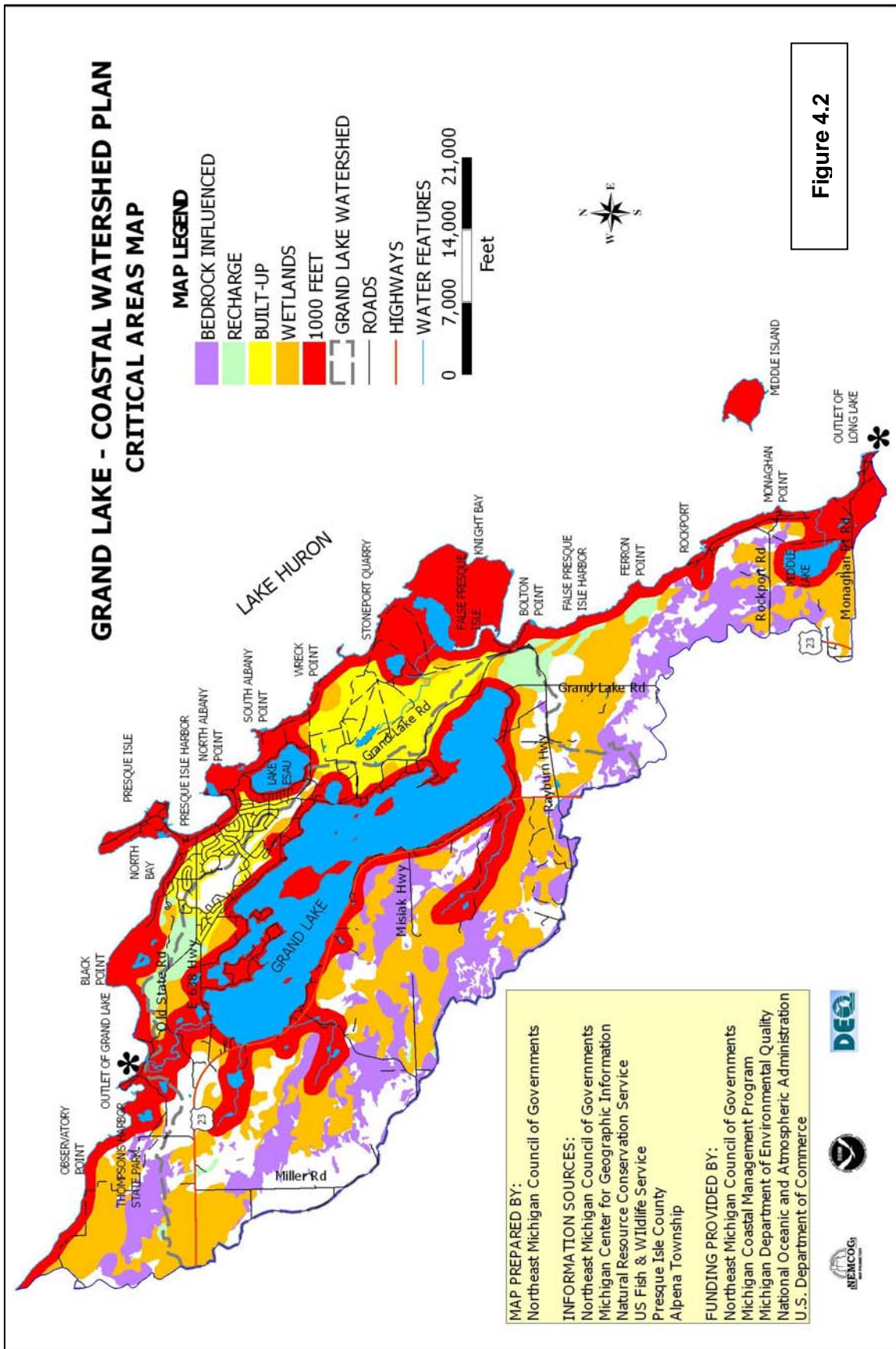


Figure 4.1





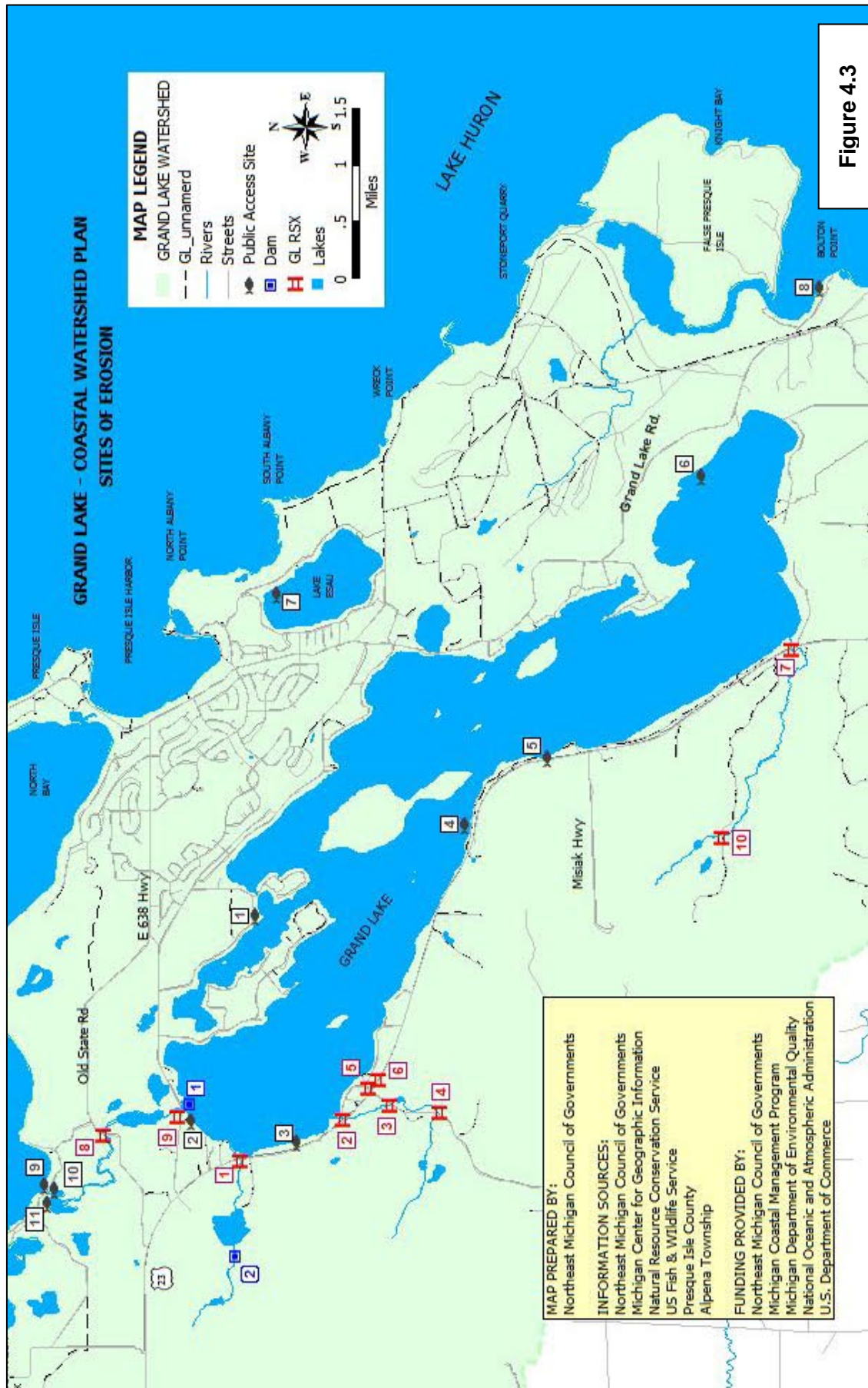
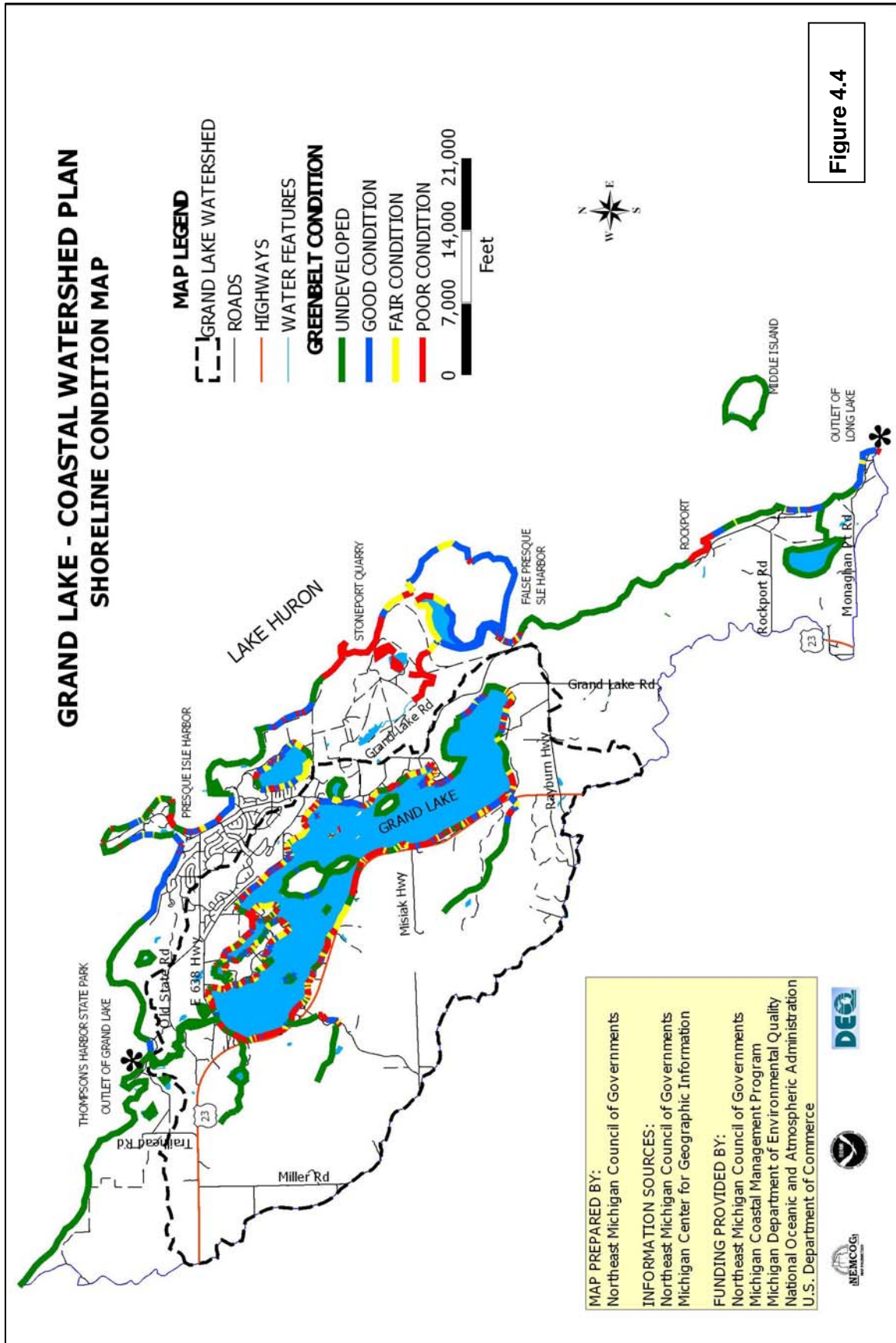
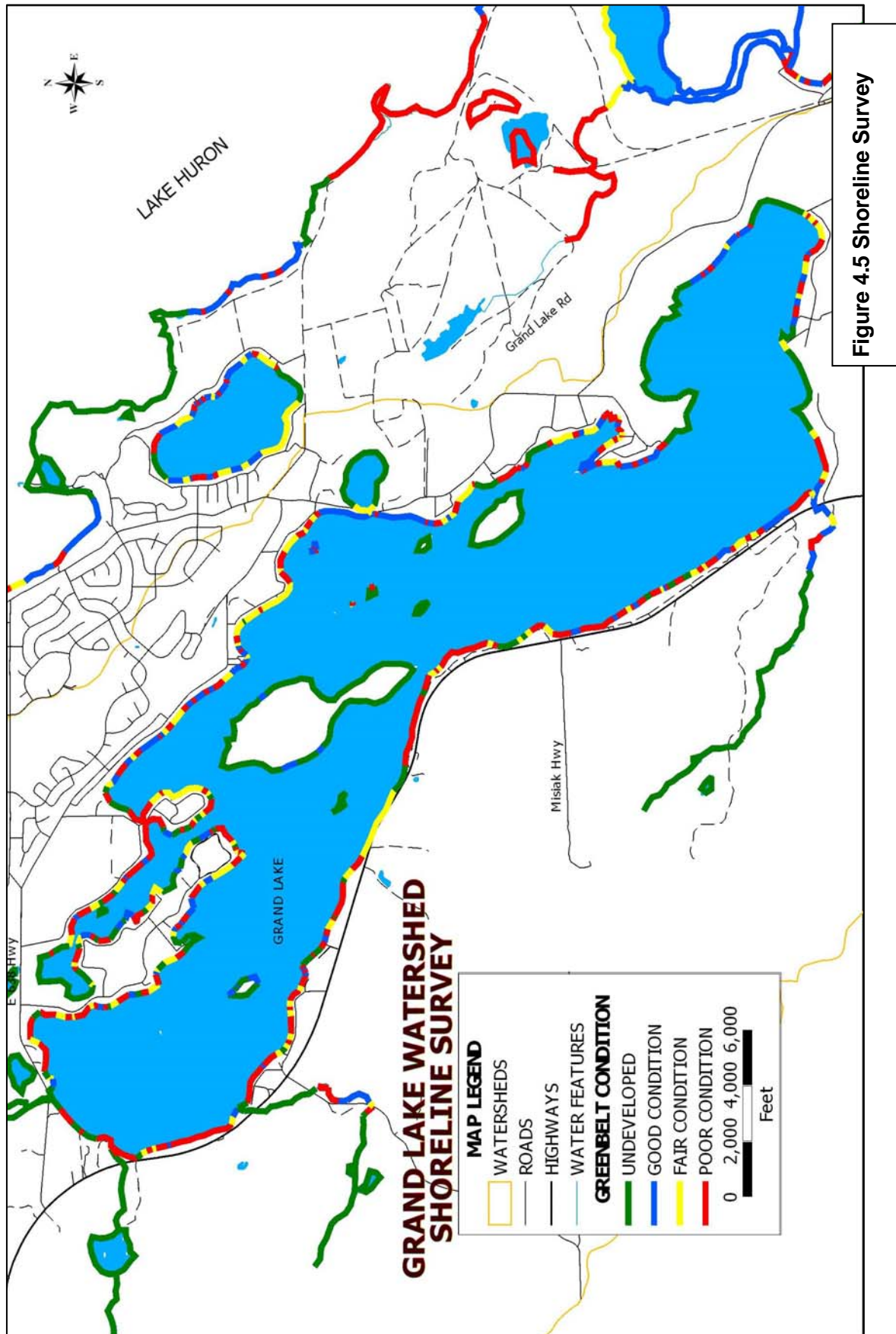


Figure 4.3





# Status of Planning and Zoning

## Introduction

Watershed management requires the use of many different techniques in order to be effective. Several valuable management tools are available to communities, organizations and local government to aide in the development of a watershed management plan. These include proactive elements such as research, monitoring, educational outreach programs, and voluntary land protection incentives for property owners in critical areas. Remedial measures such as implementation of Best Management Practices to restore nonpoint source pollution sites and incorporating conservation-friendly design standards into new developments are also important watershed management tools. Land use planning and zoning at the local level is a vital component in watershed protection. In addition to the direct benefits for aquatic resources, planning and zoning tools can be used to ensure the conservation of wildlife habitat, provide for sustainable development, protect property values and to help maintain community character.

A sound planning and zoning program requires that a community not only support the idea, but dedicate the trained personnel and funding to make the program work; effective planning and zoning involves commitment and resources.

In the state of Michigan, planning and zoning are implemented at the township, municipal, or county level. The enabling legislation for land use planning can be found within four state acts:

- ♦ Public Act 285 of 1931 -- Municipal Planning Act
- ♦ Public Act 168 Of 1959 -- Township Planning Act
- ♦ Public Act 282 of 1945 -- County Planning Act
- ♦ Public Act 281 of 1945 --Regional Planning Act

Following adoption of a master plan, the local unit of government creates a zoning ordinance. In accordance with these acts, the zoning ordinance must be based on the goals and policies set forth in the master plan.

The state has three legislative zoning acts that enable local units of government to control land uses through regulation of activities on the land:

- ♦ Public Act 184 of 1943 -- the Township Rural Zoning Act
- ♦ Public Act 183 of 1943 -- the County Zoning Act
- ♦ Public Act 207 of 1921 -- the City and Village Zoning Act

In addition to planning & zoning, there are state regulations that are intended to help conserve natural resources. Relevant state laws for water resource protection include:

- ♦ Act 451, Part 91, Soil Erosion Control and Sedimentation Act  
(for earth changes within 500 feet of the shoreline)
- ♦ Act 451, Part 303, Wetland Protection  
(covers the dredging, draining, or filling of regulated wetlands; however, non-contiguous wetlands in rural counties are generally not regulated wetlands)
- ♦ Act 451, Part 301, Inland Lakes & Streams Act  
(covers work conducted below the ordinary high water mark)

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- ♦ Public Act 368 (1978), Aquatic Nuisance Control

This is only a brief summary, please see the respective law or contact MDEQ for more information.

For some of the issues related to watershed management, agencies (beyond the local unit of government) have a regulatory role. In the case of soil erosion & sedimentation, the Michigan Department of Environmental Quality (MDEQ) has jurisdiction; they typically have an agreement with counties to enforce the program at the local level (thus counties have a Soil Erosion Officer). With regard to regulation of wetlands, MDEQ also has jurisdiction, authorized through the federal Clean Water Act. Regulations for septic systems are handled through the District Health Department. In all three of the areas listed above, a local community may adopt their own programs for managing the resource (standards adopted cannot be weaker than what the state would otherwise use). Such a decision to adopt a local ordinance may lead to more work for the local unit of government and a greater expenditure of fiscal resources; it may also create an opportunity to better achieve the goals identified in the community's comprehensive master plan.

In any event, a local unit of government should develop a master plan (based on public input) that allows planning for future needs while maintaining existing features that are important to the community. (In the case of the Grand Lake Watershed, the applicable master plans are the Presque Isle Township Comprehensive Plan, and the Krakow Township Comprehensive Plan.) The plan becomes the basis for the zoning ordinance. Attention should be paid to whether the standards in the zoning ordinance actually achieve the goals set forth in the master plan; oftentimes they do not. Once local government units have "good" land use policies in place, there is still work that needs to be done -- the governing body must keep their policies up-to-date and make decisions regarding infrastructure and zoning in accordance with their plan.

Often volunteers on local zoning boards are pressured to make a decision on a site-specific issue without considering the whole system. Zoning standards and decisions must be made with the comprehensive master plan in mind; it can be extremely difficult to step back from a particular issue and consider the big picture, but that is exactly what trained planning commission officials must do. In addition, zoning regulations need to be enforced and monitored. Without fair and impartial enforcement, the majority who comply with land use regulations are, in effect, penalized, because of the greater effort and expense they have incurred than those who disregard regulations. If enforcement is not consistent and fair, regulations will become increasingly ineffective as the majority of landowners disregard the rules, or as the court system ceases to uphold the regulations due to discriminatory enforcement.

This following review of local land use regulations in the Grand Lake Watershed was prepared by the Northeast Michigan Council of Government in 2006. This review is not intended to evaluate the history of planning and zoning within the watershed, nor is it intended to be the sole basis for determining the effectiveness of policies regarding water resource management. This evaluation should provide insight into how effective local units of government are at protecting aquatic resources and help to identify some of the obvious weaknesses in current zoning ordinances.

## Status of Planning and Zoning

Townships located in a county with zoning have the option of having the county handle the entire planning and zoning program or administering their own. Both of the townships of the Grand Lake Watershed administer their own program. **Table 5.1** lists local government units within the watershed along with the adoption, amendment or revision dates of their master plans and zoning ordinances. Presque Isle County, Alpena County and Alpena Township information is included for purposes of comparison.

<b>Table 5.1 Status of Planning and Zoning</b>			
<b>Political Unit</b>	<b>Master Plan Date Adopted</b>	<b>Zoning Ordinance Date Adopted</b>	<b>Related Planning Documents or General Law Ordinances</b>
Krakov Township	September 25, 1996 Currently being updated	January 17, 1999 Revised May 2005	
Presque Isle Township	September 27, 2004	September 14, 1981 Amended Jan. 1994	Recreation Plan
Pulawski Township	County Master Plan	County Zoning Ordinance	
Presque Isle County	November 10, 2004	May 29, 1987 Currently being updated	County Recreation Plan
Alpena Township	August 9, 2004	August 15, 1983 Amended Mar. 2003	Recreation Plan
County of Alpena	Sept. 21, 2004	No Zoning Authority	County Recreation Plan

Krakov and Presque Isle Township both have a zoning ordinance in place, and have adopted a Master Plan as well. Krakow Township's Comprehensive Master Plan is in the process of being updated. Presque Isle Township also has an approved recreation plan. Presque Isle County adopted a zoning ordinance in 1987 that is currently being updated. The County's current Master Plan was adopted in 2004. Pulawski Township is zoned under the Presque Isle County zoning ordinance and is included in its Master Plan.

In January of 2000, the County of Alpena reestablished a County Planning Commission that had been dissolved in 1985. A primary goal of the Planning Commission has been to prepare a master plan to replace the Alpena County General Development Plan, adopted in 1968. The plan was adopted in 2004. The City of Alpena adopted a Master Plan in 1998 and is beginning the process of updating it. The Township of Alpena is in the process of updating its 1993 Master Plan. The City of Alpena and Alpena Township have their own zoning authority. Alpena County, the City of Alpena and Alpena Township all have State approved recreation plans.

To determine, in part, the efficacy of regulatory coverage for aquatic resources within the Grand Lake Watershed, local zoning ordinances were reviewed to evaluate what, if any, environmental provisions are in place that may have an impact on water resources. **Table 5.2** can assist local government policy makers in identifying how their ordinances might be amended to better protect water resources. The ordinances were specifically reviewed for the following:

## Grand Lake – Coastal Watershed Plan

- Vegetative Buffer Zones (Greenbelts): With regard to minimizing the impact of residential development along the waterfront, ensuring that natural vegetation is retained along the shoreline is generally considered one of the most important actions that can be taken. Vegetative buffers help to filter nutrients, reduce erosion, and provide natural habitat. Although much research has been done through the years to verify the effectiveness of vegetative buffers, there are several practical difficulties with having a “greenbelt ordinance.” It can be difficult to enforce, many local officials and residents are unaware of what an effective greenbelt consists of, historic patterns of development have already degraded many areas (and these may be “grandfathered” in), zoning language is often poorly worded for proper enforcement, and citizens are often unaware that there is an ordinance in place. Even with the negatives, however, maintaining a greenbelt is essential to protecting water resources – even a 25-foot greenbelt can be effective. A mowed lawn to the water’s edge is not a greenbelt.
- Setbacks of structures along the waterfront are important for reducing the amount of impervious surface near the water, helping to ensure that a greenbelt can be maintained, and reducing the potential for serious resource problems. A structure that is setback only 30 or 40 feet is more likely to be direct runoff pollutants and sediments into water resources than a structure 75 or 100 feet away from the water’s edge. Unfortunately, many local units of government that do have an effective setback for homes will make many exceptions for large decks and boathouses. Such exemptions defeat the intent of the setback, as impervious surface cover will still be present near the water’s edge. Furthermore, of the local units of government that have a greenbelt requirement of 50 or 75 feet width, many allow the structure setback to be less than the greenbelt restriction. Such a scenario significantly reduces the effectiveness of the greenbelt requirement. In addition, during the construction period, a structure built less than 50 feet from the water will have construction site disturbances that abut the water’s. An unavoidable consequence of this practice is the destruction of the greenbelt during construction. Maintaining the natural greenbelt in the first place is much easier than restoring a greenbelt. Setback requirements should be regarded as a key element for water resource protection.
- Minimum Lot Width for waterfront parcels is important for the protection of water bodies because it ultimately determines the number of homes that will be built on the water. Developed shorelines with less than a 100-ft minimum lot width often experience water resource problems. Generally, smaller lot widths around a lake leads to more homes, resulting in greater wastewater treatment needs; increased user conflicts; fertilizer input to the lake; stormwater runoff; increased site erosion, and loss of native vegetation. A higher density of homes results in an increase in the amount of impervious cover in the critical near-shore areas of surface water.
- Open space preservation is used for communities to protect their rural character, as well as maintain prime recreational, farm or forest land. Unfortunately, most zoning ordinances, if implemented as written, will not accomplish those goals. In the Grand Lake Watershed, Presque Isle Township, Krakow Township, and Pulawski Township all have open space guidelines, although the provision typically states something to the effect: "At least 40% of the total gross project shall be left as open space." Some only require 25%, which is insufficient to accomplish their community goals.

## Grand Lake – Coastal Watershed Plan

An improvement to the open space section of local ordinances would be to require the developer to increase the amount of open space to 50 or 60% and also make sure that some of the set aside acreage is from the developable portion of the site. Steep slopes, surface water, wetlands, etc., should be excluded from this calculation; otherwise only the most undesirable areas will be set aside as open space. Ordinance language should be something such as, "A minimum of 60% of the parent parcel's gross acreage shall be set aside as permanently protected open space. This area shall include at least half of the parcel's buildable land area."

There are incentive programs that local communities can adopt to encourage open space preservation, such as allowing higher development densities on the remaining land in a development or through setting up a Purchase of Development Rights (PDR) program.

- Septic Systems are under the jurisdiction of the District Health Department. Typically, only severe problems are addressed. Departments are understaffed, and there are poor records regarding septic systems. Some local units of government have begun to initiate their own programs for inspections, maintenance, or replacement requirements. Generally, such a program is being run as a "Point of Sale" program, whereby inspections of septic systems are required at the time of property transfer. System upgrades are then required for those systems that are not working properly.
- Wetland Protection is handled through the state Department of Environmental Quality. However, some communities have adopted their own wetland, more restrictive regulatory program, which is authorized through the state wetland act. As can be noted in **Table 5.2**, no local ordinances include wetland standards *beyond those at the state level*.

<b>Local Unit of Government</b>	<b>Presque Isle Township</b>	<b>Krakow Township</b>	<b>Presque Isle County</b>	<b>Alpena Township</b>	<b>Alpena County</b>
<b>Vegetative Buffer Zones/ Greenbelt</b>	30 ft.	75 ft.	No provision	25 ft.	No zoning ordinance
<b>Waterfront Setbacks</b>	50 ft.	75 ft.	30 ft.	25 ft.	-----
<b>Minimum Lot Width for Riparian Parcels</b>	100 ft.	75 ft.	75 ft.	100 ft.	-----
<b>Open Space</b>	Yes, in PUD section	Yes, in PUD section	Yes, in PUD section	No provision	-----
<b>Septic Systems</b>	No provision	No provision	Yes	Refers to County Health Department	-----
<b>Wetland Protection provisions</b>	No provision	No provision	No provision	No provision	-----
<b>Stormwater Management</b>	No provision	No provision	No provision	Yes	-----
<b>Other Environmental Provisions</b>	Environmental Conservation District	No	No	No	-----



## Future Land Use Plans

Future land use is a vision of how each community wants to develop over the planning horizon, usually 20 years. Future land use plans typically consist of a map that displays future land use areas and accompanying text describing compatible uses in each land use area. The following tables describe future land use categories for each community.

### Township of Presque Isle

The Presque Isle Township Planning Commission developed a future land use plan with assistance from a professional planning consultant and input from the Township Board and the Zoning Administrator. Recommendations for future land use were based on an analysis of several factors including existing land use patterns, social and economic characteristics, environmental conditions, available community services and facilities, existing land division patterns, property ownership, existing zoning, community goals and objectives. The future land use plan identifies locations for eight different land use classifications, listed in **Table 5.3**.

<b>Table 5.3 Presque Isle Township Future Land Use Categories</b>	
Categories	Descriptions
Conservation	Properties in this category include the Warren Creek wetland area in Sections 16, 17, & 18 in the southern half of the township; a large wetland area Section 21 south of Rayburn Highway; and Section 17 at North Bay, in the northern half of the Township, including state-owned property west of Grand Lake; Rockport Property; Grand Lake DNR boat launch site; Besser Bell, Besser Natural Area and North Albany Point.
Low density residential	This category is generally equivalent to the "Forest/Recreation" district, and includes open spaces in the Presque Isle Harbor Association. Parcels average 40 acres in size. Primarily designed to accommodate single family units on large parcels, but agriculture & forestry related activities may also occur.
Medium density residential	Similar to the "R-1 Rural Residential" district, with single family dwellings on large lots. Community uses such as parks and churches may also be allowed.
High density residential	Corresponds to "R-2 Single Family Residential" district. Primary land use is single family dwellings on small lots are the primary land use. Uses such as churches, golf courses, non-commercial recreation camps & private lodges may be allowed if designed to be compatible with residential setting. Includes Presque Isle Harbor Association lots, subdivided areas adjacent to Grand Lake, Long Lake, Lake Esau, Lotus Pond, Bell Bay and Presque Isle Peninsula.
Multiple family residential	An area in Section 4 east of Grand Lake Road and a half mile south of Lotus Pond has been designated for future development of structures in this category.
Neighborhood center	This category's primary use will be small scale commercial enterprises concentrated into neighborhood centers where a mix of residential & commercial uses could occur. Includes existing center in downtown Presque Isle on the east side of Grand Lake and future center near the Township Hall at the Grand Lake Road/Rayburn junction.
Marina center	Similar to a neighborhood center, except oriented to businesses for tourists, boaters and seasonal visitors. The area adjacent to the MDNR boat harbor and parcels located across East Grand Lake Road from the harbor are recommended for this use.
Extractive mining	Includes quarry operations at Lafarge (Stoneport). It is recommended that quarry buffer be maintained. No need for quarry expansion is anticipated, other than land already zoned for that purpose.

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Source: Presque Isle Comprehensive Plan, 2004 Update

### Township of Krakow

A future land use plan was developed for Krakow Township as a part of the Krakow Township Comprehensive Plan. The plan was developed cooperatively by the Krakow Township Planning and Zoning Commission, the Township Board of Trustees, and Northeast Michigan Council of Governments (NEMCOG). A variety of factors relating to Krakow Township were analyzed in terms of existing conditions, and the goals, objectives and needs of the community. The following categories and concepts were developed to guide the future development of the Township.

<b>Table 5.4 Krakow Township Future Land Use Categories</b>	
Categories	Descriptions
Residential	Future residential development is encouraged to locate in existing subdivisions, which are capable of handling the increase in population projected to year 2010. Residential growth will cluster around Grand and Long Lakes. This clustering will hinder installation of water/sewer system and the ability to provide police & fire protection, but will ease the pressure on farmland. As development continues around the lakes, property owners may relocate on land in the countryside away from crowded lakefronts. These areas of low-density housing will occur along the townships main roads.
Commercial and Industrial	Most commercial businesses are located along or close by US 23, between Co. Highway 638 and the eastern township boundary, and this function will be retained and enhanced in the future land use plan. The Planning Commission would like future development to occur along US 23, and on property at the intersection of US 23 & Co. Highway 638. No commercial center is planned around Long Lake. Future industry should be confined to an industrial park away from residential areas
Agriculture	Agriculture in the township is limited, but important. Legal means to discourage residential development in farmland, and tax incentives may remove some pressures to develop. The land was designated agricultural mainly because of its soil characteristics.
Recreation and Open Space	Current park facilities & state forestland were assumed to remain in their present use. The township would like to add three public access sites on Grand Lake and one on Long Lake in the future
Transportation and Utilities	The planning commission would like to increase commercial bus line transportation in the future for use by area retirees, with regularly scheduled stops at a designated commercial business within Krakow Township. Privately owned facilities and services were assumed to keep up with increasing demand. A public water/sewer system around Grand and Long Lakes is a long-range future possibility.
Source: Krakow Township Master Plan, 1996	

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### County of Presque Isle

Future Land Use recommendations were drafted as a component of the Presque Isle County Comprehensive Plan. The Comprehensive Plan was developed for the Presque Isle County Planning Commission by the professional planning consultant firm of Wade-Trim and Northeast Michigan Council of Governments (NEMCOG), with assistance from County staff at the Michigan State University Extension office and the Presque Isle County Development Commission. The purpose of the future land use plan is to describe the County's desired future land use pattern. Important land use issues explored by the Planning Commission include:

- Maintaining and strengthening the rural character of Presque Isle County by conserving forestland, open space, and farmland.
- The need for small scale commercial and light industrial uses which enhance employment opportunities.
- The increased demand for additional land for residential development, distinct from areas intended for continuing agricultural and forestry use.
- The importance of providing careful review where new development will impact existing land uses and the natural environment.

The future land use plan for Presque Isle County identified locations for seven land use classifications, listed in **Table 5.5** below.

Categories	Descriptions
Low Density Residential	Land in this category contains areas subdivided at a density of two or fewer residential lots per acre. Single-family dwellings are the primary use in this category. Duplexes, parks, institutional use (churches, libraries, schools, etc.) and recreational uses when compatible with the residential setting. Cluster/open space residential developments are encouraged where soil and other environmental conditions are suitable.
Medium Density Residential	Uses in this category are similar to the Low Density Residential category, except that it would also allow for multiple-family dwellings, vacation resorts and professional offices. Land is generally subdivided at a density of not more than four residential lots/acre.
Huron Beach/Black Lake Cottage Residential	In these areas lots were subdivided before zoning regulations were in place, and lots were divided at a density of five or more per acre. Historically, these units were used for vacation/seasonal use, but over time, some have been upgraded to year-round residences. Often adjacent lots are combined into one, older cottages are demolished, and a larger unit is constructed. However, sometimes a large unit is built on one small lot, stressing wells & septic systems, and failing to meet required zoning setbacks. When two or more adjacent lots are under the same ownership, the owner should be required to combine the lots into one for building purposes.
Community Center	Community Centers are unincorporated areas that provide a concentration of residential, commercial & institutional uses in a small community setting. (Examples: Ocqueoc, Metz and Hawks) Community Centers may contain residential neighborhoods, convenience shopping, services & community facilities, and a variety of housing opportunities. May also support social and civic functions such as government offices, recreation facilities, churches, cemeteries, personal services and retail trade. In some cases low impact industrial uses may be allowed. Community Centers should be pedestrian friendly and regulations should allow for re-use of existing structures
Industrial/Extractive	Included in this category is an existing operation where mining is expected to expand in the future. A gravel mining property is also included, but this site should be

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	<p>encouraged for redevelopment. Two small lakes on the site are results of mining operations. Several other smaller gravel pits are also included in this category, as well as existing manufacturing operations. Accessibility to highway and public services/utilities may be required for industrial uses. The County does not provide some needed infrastructure, and therefore should direct future industrial development needing these services to the planned industrial parks in Rogers City and Onaway. Presque Isle County should support (with local community involvement) the expansion of existing &amp; development of new industries where adequate services and utilities exist (or the developer is willing to install those needed.)</p>
Agricultural	<p>Agriculture is an important component of the County's economy. Agricultural areas on the future land use map generally correspond to areas where soils are suitable for farming and where land is currently zoned for agricultural purposes. Appropriate uses in this future land use category include: crop production, the raising of livestock and poultry, orchards, plant nurseries, Christmas tree farms, farm dwellings and farm buildings. Uses such as livestock auction yards, slaughter houses, intensive animal feeding operations and forestry related industries may be permitted under the special approval process. Single-family non-farm dwellings are anticipated.</p>
Forest/ Recreation	<p>This category includes areas where recreation and management/production of timber are the predominant land uses. Includes privately owned forestland, State land and some federal land. It is likely that public lands will not change in the near future and that only a small portion will convert to private ownership. Outdoor recreations such as hunting, fishing, hiking, biking, and similar activities are popular uses. Campgrounds, trails, hunting camps and resorts can be included in this category. Forest industries such as logging and lumber production are important to the County's economy. Petroleum/natural gas exploration is expected to continue, and processing facilities may be allowed under the special approval process. Development of single-family units is expected to continue in these areas.</p>
<p>Source: Presque Isle County Master Plan November 10,2004</p>	

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Township of Alpena

<b>Table 5.6 Township of Alpena Future Land Use Categories</b>	
Categories	Descriptions
Environmental Conservation	This category includes lands that were identified as having unique or fragile environmental characteristics and that are intended to be protected from potential development.
Forest/Recreation	This designation is used for lands that have either wetland conditions or rock formations at or near the ground surface. This designation is intended to preserve open and natural characteristics of the area and provide extensive hunting and recreational lands as well as provide areas for timber supply. It is anticipated that this area could accommodate dispersed residential development on large parcels given the proper conditions exist for private wells and septic systems.
Agricultural	The agricultural designation is based on the soil capability of the area and is intended to preserve good farm soils for productive agricultural activities.
Waterfront Residential	Much existing residential development has occurred on shorelines and waterways. This designation is intended to identify areas that need special residential development standards necessary to protect water resources from specific and typical development problems found in waterfront areas.
Single Family Residential	Single Family Residential is designed to accommodate single family dwellings on a range of lot sizes. Community uses such as parks, churches, schools, libraries, cemeteries, golf courses, and child care facilities may also be allowed in the area is designed to be compatible with the residential setting.
Mixed Residential	Generally includes areas currently zoned as "R-3 Mixed Residential District" where uses include those in the single family residential as well as multiple family dwellings, elderly housing, long term care facilities, hospitals and similar uses.
Commercial	The primary areas designated for commercial development are the U.S. 23 South corridor, the U.S. 23 North corridor to Bradbury Road and the M-32 corridor.
Industrial	Two primary areas are designated for industrial use. More intensive industrial uses are intended to be located east of U.S. 23 North, along Hamilton and Wessel Road. Lighter industrial uses and transportation related uses are intended to be located on the west side between M-32 and the Thunder Bay River. Two other areas designated for industrial uses are south of M-32 near the Township western boundary and a mile long corridor along the rail lines and Piper Road, northeast of Devil's Lake.
Source: Township of Alpena Master Plan, August 9, 2004	

Future Land Use for the municipalities included in the Grand Lake Watershed draw on information such as existing land use, current zoning ordinances, water resources, geology, soils and/or septic constraints and goals defined for each municipality.

# Water Quality Summary

## Designated Uses

The Grand Lake Watershed currently has five designated uses that are threatened:

- Warm and Cold Water Fisheries
- Aquatic Life and Wildlife
- Recreation Total/Partial Body Contact
- Navigation
- Public Water Supply

Two designated uses, agricultural water supply and industrial water supply, were determined not threatened at this time. The following provides a Water Quality Summary for the five threatened designated uses.

### Warm and Cold Water Fisheries

None of the streams or creeks in the Grand Lake Watershed are designated coldwater trout streams. However, the Grand Lake Pike Marsh is a fertile spawning ground for the pike population. The watershed's warm water fisheries produce abundant pan fish, and walleye, pike and a few perch may be found in several tributaries and outlets. Unfortunately, increased sediment, nutrients, bacteria, oil/grease, and heavy metals have threatened this use. Sediments were identified as having the most harmful effect on the fisheries. An over abundance of sediments in lakes and streams may block fish gills, destroy essential spawning habitat and reduce the amount of light available for healthy plant growth. Public access sites are identified as being the most significant sources of sediment, however land development, road/stream crossings and streambank erosion were also found to contribute significant amounts of sediment to the river system.

Nutrients ranked second as the pollutant most challenging to the health of the watershed's fisheries. Wastewater, residential lawns and waterfowl were deemed the most significant sources of nutrients and bacteria. Heavy metals/organic compounds are also considered a threat to the watershed's warm water fisheries.

### Indigenous Aquatic and Wildlife

Sediment, heavy metals/organic compounds, and pesticides/herbicides are currently threatening aquatic life and habitat. Sediment affects aquatic life in the same way it affects fisheries; by clogging gills and decreasing spawning habitats. Heavy metals/organic compounds such as oil, grease and other toxic substances, as well as herbicides and pesticides can affect the life cycles of aquatic species by decreasing immunity and reproductive viability and, in high enough concentrations, cause death.

Sources of sediment include road/stream crossings, streambank erosion, stormwater runoff, land development practices and lake and river access sites. Sources of heavy metals/organic compounds include stormwater runoff, sites of environmental contamination and road/stream crossings. Common pollutants such as vehicle fluids (antifreeze, oil, grease, gasoline), pesticides,

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fertilizers, cleaners and paint products can be carried directly to the lake via storm drains, or can be washed into the lake across well-manicured lawns.

### Recreation Total/Partial Body Contact

Recreation was perceived as threatened by increased bacteria in the Grand Lake Watershed. High levels of bacteria can make swimming, canoeing, fishing and other activities, where individuals come in contact with the water, harmful. Although this has not been documented in the watershed in recent years, preventive measures need to be established to protect this designated use. The sources for bacteria include septic systems, waterfowl and stormwater discharge.

Improperly sited, designed, or maintained septic systems around the lake can allow bacteria to enter the waterways. Increased riparian development requires additional septic systems to be constructed. Also, many seasonal homes are being converted into year-round residences and the size or condition of the septic system may not be adequate to serve the increased use. Proper function of septic systems is imperative to reducing the amount of bacteria entering the water bodies.

### Navigation

Sedimentation and invasive species have both been found to be detrimental to navigational use in the Grand Lake Watershed. Sedimentation is the process of "filling in" of a lake or stream with particles of matter such as sand and gravel. An increased rate of sedimentation is currently threatening navigation in areas of the watershed. Known sources of sediment include road/stream crossings, streambank erosion, and stormwater runoff. Other sources include land development practices and lake and river access sites.

Sedimentation at road/stream crossings is often a result of short culverts, steep embankments, sand and gravel surfaces and inadequate diversion outlet. Public access sites located at road stream crossings need to have adequate measures in place in order to prevent erosion from foot traffic.

Streambank erosion, another factor in the sedimentation process, may be caused by human impact, lack of vegetation along the bank and natural hydrologic conditions. Additionally, inadequate stormwater management can lead to the discharge of sediments into the water bodies. Various harmful pollutants including heavy metals, toxic substances and pesticides, which threaten other designated uses, are often attached to sediment particles.

One of the definitions of pollution, according to the American Heritage Dictionary of the English Language is "to make less suitable for an activity, especially by the introduction of unwanted factors". Invasive species, a category not generally considered a pollutant, certainly fit this description. Certain non-native species, such as Eurasian Watermilfoil and Hydrilla can make navigation difficult, or even impossible. Once introduced to a water body these species can spread rapidly, forming dense mats of vegetation that not only hamper navigation, but deprive native aquatic plants and animals access to sunlight. As the plant matter dies and sinks to the bottom of a lake it decomposes and in the process depletes the oxygen supply, further degrading habitat for native species. Other invasive aquatic species, such as zebra mussels, spiny water flea, and round goby, compete with native species for food and habitat, and degrade the water bodies for recreational activities such as fishing and swimming.

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### Public Water Supply

The Environmental Protection Agency (EPA) is a federal agency that works closely with other federal agencies, state and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. The Department of Environmental Quality (DEQ) has primary enforcement authority in Michigan for the Federal Safe Drinking Water Act under the Michigan Safe Drinking Water Act. The DEQ has regulatory oversight for all public water supplies including approximately 1,500 community and 11,000 non-community water supplies. The program also regulates drinking water well drilling for approximately 25,000 new domestic wells drilled each year. Michigan has over 1.12 million households served by private wells, more than any other state. In addition to its regulatory activities, the DEQ investigates drinking water well contamination, and oversees remedial activities at sites of groundwater contamination affecting drinking water wells.

Information concerning water systems in Michigan is maintained by the MIDEQ, and can be found on the EPA's *Safe Drinking Water Information Site*. The records at this site go back to 1993. For violations prior to 1993, interested parties may contact the operators of the water system in question, contact the State of Michigan, or file a Freedom of Information Act (FOIA) request.

### **Drinking Water Quality in the Grand Lake Watershed**

Water quality data for the Grand Lake Watershed was analyzed and is briefly summarized below. Although many of the wells listed in the summary are actually located outside the watershed, data from these sites were included to provide an overview of the regions public water supply.

The EPA divides drinking water wells into four classes:

#### Private Wells

If drinking water comes from a private well, the owner is responsible for the water's safety. The EPA rules do not apply to private wells, but the agency *recommends* that well owners have their water tested annually. For a list of certified commercial laboratories that test drinking water contact the State Certification Officer at:

Department of Environmental Quality  
3423 N. Martin Luther King B  
P.O. Box 30195  
Lansing, MI 48909  
(517) 335-8812

The majority of residents in the Grand Lake Watershed receive their water from private wells. All of these wells receive their water supply from ground water aquifers.

#### Community Water Systems

Community water systems serve the population year-round, such as in private residences or businesses. There is only one community water system active in the Grand Lake Watershed, the Presque Isle Harbor Water Company in Presque Isle Township. This water system is, as with all of the community water systems in the watershed, supplied by groundwater. The Presque Isle Harbor Water Company supplies drinking water for 488 people, and has had no significant monitoring, reporting or health-based violations.



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### Non-Transient Non-Community Water Systems

Non-transient water systems serve the same population, but not year-round (for example, schools that have their own water system). There are four such water systems located in the watershed, serving a combined population of 230. None of the non-transient, non-community water systems in the watershed have received health violation notices within the last ten years.

### Transient Non-Community Water Systems

Transient non-community water systems are systems that do not consistently serve the same population. Rest stops, campgrounds, gas stations, motels and convenience type stores not hooked into a community water supply would be included in this category. Most of the wells in the watershed that are not considered private wells fall into this group. Twenty-three such wells are found in the watershed, and all are supplied by ground water. Thousands of people use water from the transient non-community water systems of the watershed region each year. Four of these water systems were cited within the last ten years for the presence of coli form bacteria; two systems were cited two or more times during this period, for a total of eight violations. In all instances, compliance to the Safe Drinking Water Act was achieved in a timely manner.

## Goals, Strategies and Action Items

The final component to developing the watershed management plan is to draft goals, strategies and action items. The basis of this long range effort is to use a four pronged approach of education, technical assistance, regulation, and acquisition/conservation easements. Previous chapters of this plan provided information on existing conditions such as soils, cover types, natural features and geology; water resources; status of planning and zoning; field inventories such as shoreline conditions, erosion sites and road-stream crossings; and water quality summary. The Grand Lake - Coastal Watershed Plan steering committee identified goals and strategies, prioritized strategies and developed action items associated with each strategy.

Factors that need to be taken into consideration when developing watershed action items include the impact to the watershed, cost of implementation, degree of cooperation/participation expected from the community or local government, community support, and possible tie-in with local organizations or groups that may be working on similar projects.

### **Goal 1: Establish Responsible Land-Use Practices**

#### **Strategy 1: Use a collaborative approach to protecting, managing natural systems by forming partnerships with landowners, conservation organizations, businesses, local units of government and public agencies**

*Action Items:*

- Form a subcommittee responsible for gathering information on local natural resource activities and issues affecting the watershed for the purpose of finding ways to pool resources between groups and promoting cooperative watershed protection projects and programs
- Encourage local organizations, businesses, government agencies, educators and private citizens to become active participants in natural resource protection through volunteerism.

#### **Strategy 2: Promote a community directed approach to land use management for the reduction of nonpoint source pollution derived from changing land use patterns within the watershed**

*Action Items:*

- Develop and assemble educational packets that cover such topics as septic maintenance, developing and maintaining greenbelts, proper fertilizer application, etc.) to distribute to riparian landowners. For example, Michigan Department of Agriculture has published a bulletin titled, "Managing Shoreline Property to Protect Water Quality."
- Promote responsible use of access sites through signs encouraging use of designated trails, stairs when available, and reducing wake speeds.
- Develop informational pamphlets that encourage responsible use at access sites, distribute through canoe liveries, boat/ORV dealerships or rentals and in parking areas.

**Strategy 3: Develop planning & zoning strategies that recognize the land's environmental constraints; consider level of infrastructure available/needed; support concept of sustainable development.**

*Action Items:*

- Hold a "Filling the Gaps" seminar for local officials in Presque Isle, Krakow, and Alpena Townships to provide information on local government's important role in environmental protection.
- Distribute to planning commissions: handouts and model ordinance language covering special areas overlay zones, environmental assessment requirements, fees for professional reviews, sensitive areas protection, PUD/cluster development, conservation cluster residential development, site plan review, shoreline protection provisions, recommended setback distances, stormwater management guidelines, greenbelt provision language, groundwater protection standards and coordinated permit review and approval procedures would be provided.
- Work with local government on the adoption of guidelines & regulations that provide for the protection of the water resources.
- Educate the public and local government on stormwater issues through the PowerPoint Presentation "The Connection between Land Use Practices and Water Quality"
- Local planning and zoning are the primary tools communities can use to encourage the use of lands in accordance with their character and adaptability, to limit the improper use of land, and to conserve natural resources and energy. Amending the zoning ordinance to streamline the process for conservation cluster residential development will slow fragmentation of the large tract forest resources.
- 

**Strategy 4: Draft report "The Connection between Water Quality and the Local Economy"**

*Action Items:*

- Research tax base, property values, recreation value, include data from studies done on similar lakes/watersheds; correlate quality of water to economic indicators. Note, a study in Ohio has shown a correlation between water quality and property values, i.e. higher quality water, higher property values.
- Distribute report to property owners, real estate agents, and local planning and zoning commissions.

**Strategy 5: Work with local organizations to take an active role in protecting the long term ecological and biological integrity of the watershed.**

*Action Items:*

- Encourage the Grand Lake Association to take action on implementing the watershed plan. This would involve expanding the focus of the organization and may require the creation of a water quality working group or subcommittee.
- Encourage Lake Esau riparian and adjacent property owners to consider creation of an association to deal with their unique issues and to provide representation on the Grand Lake Watershed Steering Committee.
- Encourage the Presque Isle Harbor Association to embrace the recommendations of the plan and identify an existing committee to work on implementing the plan.

## **Goal 2: Complete a comprehensive assessment of Grand Lake and lakes in the coastal watersheds**

**Strategy 1: Develop a plan to assess such indicators of lake water quality as DO, condition of biological communities, temperature, conductivity, pH, flow, trophic state, nutrients, land cover types, types & quality of habitat, presence of invasive species, lake levels, and presence of heavy metals and chemicals.**

*Action Items:*

- Develop comprehensive list of monitoring activities to determine present conditions in Grand Lake
- Draft plan for data management & reporting, develop Quality Assurance Project Plan (QAPP)
- Pursue funding for assessment and follow-up surveys
- Establish a "lake level working group" to address long term lake level issues. Working group should have representatives from the township government, county government, local organizations and agencies, landowners and LaFarge Corporation, Quile Corporation, Michigan Department of Environmental Quality, and other appropriate state and federal agencies.
- Seek funding and conduct a hydro-geological study to assess long term lake level issues.
- Develop a proactive lake level plan for providing long term supplemental water sources for pumping requirements to maintain lake levels in anticipation of the quarry ceasing to pump dewatering outfalls to Lake Esau and Lotus Pond.
- Educate the decision makers and community about the issues and planning processes for cooperation and help in eventual solution of the issues.
- Develop a support structure to support the township officials in developing solutions and viable forward plans.

## **Goal 3: Develop Educational and Technical Assistance Programs for Citizens of the Watershed**

**Strategy 1: Involve and educate public on actions they can take to conserve ecological & biological integrity of coastal watersheds, water resources and critical resource base.**

*Action Items:*

- Sponsor local workshops that focus on water quality, woodlands, wetlands, threatened and endangered species, and wildlife habitat. Workshops should also have a field trip component.
- Distribute educational materials to waterfront homeowners. Where possible use existing brochures and educational materials. Information should include importance of septic maintenance, greenbelts, water friendly lawn maintenance, use of native plants, benefits of fluctuating lake levels, and being a Great Lakes Steward.

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- Draft brochures describing installation, maintenance and benefits of greenbelts, include lists of native plants; make available to riparian landowners by distribution to lake associations, local organizations, at local businesses and in educational packets.
- Develop educational programs for developers and real estate companies. Educational efforts should provide information on topics such as protecting water quality, wetlands, threatened and endangered species, and wildlife habitat. Workshops should also have a field trip component.
- Create and distribute a watershed specific educational brochure "Protect Your Watershed"
- Plan and implement a "Coastal Watershed Resource Day", encourage participation by students in area schools, community members and local government
- Develop water quality information packets for distribution to waterfront property owners and for realtors to dispense to new riparian property owners.
- Continue to locate and preserve where possible the historic and archeological resources within the land and underwater areas.
- Develop an educational component to increase public awareness about causes of and methods to prevent the spread of invasive species.
- First identify and then provide information on the protection of habitat and ecological corridors that support wildlife, particularly threatened and/or endangered species.
- Identify and encourage the preservation and management of plant communities that provide critical habitat for resident and migratory wildlife species.
- Support continued efforts to document presence of threatened and endangered species and communities and develop strategies to conserve those finite resources.
- Encourage the use of native plants for reforestation, wildlife habitat, street and neighborhood trees, landscaping, parks and roadside corridors.

### Strategy 2: Develop a riparian landowner assistance program.

#### *Action Items:*

- Draft brochures describing installation, maintenance and benefits of greenbelts, include lists of native plants; make available to riparian landowners by distribution to lake associations, local organizations and at local businesses.
- Establish a program to provide technical assistance and develop "Lakescape" plans for homeowner. Plans would address enhancement of greenbelts, activities to improve wildlife habitat, protection of water quality, "water friendly" lawn maintenance, and protection of threatened and endangered species.
- Demonstration Projects – Identify and work with interested homeowners to complete projects for greenbelt re-establishment, wildlife habitat improvement, and erosion control. These demonstration projects could be funded with cost-sharing grants. With landowner permission, sites could be used for outdoor workshops. To promote the successes, draft article for local papers about the model sites and benefits of greenbelts.
- Incorporate greenbelt success stories into PowerPoint
- All lakescape plantings and erosion projects should use native vegetation and organic erosion control structures.

**Strategy 3: Educate public as to the importance of using native vegetation when restoring greenbelts, improving wildlife habitat and reforestation after timber harvests.**

*Action Items:*

- Include pamphlets in educational packets listing native plants for landscaping, seed and live plant sources and the benefits of using native vegetation. Also provide information on non-native, invasive species and how to prevent their spread.

**Strategy 4: Establish a program to preserve priority conservation areas through Voluntary Conservation, Conservation Easements, Purchase of Development Rights (PDR) and Fee Simple Purchase.**

*Action Items:*

- Develop criteria for determining what constitutes a priority conservation areas and identify priority parcels within the watershed. Develop priority parcel map and landowner database
- Assemble an information packet containing information on the various voluntary land protection techniques; disseminate packet to priority landowners.
- Hold workshops to inform landowners on voluntary land protection.
- Seek funding from public and private sources to support this effort.
- Contact and meet with at least ten priority property owners for consideration of conservation easement, and/or land donation.

**Strategy 5: Develop large tract landowner education and technical assistance program.**

*Action Items:*

- Establish a targeted landowner assistance program. There are a number of existing landowner assistance programs through the DNR, Conservation District, NRCS, Forest Stewardship, USFWS, and FLEP. This plan recommends working cooperatively with agencies to secure funding and to provide technical assistance to landowners.
- Compile a listing of targeted landowners through the Presque Isle County Equalization Office. The targeted landowner mailing list will be used for a direct mailing to offer technical assistance and develop resource stewardship plans for interested landowners in the Grand Lake-Coastal Watersheds planning area.
- Along with development of resource stewardship plans, technical assistance should be provided to assist landowners in implementing their plan and where appropriate, applying for resource project cost-sharing money.
- Distribute educational materials to landowners. Where possible use existing brochures and educational materials. Information should include forest management, timber harvesting, wildlife, fisheries, threatened and endangered species, invasive species, tree planting, Best Management Practices (BMP's), and cost sharing programs.
- Hold forest and wildlife management workshops in the community. The landowner mailing list developed for the distribution of educational materials should be used to send a personal invitation to key landowners. The workshops should be advertised to draw in landowners from other areas.
- Organize a field tour to highlight environmentally sensitive sites, special plant communities, degraded sites and forest management and wildlife management

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activities.

- Select landowners to develop a demonstration project to promote proper forest management and/or habitat preservation.

### **Strategy 6: Develop a backyard conservation education and technical assistance program for small lot landowners including residential and commercial owners.**

#### *Action Items:*

- Establish a targeted landowner assistance program.
- Compile a listing of targeted landowners through the Presque Isle County Equalization Office. The targeted landowner mailing list will be used for a direct mailing to offer technical assistance and develop backyard conservation plans for interested landowners in the Grand Lake-Coastal Watersheds planning area.
- Distribute educational materials to landowners. Where possible use existing brochures and educational materials. Information should include shade tree management, wildlife, fisheries, wildlife corridors, threatened and endangered species, invasive species, tree planting, and Best Management Practices (BMP's).
- Hold backyard conservation workshops in the community that focus on the approach of "Landscaping for Wildlife." The landowner mailing list developed for the distribution of educational materials should be used to send a personal invitation to landowners. The workshops should be advertised to draw in landowners from other areas.
- Organize a field tour to highlight environmentally sensitive sites, special plant communities, degraded sites and forest management and wildlife management activities.
- Select landowners to develop a demonstration project to promote backyard conservation and/or habitat preservation.
- Along with development of resource stewardship plans, technical assistance should be provided to assist landowners in implementing their plan.

### **Strategy 7: Develop and implement a school education program**

#### *Action Items:*

- Conduct a water resource curriculum review: review and compile existing instructional materials for elementary and secondary students that focus on water resources.
- With input from teachers, modify selected materials to make them more locally relevant (Place-based education).
- Partner with local groups, agencies to conduct a conference for teachers and students focusing on water resources and watershed management. Introduce strategies that promote inquiry-based teaching and learning, as well as place-based education that include local projects that involve the community (i.e., DTE's Freshwater Institute)
- Explore using Alpena Community College as a resource

**Goal 4: Reduce and prevent the amount of erosion and sediments entering water bodies.**

**Strategy 1: Reduce sedimentation from public and private access sites and parks.**

Action Items:

- Prioritize sites identified in the non-point source erosion survey.
- Develop erosion stabilization plans with construction design standards, materials and estimated costs.
- Obtain funding and stabilize sites.

**Strategy 2: Conduct intensive educational program to demonstrate lake-friendly methods of erosion control and minimize nutrient input.**

Action Items:

- Using existing educational materials, conduct a direct mailing to property owners.
- Conduct soil erosion workshop for contractors and landscapers to improve their practices with regard to new construction.
- Develop two or three bio-technical erosion control demonstration sites and conduct a public tour for property owners.

**Strategy 3: Implement BMPs at stream bank erosion sites.**

Action Items:

- Contact property owners of moderate and severe stream bank erosion sites.
- Develop a cost-share program to help implement BMPs.
- Develop designs for sites with willing property owners.
- Obtain funding and stabilize stream banks.

**Strategy 4: Reduce sedimentation from road/stream crossings by implementing best management practices.**

Action Items:

- At the present time one site has minor erosion problems, the bridge on Co. Hwy 638 at the outlet of Grand Lake. Combined with erosion problems at the dam itself, this plan recommends a project to address erosion and access at both sites.
- Determine appropriate treatment and develop engineering design.
- Obtain funding to implement BMPs.

**Goal 5: Reduce Amount of Chemical and Nutrient Runoff**

**Strategy 1: Educate landowners to identify & correct improperly sited, maintained or installed septic systems.**



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### Action Items:

- Work with District Health Department #4, local zoning departments, conservation organizations and local civic organizations to implement an education program.
- Distribute educational materials through communities and civic organizations.
- Develop and make presentations to local organizations.
- Organize workshops, and presentations in the watershed to educate landowners on proper maintenance of septic systems.
- Provide septic system information packets to real estate brokers for distribution to new owners.

### **Strategy 2: Institute a consistent, reliable water quality monitoring program in all lakes within the watershed planning area.**

#### Action Items:

- Initiate the volunteer lake monitoring by working with lake associations, and property associations.

### **Strategy 3: Enhance wastewater treatment by initiating a trial "Point of Sale" septic system inspection program & providing technical assistance and education to shoreline areas with known septic system problems.**

#### Action Items:

- Meet with local communities to discuss options for implementing a trial "Point of Sale" septic system inspection program septic system.
- Provide sample ordinance language and real life examples of communities in Northeast Michigan that have implemented such programs.

### **Strategy 4: Educate landowners on actions to reduce nutrient and chemical run-off inputs into surface water. Areas of concern include fertilizer use, pesticides and herbicides, leaf burning, soils erosion and greenbelts.**

#### Action Items:

- Develop and make presentations to local organizations.
- Develop and distribute educational materials through communities and civic organizations.
- Organize workshops, and presentations in the watershed to educate landowners.

## Conservation Planning Areas

The next step in this planning process is to identify conservation planning areas. Areas within the planning area with common ecological features such as riparian zones and forestlands, similar ownership types and patterns, have been grouped and mapped. Certain natural systems function across planning area boundaries and taking an ecosystem approach requires managing them across those political boundaries and areas.

### Conservation Planning Areas

Riparian Lands

Small Tract

Public/Recreation

Large Tract/Open Space

Quarry with buffers

This approach helps to focus implementation efforts within the watershed. Voluntary conservation supported by landowner education and technical assistance programs, combined with

community participation, regulations, conservation easements and fee simple purchase, form a comprehensive approach to an area-wide resource management and conservation program.

### Riparian Lands – Shorelines, Streambanks and Beaches

Waterfront properties along the Grand Lake, Lake Esau and other smaller inland lakes, streams and Lake Huron shoreline are included in this conservation planning area. Much of the privately owned lands have been developed and subdivided into smaller waterfront lots. These smaller, more densely developed waterfront lots warrant different approaches to voluntary conservation, education and water quality Best Management Practices (BMPs). If homeowners choose not to bring the city to the shore, waterfront development can occur without negatively impacting water quality and wildlife habitat

### Large Tracts/Open Space

Clearly one of the key assets of this area is the large tracts of forestlands. The large areas of uninterrupted forests provide important habitat for wildlife such as bear and bobcats. These large tracts of undeveloped forests in the watershed play an important role in protecting water quality in the lakes and streams. Slowing precipitation runoff results in clean water discharging into area streams and lakes. A healthy watershed equates to a healthy water system. Current owners have shown a commitment to maintaining the natural resources on their lands. These properties have been managed for recreational use and timber production. Given the large acreages and relative inaccessibility, some areas may not see humans for years and others are visited only during deer hunting season. Increasing values and associated property taxes are becoming more of a burden on large tract landowners. While present landowners' priorities tend towards maintaining properties for recreational purposes, long term views vary from preservation to development potential of these forested lands.

According to the MDNR pre-settlement maps, cedar swamps, pine forests and northern hardwood forests dominated the landscape prior to logging and land clearing. Logging activities over the last century have altered forest types. For example, clear-cutting and wildfires increased coverage of aspen and oak forests and decreased acreage of northern hardwoods, pine and hemlock forests. Studies have found coastal forests of spruce-fir-cedar and pine forests are important as spring time migratory stop over sites. Birds feed extensively on early hatching midges in the protected bays,

## Grand Lake - Coastal Watershed Plan

gaining energy to continue their flight northward. Forests provided cover and protections for the small birds.

### Public/Recreation Lands

The largest single landowner is the State of Michigan (13,995 acres). State lands include Thompson's Harbor State Park in the northwestern parts of the planning area. The state park is a day use facility with minimal amenities. There are no camping facilities or drinking water sources. The ownership provides over 8 miles of undeveloped rugged shoreline and many miles of walking trails. Excellent examples of cobble beaches, low dunes, fens, shallow ponds, marshes and forested wetlands can be found within the park. The other state ownership includes the Rockport properties in the southern part of the planning area. Rockport property offers sinkholes, nearly four miles of beaches, and an abandoned limestone quarry. The DNR will be initiating the development of Phase I Park Management Plans for these two properties in 2007. These plans will designate management zones and compatible uses within the parks. Other locally owned public lands and private parks (PIHA) are included in this conservation planning area. All of the lands provide protected natural lands and offer large areas for outdoor recreation.

### Small Tracts

Presque Isle Township is the fastest growing community in Presque Isle County. One half of the County's population growth between 1990 and 2000 was attributed to Presque Isle Township. A big player in the population growth is the Presque Isle Harbor Association development. Sound resource management activities, even on small lots, can have a positive impact on the environment. In other words, conservation starts in your backyard. Small lot residential and commercial development is included in this category.

### Quarry and Quarry Buffer

The quarry is a prominent feature in Presque Isle Township and the watershed planning area. The operation produces crushed limestone that is shipped to markets around the Great Lakes. It has an important positive impact on the local economy by providing needed jobs and tax revenues. Members of the steering committee have expressed concerns about potential impacts to lake levels as the operation continues to expand its footprint along with deepening the quarry. Substantial reduction in the size of watersheds and groundwater movement in fractured limestone aquifers are the basis of concerns.

### *Special Issue Areas*

#### Wetlands

Wetlands areas are commonly referred to as swamps, marshes and bogs. The non-forested wetland category includes lowland brush (tag alder and willow), wet meadows, aquatic vegetation, fens, bogs and marshes. There are a number of examples of coastal fens in the planning area. These very fragile and rare systems warrant extra protection from intrusive uses such as ORV's. Fens and shallow marl lakes are prime habitat for the Hines Emerald Dragonfly. The USF&WS is completing an investigation to designate critical habitat for the dragonfly. One of those areas includes portions of Thompson's Harbor State Park. Lowland forests include areas supporting lowland hardwoods and conifers, such as northern white cedar, black spruce, balsam fir, elm, red maple, ash and aspen species. Networks of wetlands receive surface water and subsurface water

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discharge, creating the streams and creeks which in turn flow into area lakes or directly into Lake Huron. These interconnected resources exemplify how activities distant from major water bodies can still have an impact on the water quality.

### Karst Geology

Bedrock is near the surface on the islands and in the northern part of the study area. Northern white cedar thrives on these shallow calcareous soils over limestone bedrock and is the common forest species on wet and dry sites. Limestone bedrock/karst geology greatly influences the surface drainage in the study area by impeding water percolation into the ground in some locations and by rapidly draining water through bedrock cracks at other sites. The bedrock cracks at the surface are called swallow holes. Large volumes of water can drain into these swallow holes entering the limestone bedrock aquifers of cracks and porous stone. Karst geology features are prominent in the watershed planning area. The Rockport property contains several sinkholes, one which is a small lake. Development on the shallow soils typically requires mounded septic systems. Water wells must be drilled into the bedrock sometimes several hundred feet to reach adequate quantity and quality of water. Development densities should be limited in areas where bedrock is at or near the surface.

### Lake Huron Beaches

The Lake Huron shoreline is defined by its peninsulas and bays. The bays have always played an important role in the history of human occupation. They were important fishing grounds for native people and early settlers. Today, the waters provide ample sport fishing opportunities. The bays have always provided critical fish habitat for feeding and spawning. Additionally, the waters and adjacent wetlands provide habitat for a wide variety of plants and animals. During cyclic low water periods, historically every 10 to 15 years, extensive areas of sand, mud, cobble stones and bedrock are exposed. Emergent wetlands vegetation expands out into the exposed bottomlands while woody plants such as northern white cedar and balsam poplar will expand outward from the forests edge onto dryer sites. When water levels again rise, the newly established vegetation is drowned and dies back. However, in the process these temporal wetlands provide habitat for land and water animals.

Property owners can undertake a wide variety of minor activities on Great Lakes bottomlands without any permits or oversight from the Corps or DEQ, including:

- Hand shoveling or manually raking dead fish, zebra mussel shells, trash, and dead vegetation (Note: wheel barrows and mechanized vehicles can be used to move these materials to uplands for disposal.)
- Manually burying debris such as dead fish and dead vegetation
- Building sand castles.
- Hand shoveling and raking wind blown sand from home sites
- Building bonfires
- Camping
- Beaching boats and seasonally storing ice shanties

In order to mechanically level sand, mechanically groom the top four inches (or more), construct a path by moving sand or gravel, or remove vegetation in Great Lakes bottomlands, landowners will need a permit from the Army Corps of Engineers (Corps) and from the Michigan Department of Environmental Quality (DEQ). See Appendix D - Great Lakes Shoreline Management and Beach Maintenance Permit Requirements for current information on activities requiring permits.

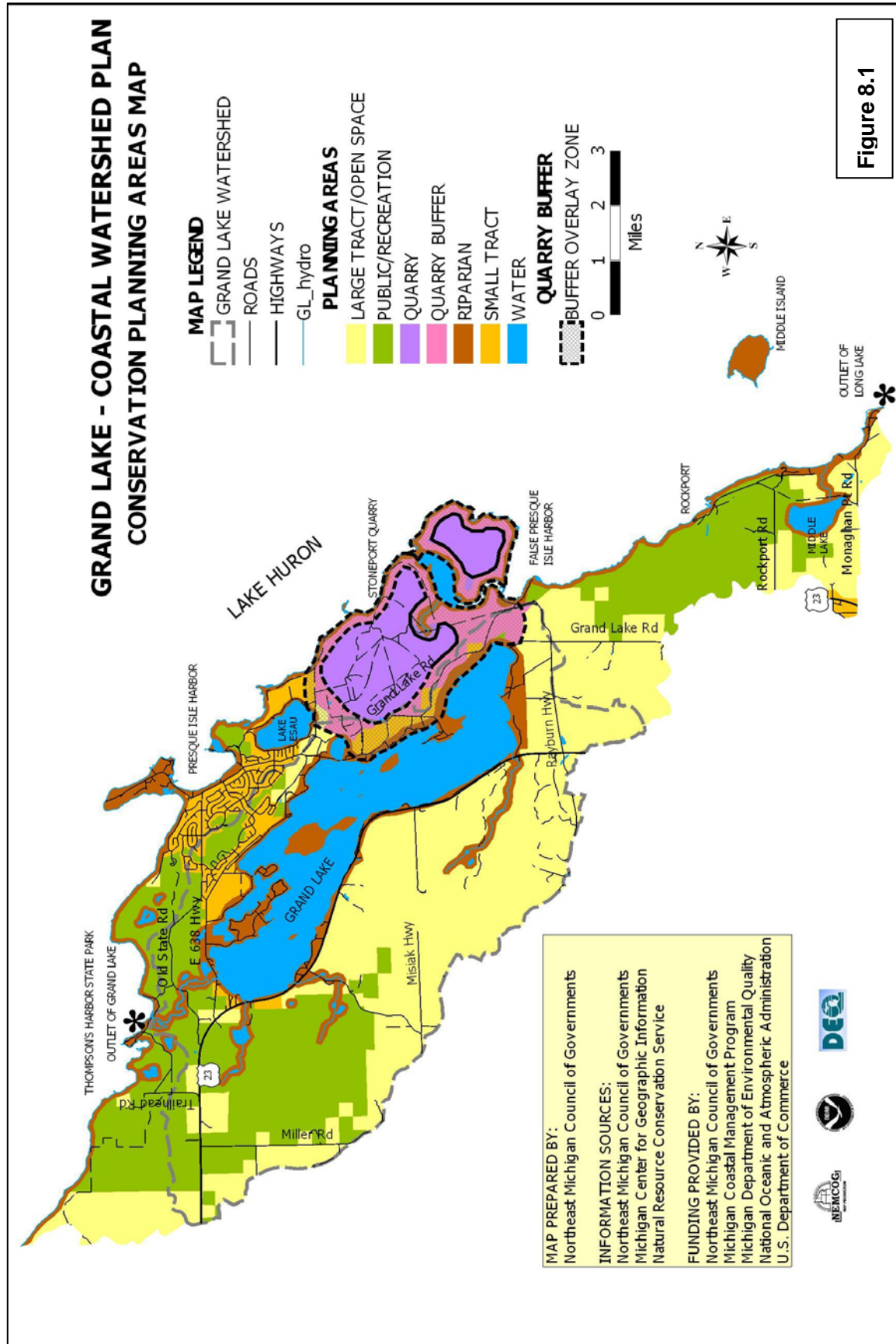
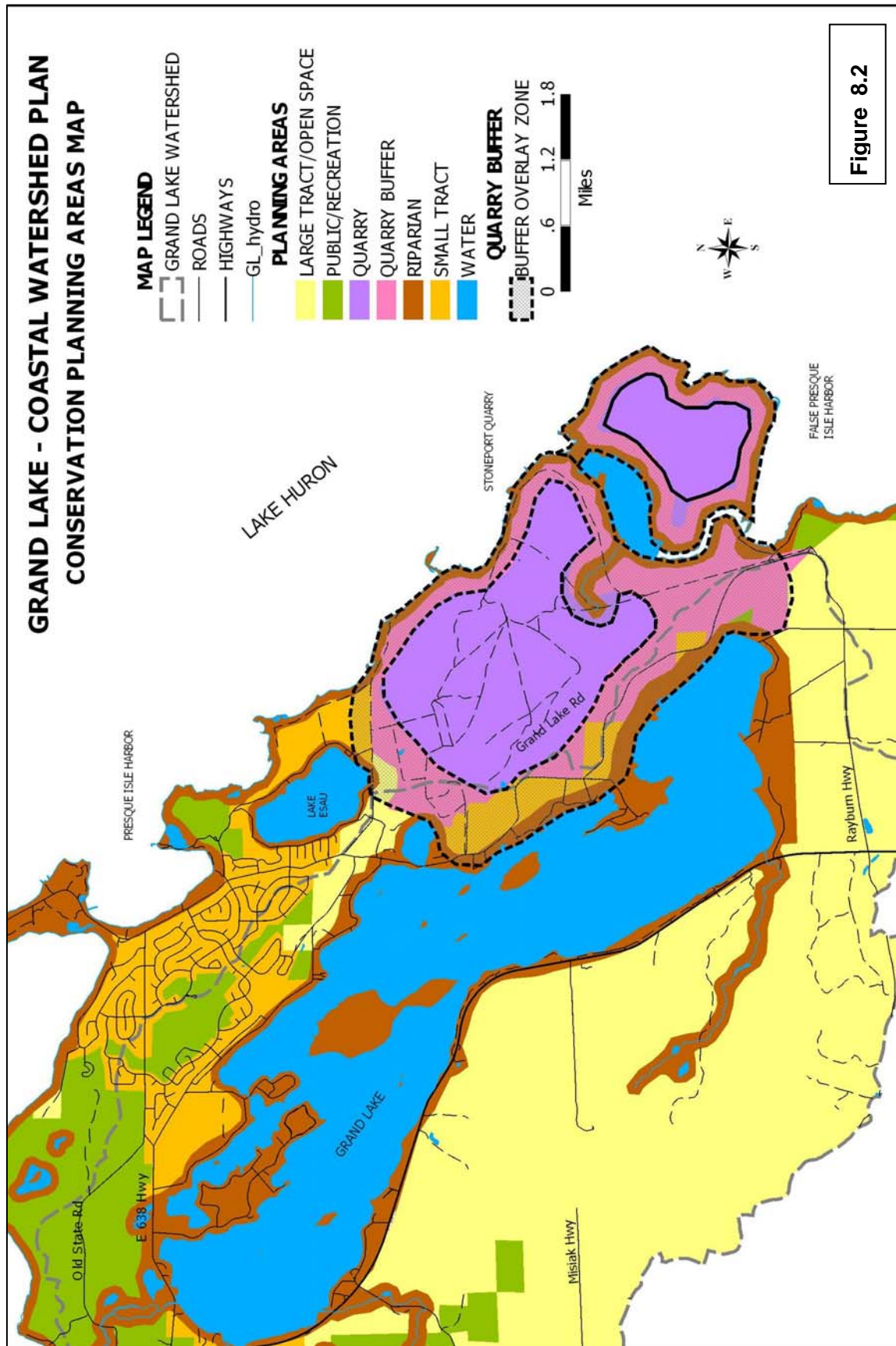


Figure 8.1



**Figure 8.2**

# Implementation

## Collaboration on Implementation

Teamwork is the key to achieving goals and strategies of this plan. Local government, agencies, organizations and landowners must work together to build partnerships that rely on each other's strengths and resources. The Watershed Steering Committee can be touted as a shining example of teamwork and has set the groundwork for building partnerships. Another example of partnerships can be found in watershed planning and management efforts in Northeastern Lower Peninsula of Michigan. NEMCOG, Huron Pines RC&D Council, County Conservation Districts, Natural Resource Conservation Service, Headwaters Land Conservancy, Michigan Department of Environmental Quality, Watershed Councils, local units of government and citizens have worked together to develop and implement a number of non-point source management plans.

Many organizations and agencies provide landowner technical assistance, education programs, regulate activity on land and water and offer incentives for long term preservation of critical areas. However, coordination of the existing multitude of options is lacking in the Grand Lake-Coastal watershed planning area, as well as the entire Northeastern Michigan coastal area. NEMCOG, as the regional planning agency for northeast Michigan, will continue to work towards implementing the watershed plan. NEMCOG will apply for grants to fund educational and technical assistance programs. However, to ultimately achieve desired outcomes recommended in the plan, local government, agencies and organizations must take an active role. This plan was developed as a blue print for preserving the resources of the Grand Lake - Coastal Watershed; to be used by any entity, public or private, to achieve this goal.

### List of the Players During Implementation Phase

Grand Lake Watershed Steering Committee  
Krakow Township  
Presque Isle Township  
Alpena Township  
Presque Isle County  
NEMCOG  
District Health Department #4  
Michigan Department of Natural Resources  
Michigan Department of Environmental Quality  
County Conservation Districts  
US Fish and Wildlife Service  
Huron Pines RC&D Council  
Natural Resource Conservation Service  
Great Lakes National Program Office of the EPA  
Headwaters Land Conservancy  
The Nature Conservancy  
Grand Lake Association  
Grand Lake Sportsman Club  
Presque Isle Community Men's Club and Presque Isle Women's Club  
Presque Isle Harbor Association  
Real estate agencies, local businesses and industries

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### Voluntary Conservation

The quality of the environment and the integrity of the ecosystem can, in large part, be attributed to the stewardship of landowners. The miles of undeveloped shoreline, undisturbed coastal wetlands and thousands of acres of forestland are present today because of the actions of the many landowners in the area. The best opportunity for long term conservation of the fragile and unique areas will be through voluntary conservation. The plan supports continued resource stewardship and recognizes the need to offer education and technical programs to assist landowners.

There are a number of existing programs that provide some level of technical assistance and resource education to landowners. Several of the agencies providing these services are: Michigan DNR, Huron Pines RC&D Council, Alpena and Presque Isle Conservation Districts, Natural Resource Conservation Service, NEMCOG, U.S. Fish and Wildlife Service. Services are provided on a walk-in basis or are project specific. A landowner targeting program that focuses on the watersheds would likely generate more interest than existing staffing and funding levels at agencies could accommodate. To implement the plan, additional funding will be necessary to support either existing staff or hire new staff to contact landowners, provide landowner assistance, conduct education programs, develop demonstration projects and coordinate with existing programs.

### Long Term Preservation

Organizations and agencies have programs designed to protect special areas either through fee simple purchase or conservation easements. Examples of these are Michigan Department of Environmental Quality Coastal Management Program, Michigan Natural Resource Trust Fund, Headwaters Land Conservancy and The Nature Conservancy. Headwaters Land Conservancy and the Nature Conservancy can lead efforts to work with landowners and units of governments to achieve long term protection of critical and sensitive areas through conservation easements and fee simple purchases. Publicly owned lands such as Thompson's Harbor State Park and Rockport offer some level of long term protection. Both of these properties are home to many threatened and endangered species, in addition to numerous unique natural communities and geological features.

### Regulation and Policies

Local, state and federal regulations and policies afford some level of protection. Local communities hold the first level of responsibility in protecting the unique resources of the area through their land use planning and zoning responsibilities. Community master plans recognize the need to limit development in sensitive natural resource areas. Zoning also limits development in areas less suitable for intensive development. It is hopeful resource information and recommendations in the plan will be considered when communities update their master plans and zoning ordinances. Communities can apply for funding from the Michigan Department of Environmental Quality Coastal Management Program to update their master plans and zoning ordinances to reflect resource friendly planning. Some examples may be reviewing waterfront zoning standards and greenbelts, incorporating special areas overlay zones, environmental assessment requirements, fees for professional reviews, sensitive areas protection, PUD/cluster development, conservation cluster residential development, site plan review standards, shoreline protection provisions, recommended setback distances, stormwater management guidelines,



## **Grand Lake - Coastal Watershed Plan**

greenbelt provision language, groundwater protection standards and coordinated permit review and approval procedures. Long term preservation can be achieved by communities adopting sustainable development and open-space conservation approaches in their planning and zoning.

One of the greatest challenges in the long haul is, watershed boundaries ignore political boundaries. Since the watershed planning area is under the jurisdiction of four autonomous planning and zoning entities (Alpena Township, Krakow, Presque Isle Townships and Presque Isle County) coordination and collaboration is critical. The watershed steering committee with representatives from these communities can play a key role in working towards collaboration and consistent planning and zoning across political boundaries. Again, there is an excellent opportunity for the four communities to join together and apply for funding to the Coastal Zone Management Program. The communities could develop common planning and zoning standards that will result in a holistic approach to conserving the ecological and biological integrity of the entire watershed planning area.

## **EPA's Nine Required Elements of a Watershed Plan**

The scope and funding of this project did not allow for the EPA's Nine Elements to be fully addressed. In order to maximize the potential for receiving funding for implementation, the plan should be examined and possibly expanded to incorporate all the elements. It will require additional funding to accomplish this task and for the plan to meet the EPA's criteria. Below are the Nine Elements:

Element 1: Identify causes and sources of pollutants that need to be controlled to achieve load reductions within the watershed. Sources that need to be controlled will be identified at sub-category level when appropriate (i.e. Agricultural operation: number of dairy, livestock, orchard, row crop, etc. operations that need upgrading as well as estimates of number of cattle per facility, acres of crops needing improved nutrient management). Estimates at this level of definition will be calculated for all causes and sources of pollutants affecting the watershed. Estimates of the load reductions expected for the management measures recommended for all sub-categories will also be calculated.

Element 2: A description of the Non-Point Source (NPS) management measures that will need to be implemented to achieve load reductions and to achieve the watershed goals listed in the watershed plan, maps and detailed descriptions of the critical areas, in which those measures will be developed.

Element 3: Estimates of the amounts of technical and financial assistance needed for the completion of each of the watershed goals will be calculated, along with associated costs such as copying, printing and mailings. Funding sources will be pursued, such as Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, US Fish and Wildlife grants, to assist in the transition and implementation of this plan. Information sources and authorities that will be relied on during the transition and implementation of this plan will be identified.

Element 4: An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing and implementing the NPS management measures that will be implemented.

Element 5: A detailed schedule for implementing the NPS management measures identified in this plan will be developed and submitted for approval during this transition phase.

Element 6: A description of interim measurable milestones, for determining whether NPS management measures or other control actions are being implemented, will be developed in anticipation of receiving possible implementation funding.

Element 7: Once the recommended NPS measures for controlling nonpoint pollution have been implemented, a meeting will be held with project partners to develop a set of criteria that can be used to determine whether the desired reductions are being achieved over time. If it is determined that progress has not been made, a set of criteria for determining whether the watershed plan needs to be revised will be developed.

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Element 8: A monitoring component to evaluate the effectiveness of implementation efforts over time, measured against the above-mentioned criteria, will be established during the transition phase of the watershed plan.

Element 9: Monitoring components to evaluate the effectiveness of the improvement measures recommended for the plan has been developed and are listed in the goals and strategies section of the watershed plan. A monitoring component to evaluate the effectiveness of implementation efforts over time, measured against the above-mentioned criteria, will be established during the transition phase of the watershed plan.

### Evaluating Success

In order to determine the overall effectiveness of the watershed management plan, an evaluation process is essential. An effective evaluation process will indicate whether watershed management efforts are successful. Implementation methods can be modified or improved as information gathered from evaluations is analyzed. A sound evaluation program will increase the likelihood of continued support from partnering agencies, community organizations and community members if accomplishments are well documented and made available to the public. Listed below are the evaluation methods for the Grand Lake-Coastal Watershed Initiative, as recommended in the DEQ Handbook: *Developing a Watershed Management Plan for Water Quality*.

- ◆ Physical water quality monitoring
- ◆ Chemical water quality monitoring
- ◆ Biological life measurements
- ◆ Photographic or visual evidence, before and after photos
- ◆ Documentation of site BMP's installed
- ◆ Pollutant loading measurements
- ◆ Stakeholder surveys to evaluate knowledge or change in behavior
- ◆ Focus group sessions to determine effectiveness of project activities

Detailed evaluation methods for each task are outlined above in the goals section. Several different evaluation methods were incorporated into the plan to accommodate the variety of strategies recommended for implementation. In order to document the installation of BMP's, before and after photos will be taken at road/stream crossings, streambank restoration sites, newly installed greenbelts and livestock crossings. Focus groups, interviews and surveys will be used when changing viewpoints and management strategies needed to be documented and structural BMP's were not recommended. A timeline for the completion of the evaluations is included in each recommendation table. **Table 9.1** below summarizes the evaluation process for the Grand Lake-Coastal Watershed Initiative: Phase Two.

Grand Lake - Coastal Watershed Plan

<b>Table 9.1 Evaluation Process</b>				
<b>Evaluation Method</b>	<b>Watershed Concern</b>	<b>Property Measured</b>	<b>Characteristics of Method</b>	<b>Strategy</b>
Public Surveys	Shoreline/Streambank Protection; Information/Education Program	Knowledge & Awareness, Current Practices, Concerns	Moderate cost; Low response rate	Before & after implementation. Distribute through mailings, displays
Written Evaluations	Land Use Program; Voluntary Land Protection; Information/Education	Knowledge & Awareness	Good response rate; Low cost	Brief evaluations completed on site after event; questions on strengths/weaknesses of program, suggestions for improvement
Field Surveys	Streambank Protection; Agricultural & Road/Stream Crossing Programs	Extent of buffers, flow, erosion, impacts & trends	Time consuming, Moderate cost, Provides current & detailed data	Record observations on inventory sheets, Take Before & After photos, Analyze data
Documentation	All Projects & Programs	Participation; aesthetics; pre-& post-conditions	Low cost; Easy; Provides quick review of progress	Before & after photos, trend tables, database
Communication Records	All Projects & Programs	Public concerns; problem areas; level of community interest/participation	Information is subjective; Limited number of contacts	Keep records of phone calls, e-mails, letters; track trends, concerns, suggestions, complaints
Participation Tracking	All Projects & Programs	Numbers & Geographic distribution of participants, results of participants' efforts	Low cost; Easy to document, Easy to understand	Sign-in/evaluation sheets, document with photos, end results
Focus Groups	Streambank Protection; Land Use Program; Information/Education	Knowledge & Awareness, Perceptions, Current practices	Medium to high cost; Motivations/barriers to change readily identified; Instant feedback	Select 6-8 people randomly from watershed area. Draft questions, facilitate discussion. Record session.
Agency Reviews	Shoreline Protection; Information/Education	Accuracy/validity of data collected, Observations	Low Cost; Valuable insight from experienced professionals	Partnering agency will review data, BMPs, level of improvement & offer input on methods/results



**CONDITIONS AND TREATMENT**

Erosion Conditions:

- \_\_\_\_\_ Streambank Erosion Adjacent to Crossing
- \_\_\_\_\_ Embankment Erosion
- \_\_\_\_\_ Culvert Outlet Erosion
- \_\_\_\_\_ Pool Formation at Culvert Outlet
- \_\_\_\_\_ Shoulder/Ditch Erosion
- \_\_\_\_\_ Sand/Soil Over Crossing
- \_\_\_\_\_ Other \_\_\_\_\_

Recommended Treatment:

- \_\_\_\_\_ Pavement
- \_\_\_\_\_ Pave Curb & Gutter
- \_\_\_\_\_ Erosion Control Structures ( )
- \_\_\_\_\_ Sediment Basins ( )
- \_\_\_\_\_ Extend Culvert ( )
- \_\_\_\_\_ Diversion Outlets ( )
- \_\_\_\_\_ Increase Fill
- \_\_\_\_\_ Replace Culverts ( )
- \_\_\_\_\_ Other \_\_\_\_\_

Extent:

\_\_\_\_\_ Minor \_\_\_\_\_ Moderate \_\_\_\_\_ Severe

Reason for Recommendation: \_\_\_\_\_

Cause: \_\_\_\_\_  
\_\_\_\_\_

**PHOTOS**

Film Numbers: \_\_\_\_\_

**SITE SKETCH**

**APPENDIX B**

**Severity Scoring Worksheet**

Grand Lake Coastal Watershed  
Road/Stream Crossing Inventory

**Site I. D.** \_\_\_\_\_

<b>Factors Contributing to Severity</b>	<b>Points</b>	<b>Site Score</b>
ROAD SURFACE	Paved: 0 pt Gravel: 3 pt Sand and Gravel: 6 pt Sand: 9 pt	
LENGTH OF APPROACHES	0-40 ft: 1 pt 41-1000 ft (0.008-0.189 mi.): 3 pt 1001-2000 ft (0.19-0.379 mi.): 5 pt > 2000 ft (>0.379 mi.): 7 pt	
SLOPE OF APPROACHES	0 %: 0 pt 1-5%: 3 pt 6-10 %: 6 pt >10 %: 9 pt	
VEGETATIVE COVER OF SHOULDERS & DITCHES	Heavy: 1 pt Partial: 3 pt None: 5 pt	
WIDTH OF ROAD, SHOULDERS & DITCHES	< 15 ft: 0 pt 16-20 ft: 1 pt > 20 ft: 2 pt	
EMBANKMENT SLOPE	Bridges: 0 pt >2:1 slope: 1 pt 1:5-2:1 slope: 3 pt Vertical or 1;1 slope: 5pt	
STREAM DEPTH	0-2 ft: 1 pt >2 ft: 2 pt	
STREAM CURRENT	Slow: 1 pt Moderate: 2 pt Fast: 3 pt	
EXTENT OF EROSION	Minor: 1 pt Moderate: 3 pt Severe: 5 pt	
<b>TOTAL</b>	<b>0-15      Minor</b> <b>16-29     Moderate</b> <b>≥ 30       Severe</b>	

## Appendix C Road/Stream Crossing Report

A road/stream crossing site exists wherever a road or street and a stream intersect. These crossings can be major contributors of sediments and other pollutants to the water system. Dirt and gravel from shoulders of the roads, or from unpaved roads, can be washed into a stream. The resulting build up of sediments in the stream is called *sedimentation*. Although sediments entering waterbodies is a natural process, excess amounts can wreak havoc on the aquatic environment. Some detrimental effects of sedimentation are:

- ◆ Destruction of aquatic habitat and the extermination of aquatic wildlife
- ◆ Negative impacts on birds and mammals dependent on the aquatic environment
- ◆ Restriction of plant productivity due to reduction of sunlight penetration
- ◆ Warming of waters, which can lead to destruction of coldwater fisheries
- ◆ Release of nutrients into the water system, causing the stimulation of algae growth
- ◆ Introduction into the water body of harmful pesticides, toxic metals and bacteria which may adhere to the grains of sediment
- ◆ Disruption of the fish life cycle by affecting their ability to feed, spawn, and inhibiting gill function.
- ◆ Reduction of width and depth of the stream channel, and the potential increase in flooding events

The amount of sedimentation experienced by a water body depends on several factors, such as the length and slope of the approaches, steepness of the embankment, whether or not the road is paved, the amount of vegetative cover along shoulders and ditches at the site, and the runoff path. These factors need to be taken into consideration in the development of any plan proposed to reduce the rate of sedimentation at road/stream crossings.

### *METHODOLOGY*

The road/ stream crossing inventory was conducted in the summer months of 2005 by Northeast Michigan Council of Government (NEMCOG) staff. Using topographical and county road maps, possible road/stream crossings were located and each site was visited. Photographs were taken of upstream, downstream, and left and right approaches at all sites. Physical condition and measurements of the culvert, the roadway, the length and slope of approach, road width and surface type, stream depth and current, amounts and causes of erosion, and extent of vegetation were recorded. Using the data collected, each site was assigned a ranking of minor, moderate or severe based on a point system. A site with a score between 0-15 ranks *Minor*, 16-29 is considered *Moderate*, and a score of 30 or more indicates a *Severe* site. Best Management Practices (BMPs) were determined according to the needs of each site. Sample inventory sheets and ranking sheets are included in **Appendices A** and **B**, respectively.



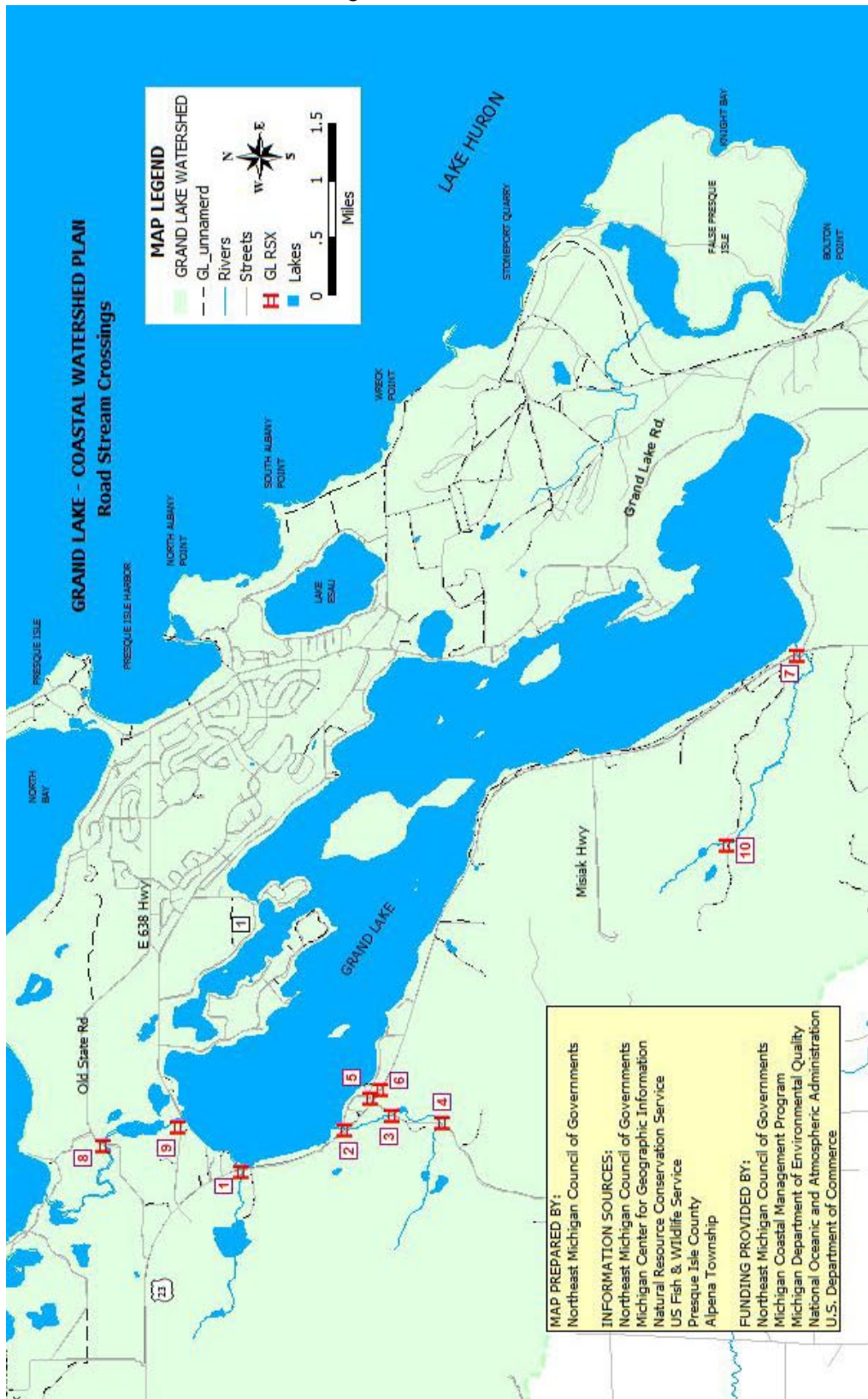
### *RESULTS*

Nine road/stream-crossing sites were inventoried in the Grand Lake Watershed (See **Figure 1**). The majority of sites ranked as *Moderate* contributors of sediments to the lake's tributaries, with two sites ranking *Minor*, and only one site was rated *Severe*. The following pages provide a



detailed record of each site inventoried. BMPs were recommended for four of the sites; implementation of the recommended treatments would cost approximately \$70,000.

Figure 1: Erosion Sites





Downstream



Upstream

**Site ID 001**

**Road:** US 23 South  
**Stream Name:** Schalks Creek  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 22  
**Landowners:**  
**Crossing Type:** Single culvert

**Culvert Description**

**Length:** 50 ft.  
**Diameter:** 6 ft.  
**Material:** Concrete  
**Condition:** Good  
**Flow:** Clear  
**Fill Depth:** 3 ft. *Inlet* 2 ft. *Outlet*  
**Embankment Slope:** 2:1 >2:1

**ROAD INFORMATION**

**Road Type:** Paved  
**Road Width:** 23 ft.

	Left	Right
<b>Approach Length:</b>	N/A	N/A
<b>Approach Slope:</b>	0%	0%
<b>Ditch &amp; Shoulder Vegetation:</b>	Heavy	Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
<b>Average Width:</b>	10-25 ft.	10-25
<b>Average Depth:</b>	1-3 ft.	1-3 ft.
<b>Current:</b>	Slow	Slow
<b>Fish Passage Problem:</b>		No

**EROSION CONDITIONS**

<b>Extent of Erosion</b>	Minor
<b>Streambank Erosion</b>	No
<b>Embankment Erosion</b>	No
<b>Culvert Outlet Erosion</b>	No
<b>Pool Formation</b>	No
<b>Shoulder/Ditch Erosion</b>	No
<b>Sand/Soil over Crossing</b>	No
<b>Other Causes</b>	No

**RECOMMENDED TREATMENT**

<b>Pavement</b>	No
<b>Pave Curb and Gutter</b>	No
<b>Erosion Control Structures</b>	No
<b>Sediment Basin</b>	No
<b>Extend Culverts</b>	No
<b>Diversion Outlet</b>	No
<b>Increase Fill</b>	No
<b>Replace Culverts</b>	No
<b>Other:</b>	

**ESTIMATED COST** \$0.00

**SEVERITY** Minor



Downstream



Upstream

**Site ID 002**

**Road:** US 23 South  
**Stream Name:** Schaut Creek  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 27

**Landowners:**  
**Crossing Type:** Single culvert

**Culvert Description**

Length: 50 ft.  
 Diameter: 6 ft.  
 Material: Concrete  
 Condition: Good  
 Flow: Clear  
 Inlet Outlet  
 Fill Depth: 0 ft. 0 ft.  
 Embankment Slope: >2:2 >2:2

**ROAD INFORMATION**

Road Type: Paved  
 Road Width: 20 ft.

	Left	Right
Approach Length:	N/A	N/A
Approach Slope:	0%	0%
Ditch & Shoulder Vegetation:	Heavy	Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
Average Width:	<10 ft.	<10 ft.
Average Depth:	<1 ft.	<1 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion	Minor
Streambank Erosion	No
Embankment Erosion	No
Culvert Outlet Erosion	No
Pool Formation	No
Shoulder/Ditch Erosion	No
Sand/Soil over Crossing	No
Other Causes	No

**ESTIMATED COST** \$0

**RECOMMENDED TREATMENT**

Pavement	No
Pave Curb and Gutter	No
Erosion Control Structures	No
Sediment Basin	No
Extend Culverts	No
Diversion Outlet	No
Increase Fill	No
Replace Culverts	No
Other:	

**SEVERITY** Minor



Downstream



Upstream

**Site ID 003**

**Road:** N. Grand Lake Hwy.  
**Stream Name:** Schaut Creek  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 35  
**Landowners:**  
**Crossing Type:** Twin culverts

**Culvert Description**

**Length:** 40 ft.  
**Diameter:** 3 ft.  
**Material:** 1 Galvanized/  
 1 Concrete  
**Condition:** Fair  
**Flow:** Clear  
**Fill Depth:** *Inlet* 3 ft. *Outlet* 3 ft.  
**Embankment Slope:** 1:1 1.5:1

**ROAD INFORMATION**

**Road Type:** Paved  
**Road Width:** 20 ft.  
**Approach Length:** Left N/A Right N/A  
**Approach Slope:** 0% 0%  
**Ditch & Shoulder Vegetation:** Heavy Heavy

**STREAM CHARACTERISTICS**

	Upstream	Downstream
<b>Average Width:</b>	<10 ft.	>10 ft.
<b>Average Depth:</b>	1-3 ft.	1-3 ft.
<b>Current:</b>	Slow	Slow
<b>Fish Passage Problem:</b>		Yes

**EROSION CONDITIONS**

**Extent of Erosion:** Moderate  
**Streambank Erosion:** No  
**Embankment Erosion:** No  
**Culvert Outlet Erosion:** Yes  
**Pool Formation:** Yes  
**Shoulder/Ditch Erosion:** No  
**Sand/Soil over Crossing:** No  
**Other Causes:** Debris/Perched Culvert

**RECOMMENDED TREATMENT**

**Pavement:** No  
**Pave Curb and Gutter:** No  
**Erosion Control Structures:** No  
**Sediment Basin:** No  
**Extend Culverts:** No  
**Diversion Outlet:** No  
**Increase Fill:** No  
**Replace Culverts:** Yes  
**Other:**

**ESTIMATED COST**

\$8,125

**SEVERITY**

Moderate



Downstream



Upstream

**Site ID 004**

**Road:** N. Grand Lake Highway  
**Stream Name:** Schaut Creek  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 34

**Landowners:**  
**Crossing Type:** Twin culverts

**Culvert Description**

Length: 60 ft.  
 Diameter: 4 ft.  
 Material: Galvanized  
 Condition: Fair  
 Flow: Clear  
*Inlet Outlet*  
 Fill Depth: 0 ft. 1.5 ft.  
 Embankment Slope: 2:1 >2:1

**ROAD INFORMATION**

Road Type: Paved  
 Road Width: 20 ft.

	Left	Right
Approach Length:	N/A	300
Approach Slope:	0%	1-5%
Ditch & Shoulder Vegetation:	Partial	Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
Average Width:	>10 ft.	>10 ft.
Average Depth:	1-3 ft.	1-3 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion	Minor
Streambank Erosion	No
Embankment Erosion	No
Culvert Outlet Erosion	Yes
Pool Formation	Yes
Shoulder/Ditch Erosion	No
Sand/Soil over Crossing	No
Other Causes	Perched culvert

**ESTIMATED COST** \$13,325

**RECOMMENDED TREATMENT**

Pavement	No
Pave Curb and Gutter	No
Erosion Control Structures	No
Sediment Basin	No
Extend Culverts	No
Diversion Outlet	No
Increase Fill	No
Replace Culverts	Yes
Other:	Planting/seeding
<b>SEVERITY</b>	Severe



Downstream



Upstream

**Site ID 005**

**Road:** Grand Lake Highway (N. of US 23)  
**Stream Name:** Unknown  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 35

**Landowners:**  
**Crossing Type:** Twin culverts

**Culvert Description**

Length: 50 ft.  
 Diameter: 2 ft.  
 Material: Unknown  
 Condition: Good  
 Flow: Clear  
 Fill Depth: *Inlet* 1 ft. *Outlet* 1 ft.  
 Embankment Slope: 2:1 2:1

**ROAD INFORMATION**

Road Type: Gravel  
 Road Width:  
 Approach Length:  
 Approach Slope:  
 Ditch & Shoulder Vegetation: Heavy Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
Average Width:	>10 ft.	>10 ft.
Average Depth:	1-3 ft.	1-3 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion	Minor
Streambank Erosion	No
Embankment Erosion	No
Culvert Outlet Erosion	No
Pool Formation	No
Shoulder/Ditch Erosion	No
Sand/Soil over Crossing	No
Other Causes	No

**RECOMMENDED TREATMENT**

Pavement	Yes
Pave Curb and Gutter	Yes
Erosion Control Structures	No
Sediment Basin	No
Extend Culverts	No
Diversion Outlet	No
Increase Fill	No
Replace Culverts	No
Other:	

**ESTIMATED COST** \$25,000

**SEVERITY** Moderate



Downstream



Upstream

**Site ID 006**

**Road:** US 23  
**Stream Name:** Unknown  
**County:** Presque Isle  
**Township:** Krakow  
 T34N.R7E.Sec 35

**Landowners:**  
**Crossing Type:** Single culvert

**Culvert Description**

Length:  
 Diameter: 1 ft.  
 Material: Concrete  
 Condition: Fair  
 Flow: Clear  
 Fill Depth: *Inlet* 3 ft. *Outlet* 3 ft.  
 Embankment Slope: 1.5:1 1.5:1

**ROAD INFORMATION**

Road Type: Paved  
 Road Width: 23

	Left	Right
Approach Length:	Unknown	Unknown
Approach Slope:	Unknown	Unknown
Ditch & Shoulder Vegetation:	Partial	Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
Average Width:	Undefined	Undefined
Average Depth:	<1 ft.	<1 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion	Minor
Streambank Erosion	No
Embankment Erosion	No
Culvert Outlet Erosion	No
Pool Formation	No
Shoulder/Ditch Erosion	No
Sand/Soil over Crossing	No
Other Causes	No

**RECOMMENDED TREATMENT**

Pavement	No
Pave Curb and Gutter	No
Erosion Control Structures	No
Sediment Basin	No
Extend Culverts	No
Diversion Outlet	No
Increase Fill	No
Replace Culverts	No
Other:	

**ESTIMATED COST** \$0

**SEVERITY** Moderate



Downstream



Upstream

**Site ID 007**

**Road:** U S 23 Hwy.  
**Stream Name:** Warren Creek  
**County:** Presque Isle  
**Township:** Presque Isle  
 T33N.R8E.Sec 17  
**Landowners:**  
**Crossing Type:** Single culvert

**Culvert Description**

Length:  
 Diameter:  
 Material: Concrete  
 Condition: Fair  
 Flow: Clear  
*Inlet Outlet*  
 Fill Depth:  
 Embankment Slope: 1:1 1:1

**ROAD INFORMATION**

Road Type: Paved  
 Road Width: 24 ft.  
 Approach Length: Unknown  
 Approach Slope: Unknown  
 Ditch & Shoulder Vegetation: Heavy

	Left	Right
	Unknown	Unknown
	Unknown	Unknown
	Heavy	Partial

**STREAM CHARACTERISTICS**

	Upstream	Downstream
Average Width:	Undefined	Undefined
Average Depth:	<10 ft.	<10 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion	Minor
Streambank Erosion	No
Embankment Erosion	No
Culvert Outlet Erosion	No
Pool Formation	No
Shoulder/Ditch Erosion	No
Sand/Soil over Crossing	No
Other Causes	No

**RECOMMENDED TREATMENT**

Pavement	No
Pave Curb and Gutter	No
Erosion Control Structures	No
Sediment Basin	No
Extend Culverts	No
Diversion Outlet	No
Increase Fill	No
Replace Culverts	No
Other:	

**ESTIMATED COST** \$0

**SEVERITY** Moderate





Downstream



Upstream

**Site ID 008**

**Road:** Old State Road  
**Stream Name:** Grand Lake Outlet  
**County:** Presque Isle  
**Township:** Krakow  
 T34N R7E Sec15

**Landowners:**  
**Crossing Type:** Bridge

**Culvert Description**

Length:  
 Diameter:  
 Material: Concrete/Steel  
 Condition: Fair  
 Flow: Clear  
 Fill Depth: *Inlet* *Outlet*  
 Embankment Slope: N/A N/A  
 2:1 2:1

**ROAD INFORMATION**

Road Type: Gravel  
 Road Width: 23 ft.  
 Approach Length: Left 60ft. Right 70ft.  
 Approach Slope: 1-5% 1-5%  
 Ditch & Shoulder Vegetation: Heavy Heavy

**STREAM CHARACTERISTICS**

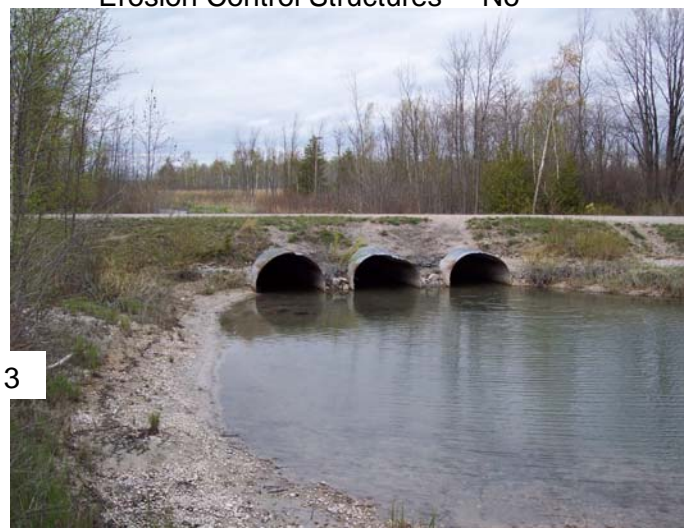
	Upstream	Downstream
Average Width:	<10 ft.	<10 ft.
Average Depth:	<3 ft.	<3 ft.
Current:	Slow	Slow
Fish Passage Problem:		No

**EROSION CONDITIONS**

Extent of Erosion: Minor  
 Streambank Erosion: No  
 Embankment Erosion: No

**RECOMMENDED TREATMENT**

Pavement: No  
 Pave Curb and Gutter: No  
 Erosion Control Structures: No



Downstream

Upstream

**Site ID 09**

**Road:** E. 638 Hwy  
**Stream Name:** Grand Lake Outlet  
**County:** Presque Isle  
**Township:** Krakow (T34N.R7E.Sec23)

**Landowners:**  
**Crossing Type:** Triple Culvert

**Culvert Description**

**Length:** 60 ft.  
**Diameter:** 5 ft.  
**Material:** Galvanized  
**Condition:** Fair  
**Flow:** Clear  
  
**Fill Depth:** 3 ft. 3 ft.  
**Embankment Slope:** 2:1 2:1

**ROAD INFORMATION**

**Road Type:** Paved  
**Road Width:** 23 ft.  
  

	Left	Right
<b>Approach Length:</b>	500 ft.	100 ft.
<b>Approach Slope:</b>	1.5%	1.5%

**Ditch & Shoulder Vegetation:**

**STREAM CHARACTERISTICS**

	Upstream	Downstream
<b>Average Width:</b>	30 ft.	30 ft.
<b>Average Depth:</b>	2 ft.	2 ft.
<b>Current:</b>	Moderate	Moderate
<b>Fish Passage Problem:</b>		

**EROSION CONDITIONS**

<b>Extent of Erosion</b>	Moderate
<b>Streambank Erosion</b>	Yes
<b>Embankment Erosion</b>	Yes
<b>Culvert Outlet Erosion</b>	Yes
<b>Pool Formation</b>	No
<b>Shoulder/Ditch Erosion</b>	Yes
<b>Sand/Soil over Crossing</b>	No
<b>Other Causes</b>	

**RECOMMENDED TREATMENT**

<b>Pavement</b>	No
<b>Pave Curb and Gutter</b>	No
<b>Erosion Control Structures</b>	Yes
<b>Sediment Basin</b>	No
<b>Extend Culverts</b>	No
<b>Diversions Outlet</b>	No
<b>Increase Fill</b>	No
<b>Replace Culverts</b>	No
<b>Other:</b>	

**ESTIMATED COST** \$

**SEVERITY** Moderate

**Great Lakes Shoreline Management and Beach Maintenance Permit Requirements<sup>1</sup>**

<b>Activity</b>	<b>Definition</b>	<b>Limitations</b>	<b>DEQ Permitting Requirements Beginning Nov. 1, 2007 (Proposed)</b>	<b>DEQ permitting Requirements under PA 14 2003 valid until Nov 1, 2007</b>	<b>U.S. Army Corps of Engineers Requirements<sup>4</sup></b>
<b>Mowing vegetation to a height of not less than 4 inches</b>	Creation of a pathway to the water's edge	Limited to 10 feet in width	Requires General Permit	No permit required	Not Regulated
	Creation of an individual recreation area not exceeding 400 square feet	Area not to exceed 400 square feet			
	Mowing in Previously mowed areas on properties in Saginaw Bay and Grand Traverse Bay	Mowing must have been conducted in accordance with NREPA <sup>2</sup> . Limited to width of riparian property or 100 feet, which ever is less			
	Mowing of areas predominantly vegetated by invasive or non-native species	Must be part of a DEQ approved invasive species control plan			
<b>Leveling of Sand</b>	Relocation of sand to sand areas, including redistribution, grading and spreading sand deposited on upland riparian property	No alteration of natural lake contours, excavation of basins, leveling of sand in non-sand (i.e. organic or cobble) areas, relocation of natural shoreline or formation of new upland areas	Requires General Permit	No permit required	Requires Regional Permit (less than two cubic yards per lineal foot of frontage)
<b>Grooming of Sand</b>	Use of equipment in the top 4 inches of sand to remove debris (includes muck/algae removal above the water's edge)	No Destruction or disturbance of plant roots	Requires General Permit	No permit required	Requires Nationwide Permits 18 & 19 (minor dredge and fill up to 25 cubic yards)
<b>Path Construction</b>	Temporary pathway from upland directly to the water's edge	Limit one pathway per property, maximum 6 feet wide. Only on-site sand and gravel may be used, no alteration of natural shoreline contours is permitted	Requires General Permit	No permit required	Requires Nationwide Permit 14
<b>Removal of Vegetation</b>	Manual or mechanized removal of vegetation other than de minimus <sup>3</sup> hand removal	Limitations will be specified by the DEQ during permit application review period	Requires Individual Permit <sup>5</sup> with a public notice	Requires Individual Permit with a Public Notice	Requires Individual Permit with a Public Notice

1. Activities not authorized in areas regulated under Part 323, Shorelands Protection Act (Environmental Areas); Part 353, Sand Dunes Protection and Management; and Part 365, Endangered Species Protection.

2. Natural Resources and Environmental Protection Act, 1994, PA 451, as amended

3. De minimus hand removal means insignificant or minute removal that is done without mechanized equipment. Group efforts to clear an area or hiring of workers to clear an area by hand is not considered de minimus.

4. Visit [http://www.lre.usace.army.mil/who/regulatory\\_office/](http://www.lre.usace.army.mil/who/regulatory_office/) for information on USACOE requirements

5. Individual permit applications require additional fees and will receive a more detailed review by the DEQ, including a public notice period and a possible a public hearing.

**State of Michigan  
Department of Environmental Quality**

Land and Water Management Division  
P.O. Box 30458  
Lansing, MI 48909-7958

**PUBLIC NOTICE**

**PROPOSED GENERAL PERMIT CATEGORY FOR LIMITED GREAT LAKES SHORELINE  
MANAGEMENT ACTIVITIES**

February 5, 2007

Section 30312 of Part 303, Wetlands Protection, and Section 32512 of Part 325, Great Lakes Submerged Lands, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, authorize the Michigan Department of Environmental Quality to issue a General Permit identifying categories of activities that are similar in nature, will cause only minimal adverse environmental affects when performed separately, and will have only minimal cumulative adverse effect on the environment. Permit applications made for these types of activities may be processed in an expedited manner without issuance of an individual public notice.

General Permits are issued for a five-year period. The purpose of this public notice is to provide an opportunity for public review and comment prior to the issuance of this General Permit.

Written comments on the new Proposed General Permit Category should be sent to:

Ms. Peg Bostwick  
Michigan Department of Environmental Quality  
Land and Water Management Division  
P.O. Box 30458  
Lansing, MI 48909-7958

All comments must be received by May 6, 2007.

This notice will be reviewed by federal agencies in accordance with an agreement with the U.S. Environmental Protection Agency, under provisions of Section 404 or the Federal Clean Water Act Amendments of 1977.



JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



STEVEN E. CHESTER  
DIRECTOR

**GENERAL PERMIT FOR  
LIMITED GREAT LAKES SHORELINE MANAGEMENT ACTIVITIES**

\_\_\_\_\_, 2007

***IMPORTANT: PRIOR WRITTEN AUTHORIZATION UNDER THIS GENERAL PERMIT IS REQUIRED. Please review General Permit Procedures outlined in this document.***

Issued Under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451 as amended, being Section 324.30301 to 324.30323 of the Michigan Compiled Laws, Annotated

And

Part 325, Great Lakes Submerged Lands, of the Natural Resources and Environmental Protection Act, 1994 PA 451 as amended, being Section 324.325.01 to 324.32516 of the Michigan Compiled Laws, Annotated

**BACKGROUND INFORMATION**

**PURPOSE**

This General Permit (GP) is intended to facilitate activities for limited shoreline management along the Great Lakes coast that are expected to have only a minor impact on wetlands and the Great Lakes bottomlands and that can, therefore, be reviewed through an expedited permit application process. This GP will allow the DEQ to evaluate applications for permits without public noticing, reducing the inconvenience and cost of the permit process for applicants proposing minor activities and the costs of administering the program while protecting the wetland resource.

Please note that this GP does not define projects that will be permitted, but only those that may be considered for expedited processing.

**LEGISLATIVE AUTHORITY**

The DEQ may issue a GP only for activities that are, "...similar in nature, will cause only minimal adverse environmental effects when performed separately, and will have only minimal cumulative adverse effect on the environment" (see Section 30312 of the Wetland Protection Part, and Section 32512a of the Great Lakes Submerged Lands Part). The DEQ may authorize activities undertaken by individual property owners under the provisions of a GP without further public notice.

## **GEOGRAPHIC EXTENT**

This GP covers bottomlands of the entire Great Lakes shoreline in Michigan below the Ordinary High Water Mark of the Great Lakes and above the water's edge. This GP does not authorize activities below the water's edge.

## **GENERAL PERMIT PROCEDURES**

A person seeking authorization under this GP must submit a permit application on a form provided by the DEQ. The DEQ Land and Water Management Division will review requests for authorization under the GP to determine whether the conditions and limitations of the GP are met. If the DEQ determines that an application for a specific project meets all the general and specific criteria, written authorization under the GP will be issued to the applicant.

The DEQ may require that a particular project be authorized through the individual permit process if it determines that public review would be beneficial in making a decision on the application, or if it determines that a proposed project could, in combination with other projects, result in more than minimal adverse cumulative impacts.

The Michigan Legislature has established a fee of \$100.00 for authorization under the General Permit [§30306(3)(a); §32513(2)(a)].

## **ACTIVITIES AUTHORIZED BY THE GENERAL PERMIT**

This General Permit authorizes:

**1. The following activities on Great Lakes Bottomland lying below the Ordinary High Water Mark as defined in Section 32502 and above the water's edge, in areas that are naturally free of vegetation or where all vegetation has been removed and maintained in accordance with the NREPA.** These activities are not authorized in an environmental area as defined in part 323 or critical dune areas as defined in part 353, and shall not violate part 365 or rules promulgated under that part, or the endangered species act of 1973, public law 93-205, 87 stat. 884, or rules promulgated under that act. These activities are not authorized in areas exposed by temporary low water periods such as storm surges and seiches. Until 2 years from the effective date of this General Permit, property owners that have removed vegetation prior to June 5, 2006 without authorization from the DEQ may obtain approval under this General Permit on an after-the-fact basis by demonstrating that they would have been qualified to remove vegetation or to obtain a letter of permission under 2003 PA 14 and by paying twice the General Permit fee.

(a) **Leveling of sand:** The relocation of sand to sand areas, including the redistribution, grading, and spreading of sand that has been deposited through wind or wave action onto upland riparian property. Alteration of the natural lakeshore contours, including excavation of basins, formation of new upland areas, and relocation of the natural shoreline location, is not authorized. Leveling of sand is not authorized in non-sand areas, such as cobble or organic soil areas.

(b) **Grooming of sand:** Raking, dragging, or pulling metal teeth or other grooming equipment through the top 4 inches of sand without disturbance of or destruction of plant roots, for the purpose of removing debris. Debris includes animal or fish carcasses, zebra mussel shells,

dead vegetation, trash, and discarded materials of human-made origin. All collected debris shall be disposed of properly outside of any wetland.

(c) **Construction and maintenance of a path:** Construction of a temporary access walkway from the upland on the riparian property directly to the shoreline across swales with standing water, not exceeding 6 feet in bottom width and consisting of sand and pebbles obtained from the exposed, nonvegetated bottomlands or from the upland on the riparian property. This does not include grading of the pathway such that the natural contours of the land are altered or placement of a permanent structure such as a boardwalk or dock. Construction is limited to one walkway per individual private property. Adjoining property owners are authorized to share one path, not exceeding 12 feet in bottom width, located to avoid and minimize adverse natural resource impacts. Path construction for a public access area or commercial hotel is limited to one walkway, not exceeding 10 feet in bottom width, per 200 feet width of riparian property, with a minimum of one pathway per property.

**2. The following mowing of vegetation on Great Lakes Bottomland lying below the Ordinary High Water Mark as defined in Section 32502 and above the water's edge without disturbing soil or plant roots.** The mowing shall not occur in an environmental area as defined in section 32301 and shall not violate part 365 or rules promulgated under that part, or the endangered species act of 1973, public law 93-205, 87 stat. 884, or rules promulgated under that act. All collected vegetation shall be disposed of properly outside of any wetland. Thatch removal by raking or other means is not authorized.

(a) **Mowing a pathway:** Mowing of vegetation for a pathway to a height of not less than 4 inches, limited to an area 10 feet in width for the entire individual property.

(b) **Recreational areas:** Mowing of a recreational area not to exceed 400 square feet to a height of not less than 4 inches.

(c) **Mowing of previously mowed areas in Saginaw Bay and Grand Traverse Bay:** Mowing of vegetation in previously mowed areas on properties located within the pilot areas designated by the DEQ under 2003 PA 14 of Saginaw Bay and Grand Traverse Bay, if the applicant can provide evidence that the mowing was done in accordance with NREPA. This mowing is limited to the width of the riparian property or 100 feet, whichever is less and to a height of not less than 4 inches. The designated Saginaw Bay area is defined by a line drawn between Au Sable Point in Iosco County east to Point Aux Barques in Huron County. The designated Grand Traverse Bay area is defined by a line drawn between Leelanau State Park in Leelanau County east to the Antrim/Charlevoix county line.

**3. Mowing of invasive or non-native species on Great Lakes Bottomland lying below the Ordinary High Water Mark as defined in Section 32502 and above the water's edge.**

Mowing of areas predominantly vegetated by non-native or invasive species (e.g. purple loosestrife, *Phragmites*) as part of a vegetation control plan in accordance with recommendations provided by the DEQ. "Non-native" species are plants that did not occur in the Michigan prior to 1800. "Invasive" species are plants that have aggressive growth characteristics, and that threaten native ecosystems by dominating the normal vegetation of an area. A description of how the proposed mowing is consistent with recommendations provided by the DEQ must be provided as part of the application.

## **GENERAL LIMITATIONS AND CONDITIONS**

**Authority granted under this permit is subject to the following limitations which apply to all General Permits:**

1. Initiation of any work on the permitted project confirms the permittee's and the property owner's acceptance and agreement to comply with all of the terms and conditions of this permit.
2. A person, in exercising the authority granted by this permit, shall not cause unlawful pollution pursuant to part 31, Water Resources Protection, of the NREPA.
3. This permit and the written authorization under this General Permit shall be kept at the site of the work and shall be available for inspection.
4. The permittee or the property owner shall not forbid the full and free use by the public of public waters at or adjacent to the work approved herein.
5. This permit does not convey property rights in either real estate or material, nor does it authorize any injury to private property or invasion of private rights.
6. This permit does not prejudice or limit the right of a riparian owner or other person to institute proceedings in any court of the State when necessary to protect his/her rights.
7. This permit shall not be assigned or transferred without the written approval of the Michigan Department of Environmental Quality.
8. Failure to comply with conditions of this permit may subject the permittee to revocation of a permit and criminal and/or civil action as cited by the specific State Act, Federal Act, and/or Rule under which this permit is granted.
9. This activity is a single and complete project. Other regulated activities must be reviewed and permitted separately.

**NEED FOR OTHER PERMITS**

Issuance of authorization for these activities pursuant to this General Permit does not remove the need for other applicable local, state, or federal permits. **A PERMIT FROM THE U.S. ARMY CORPS OF ENGINEERS IS REQUIRED FOR MOST ACTIVITIES THAT ALTER GREAT LAKES COASTAL AREAS.**

**EXPIRATION DATE**

This General Permit, and all authorizations issued under the General Permit, will expire on xx/xx/20xx.

Issued \_\_\_\_\_, 20xx.

\_\_\_\_\_  
Elizabeth Browne, Chief  
Land and Water Management Division