Existing Conditions

The first step in developing a plan to protect the coastal resources of Misery Bay is to establish an accurate representation of existing cultural and environmental features within the study area. This chapter will present a series of maps and associated text to describe key features such as owner type, land uses, vegetation cover types, soils and geology.

NEMCOG used information and digital data sets from the Center for Geographic Information, State of Michigan, Michigan Resource Information System, Alpena Township, Alpena County, Natural Resource Conservation Service, and U.S. Geological Survey. Information from the Alpena County Master Plan and Alpena Township Master Plan was used to develop a profile of existing conditions. Field surveys were conducted during 2003.

Community Demographics

Trends in population and housing characteristics can provide an understanding of growth pressures in a community. Population trends from 1900 and 2000 are summarized in **Table 2.1**. Population levels have risen and fallen twice in the last 100 years, first in the early part of the century and again in the 1980's. The 1980 US Census recorded the largest population for Alpena Township and Alpena County at 10,152 and 32,315 respectively. During the 80's decade, population fell by over five percent and has not climbed back to the 1980 US Census level.

Table 2.1
Population Trends
Alpena Township and Alpena County, 1900-2000

Year	Alpena Township		Alpena County	
	Population	% Change	Population	% Change
1900	1,173	---	18,254	---
1910	928	-20.9%	19,965	+9.4%
1920	701	-24.5%	17,869	-10.5%
1930	813	+16.0%	18,574	+3.9%
1940	1,675	+106.0%	20,766	+11.8%
1950	2,932	+75.0%	22,189	+6.9%
1960	6,616	+125.6%	28,556	+28.7%
1970	9,001	+36.0%	30,708	+7.5%
1980	10,152	+12.8%	32,315	+5.2%
1990	9,602	-5.4%	30,605	-5.3%
2000	9,788	+1.9%	31,314	+2.3%

Source: U.S. Census Bureau.

Median family income and median household income for Alpena Township has been higher than the county but less than the state as a whole. According to the 2000 US census, the percent of families below poverty level in Alpena Township was lower than the County and State, see **Table 2.2.**

Table 2.2 Income and Poverty Statistics Alpena Township, Alpena County, State of Michigan, 2000						
Income Type	Alpena Township		Alpena County		State of Michigan	
	1990	2000	1990	2000	1990	2000
Median Family Income	$31,680	$46,181	$28,441	$42,366	$36,652	$53,457
Median Household Income	$27,011	$39,889	$22,598	$34,177	$31,020	$44,667
Per Capita Income	$11,741	$18,779	$10,930	$17,566	$14,154	$22,168
% Families Below Poverty	10.3%	5.5%	10.8%	7.7%	10.2%	7.4%
Source: Table 9, Census of Population and Housing 1990 U.S. Census. Table DP-3, Profile of Selected Economic Characteristics, 2000 U.S. Census.						

Housing in the suburban fringe areas of Alpena Township falls into the year round category. Seasonal housing is typically waterfront or hunting camps. Total housing units and occupied housing units increased between 1990 and 2000. Conversely, seasonal housing units fell during the last decade, see **Table 2.3**. The trend can be attributed to persons retiring and moving north to their seasonal homes. Another factor may be owners claiming homestead property status on their high value waterfront homes. Percent housing units in Alpena Township classified as seasonal are nearly double the state as a whole. However, compared to other townships in northeast Michigan, the percentage of seasonal housing units is lower. In contrast, the Misery Bay Initiative area has a much higher percentage of seasonal, occasional use housing units than Alpena Township as a whole. Numerous housing units would be classified as occasional use cabins. Housing units within the Misery Bay Initiative planning area is all single family residential.

Table 2.3 Housing Occupancy Alpena Township – 1990 & 2000				
Status	2000		1990	
	# Units	% Total	# Units	% Total
Occupied Housing Units	**4,037**	**84.9**	**3,642**	**82.5**
Owner Occupied	3,358	70.6	2,956	81.2
Renter Occupied	679	14.3	686	18.8
Vacant Housing Units	**720**	**15.1**	**772**	**17.5**
Recreational, Seasonal, Occasional Use	491	10.3	557	12.6
Other Vacant	229	4.8	215	4.9
Total Housing Units	**4,757**	**100.0**	**4,414**	**100.0**
Source: Table DP-1, Profile of General Demographic Characteristics, 2000 U.S. Census.				

Land Ownership

In order to assess the potential for protecting and enhancing ecological resources of the Misery Bay study 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.** The largest single landowner is Lafarge Corporation, with a limestone quarry and cement production facilities adjacent to the study area. Most of Lafarge's 3,519 acres is used for private recreational purposes. Beaumont Point, Inc. is the second largest owner with 1,517 acres. Beaumont Point, Inc. is a private hunting and

recreation club located on North Point. Other large landowners are North Shore Development and Steve Fletcher.

Much of the non-industrial private ownership is divided into parcels 40 acres and larger. Subdivisions are located along Thunder Bay, Roberts Cove and Huron Bay and El Cajon Bay. Small tracts can be found scattered throughout the area.

Beaumont Point, Inc. 1,517 acres
Lafarge 3,519 acres
State of Michigan 1,560 acres
Steven Fletcher 826 acres
North Shore Development 841 acres

Public Lands

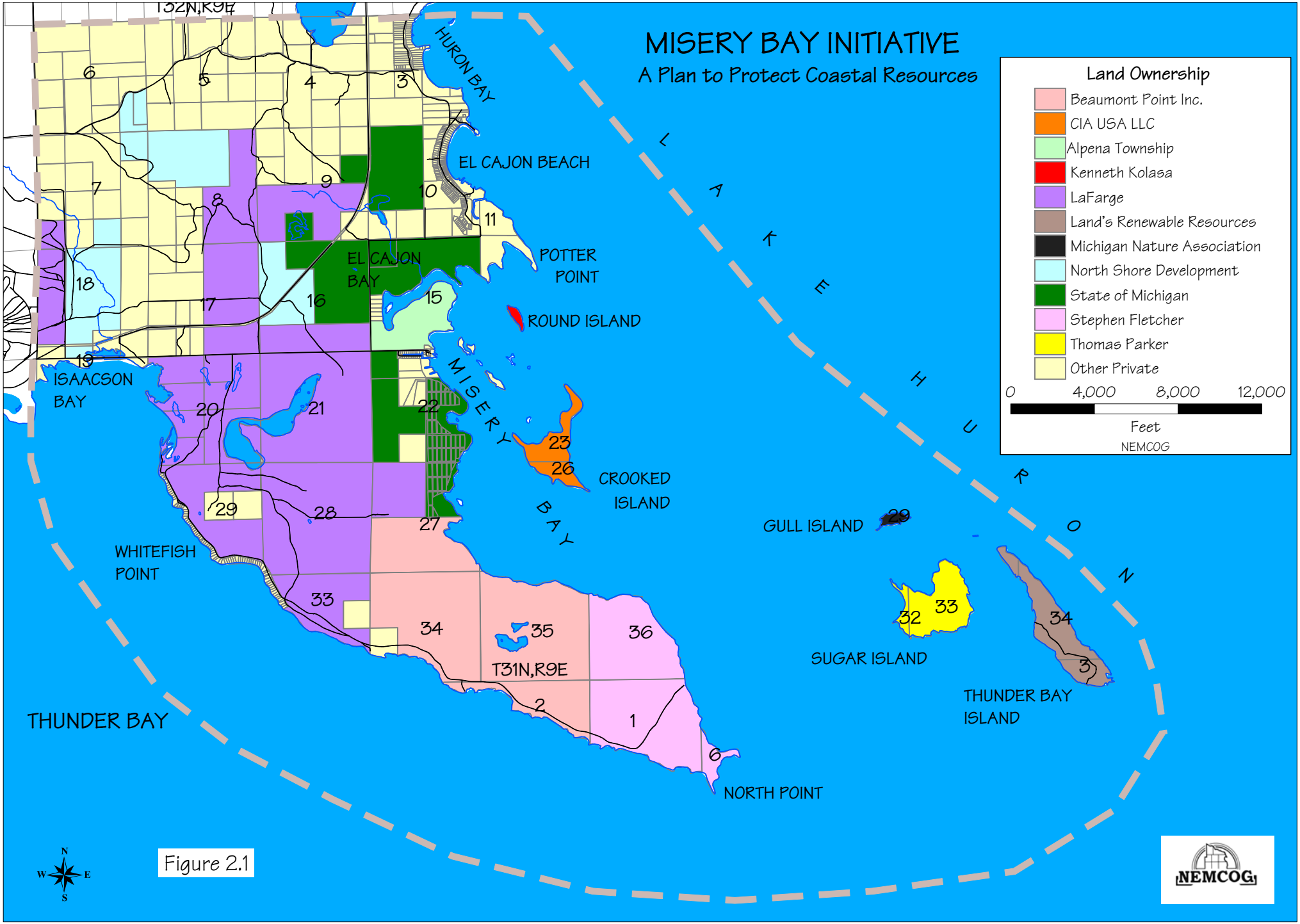
There are several tracts of land within the study area that are owned by the State of Michigan. As can be seen in **Figure 2.1**, public lands can be found in Sections 9, 10, 15, 16, 22 and 27 of T.31N.-R.9E. Critical properties include lands along the north shore of El Cajon Bay and most of Prospect Park Subdivision. This subdivision was platted along coastal lands of sections 22 and 27. Extensive terrestrial and near shore wetlands, combined with a lack basic of infrastructure such as roads, water and sewer, greatly diminished the ability to develop lots. As a result, much of the land has reverted to the State.

Alpena Township, with assistance from the Nature Conservancy, acquired 132 acres of land adjacent to El Cajon Bay and Misery Bay. The parcel includes limestone karst features, populations of dwarf lake iris, and critical wildlife and migratory bird habitats. Alpena Township submitted grant applications to the Michigan Department of Environmental Quality Coastal Management Program for a $500,000 Great Lakes Coastal Restoration grant and to the Michigan Natural Resources Trust Fund for a $1.5 million grant to purchase the property. The Nature Conservancy pledged $100,000 towards property acquisition. The grants were approved in 2004 and the land was purchased. Alpena Township now owns the 132 acres, including nearly two miles of pristine, undeveloped shoreline. Fine examples of undisturbed Great Lakes coastal wetlands are found along these shorelines.

Farmland and Open Space Preservation - P.A. 116

Information provided by the Alpena Township Assessors Office show two land holdings are enrolled in P.A. 116, Farmland and Open Space Preservation. Properties owned by Thomas Parker on Sugar Island and Stephen Fletcher on North Point are enrolled in P.A. 116.

According to information from the Michigan Department of Agriculture, “The Farmland and Open Space Preservation Act enables a farm owner to enter into a development rights Agreement with the State. The Agreement is designed to ensure that the land remains in an agricultural use for a minimum of 10 years and ensures that land is not developed in a non-agricultural use. In return for maintaining land in an agricultural use, the land owner may be entitled to certain income tax benefits, and the land is not subject to special assessments for sanitary sewer, water, lights or non-farm drain projects. Farmland Agreements must be enrolled into the program for a minimum of 10 years and may be enrolled for a maximum of 90 years. Agreements may be extended in 7 year increments after the initial term.”


MISERY BAY INITIATIVE
A Plan to Protect Coastal Resources
Land Ownership
Beaumont Point Inc.
CIA USA LLC
Alpena Township
Kenneth Kolasa
LaFarge
Land's Renewable Resources
Michigan Nature Association
North Shore Development
State of Michigan
Stephen Fletcher
Thomas Parker
Other Private
0
4,000
8,000
12,000
Feet
NEMCOG
T32N,R9E
HURON BAY
EL CAJON BEACH
EL CAJON BAY
POTTER POINT
ROUND ISLAND
ISAACSON BAY
MISERY BAY
CROOKED ISLAND
GULL ISLAND
WHITEFISH POINT
SUGAR ISLAND
THUNDER BAY ISLAND
T31N,R9E
THUNDER BAY
NORTH POINT
LAKE HURON
Figure 2.1
NEMCOG

Alpena Township submitted grant applications to the Department of Environmental Quality Michigan Coastal Management Program for a $500,000 Great Lakes Coastal Restoration grant and to the Michigan Natural Resources Trust Fund for a $1.5 million grant to purchase the property. The Nature Conservancy pledged $100,000 towards property acquisition. The grants were approved in 2004 and the land was purchased. Alpena Township now owns the 132 acres, including nearly two miles of pristine, undeveloped shoreline. Fine examples of undisturbed Great Lakes coastal wetlands are found along these shorelines.

Land Divisions

Figure 2.1 on the previous page shows parcel lines from the Township's parcel database. A color thematic parcel size map is shown in **Figure 2.2.** Parcels less than five acres in size are colored red and parcels 40 acres and greater are colored light green. Much of the land area is divided into parcels 40 acres or larger in size. Small lots, less than five acres in size, tend to be located along the coast and in platted subdivisions.

Subdivisions

There are four subdivisions in the study area. All of those were platted prior to 1960, with one platted in 1918.

Prospect Park Subdivision is located along the east shoreline of North Point. The sub was platted in 1918. The developers had grand ideas or may have been snake oil salesmen, as the proposed streets were named after presidents; proposed lakeshore parks had names such as Washington Place, Wilson Grove, and Roosevelt Park; features were called Ojibwa Bay, Wequeton sauminikee (Little Thunder Bay), Long Beach, Carmel Point and Holy Rock. Most of the 33' x 99' lots transferred into private ownership, but roads were never built and the "swampy" lots were never developed. Today, all but a few lots have reverted into State ownership.

North Point Shores Subdivision was platted in 1953 and is located along the west shoreline of North Point. Lots range from 100 to 180 feet wide and 160 to 320 feet deep. *Misery Canal Subdivision* was platted in 1956 and is located on Misery Bay at the end of Misery Bay Road. Lots are mostly 100 feet wide and range in depth from 117 to 184 feet. As the name would indicate a canal system was originally developed to give these parcels access to Lake Huron. *El Cajon Beach* is located on north of Potter Point on Lake Huron. It was platted in 1957. Lots range from 50 to 120 feet wide and 200 to 300 feet deep.

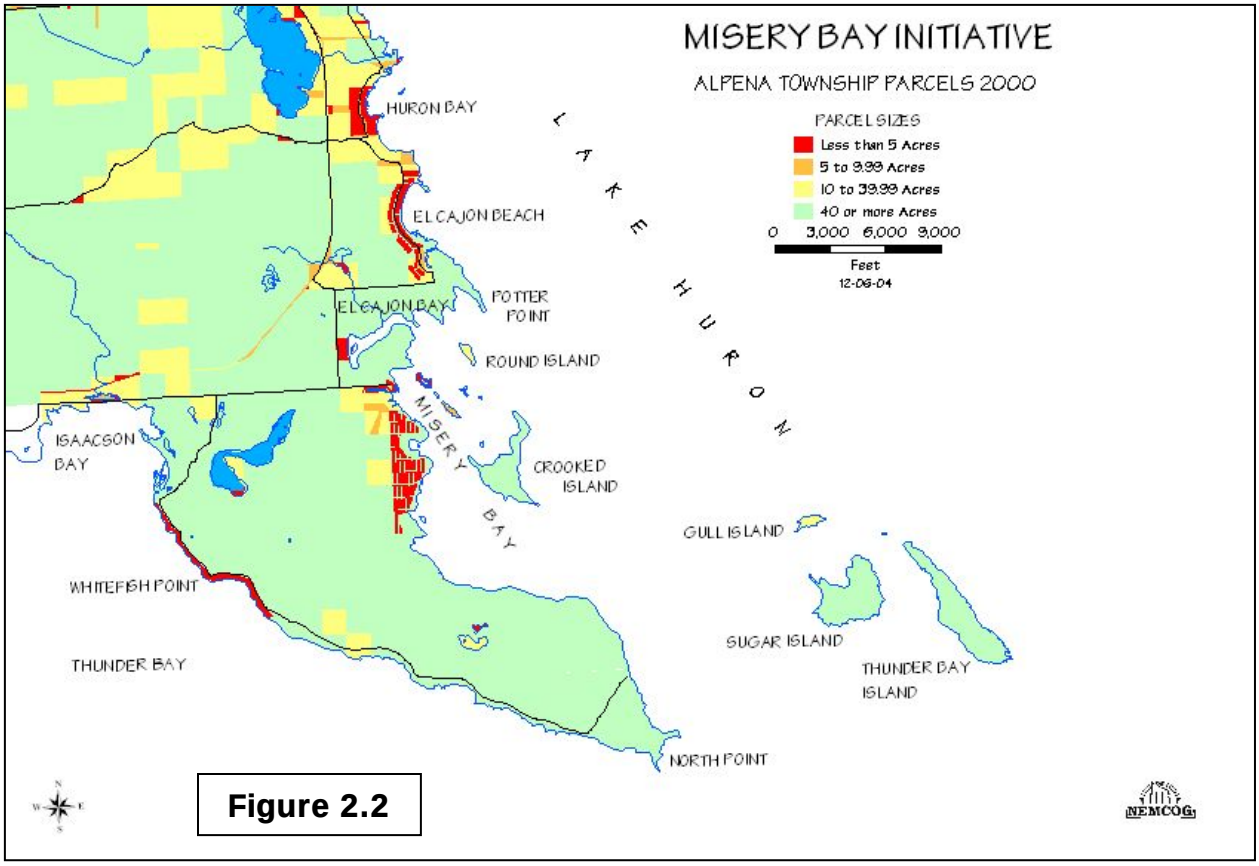


Figure 2.2

Existing Land Use/Land Cover Characteristics

NEMCOG mapped existing Land Use/Land Cover during the summer and fall of 2003. **Figure 2.3** is a color thematic map of the existing Land Use/Land Cover within the Misery Bay study area. The map was compiled using 1992 digital orthophoto quads and 1998 black and white infrared aerial photos. Ancillary data included 2002 Alpena Township Land Use Inventory and Michigan Resource Information Systems (MIRIS) land use/cover maps, 1952, 1963 and 1989 aerial photos and DNR compartment maps. Inaccessibility of much of the area limited field checking. Statistics are summarized in **Table 2.4**.

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 the coastline and scattered throughout the northeastern portion of the area.

Industrial/Extractive

This category includes the eastern edge of the Lafarge operation.

Institutional/Recreational

This category includes the Lafarge Clubhouse on North Point. The State of Michigan owns 1,560 acres of land open for public recreation. However, these lands were mapped by their vegetation type and not land use category.

Non-forested Uplands
The non-forested land category accounts for 2.9 percent or 452 acres of the Misery Bay Study Area. This category consists of herbaceous open and shrub land.

Upland Forests
The upland-forested lands cover 4,434 acres or 28 percent of the study area. Forest types include aspen-birch, oak, pine and northern hardwoods.

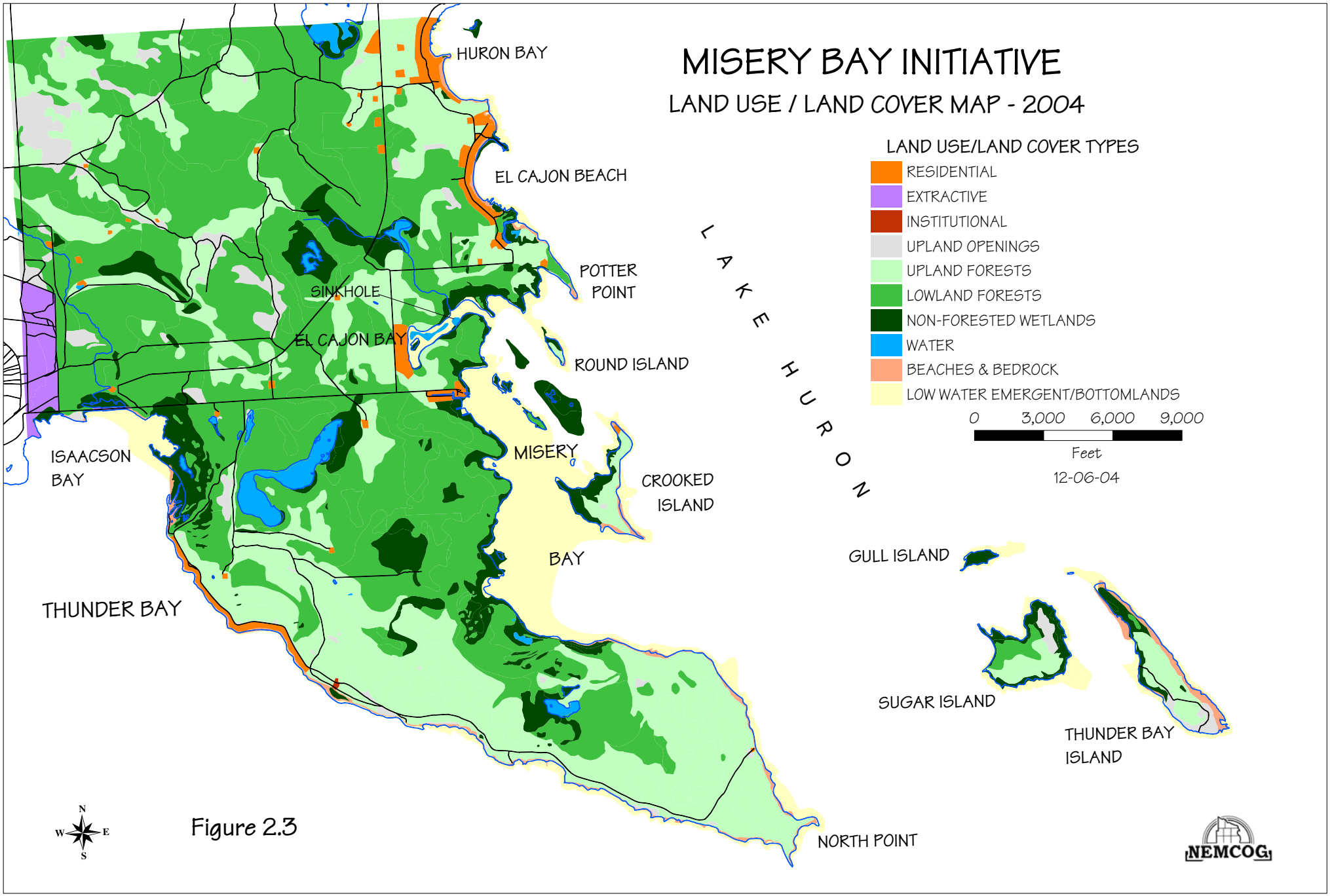
Lowland Forests and Wetlands
Wetlands include land that has sufficient water at, or near, the surface to support wetland or aquatic vegetation. These areas are commonly referred to as swamps, marshes and bogs. The wetland category comprises non-forested types such as lowland brush (tag alder and willow), wet meadows, fens, and marshes. Non-forested wetlands account for 1,602 acres or 10.3 percent of the Misery Bay study area. Lowland forests grow on soils with a seasonally high water table and are often classified as wetlands. 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 6,684 acres or 43 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 Existing 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 1.5 percent of the area. Water bodies include Elbow Lake, Grass Lake and numerous other small unnamed lakes and ponds.

Beaches, Exposed Bottomlands and Bedrock Surfaces
Fluctuating lake levels of the Great Lakes combined with the shallow bays and gradual drop-off of the lake bottom around North Point and Misery Bay greatly influences the extent of these categories from year to year. This approach mapped the extent of these features during low water periods. During low water periods, large expanses of Lake Huron bottomlands within Whitefish Bay, El Cajon Bay and Misery Bay (between Crooked Island and North Point) 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. Areas classified as beaches were delineated from aerial photos taken during high water periods. Based on aerial photos taken during periods of lower water (1963 and 1992) and site visits during the summer of 2003, approximate boundaries of exposed bottomlands were mapped.

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


MISERY BAY INITIATIVE
LAND USE / LAND COVER MAP - 2004
LAND USE/LAND COVER TYPES
RESIDENTIAL
EXTRACTIVE
INSTITUTIONAL
UPLAND OPENINGS
UPLAND FORESTS
LOWLAND FORESTS
NON-FORESTED WETLANDS
WATER
BEACHES & BEDROCK
LOW WATER EMERGENT/BOTTOMLANDS
0 3,000 6,000 9,000
Feet
12-06-04
HURON BAY
EL CAJON BEACH
POTTER POINT
SINKHOLE
EL CAJON BAY
ROUND ISLAND
LAKE HURON
ISAACSON BAY
MISERY
CROOKED ISLAND
BAY
THUNDER BAY
GULL ISLAND
SUGAR ISLAND
THUNDER BAY ISLAND
NORTH POINT
N
W
E
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NEMCOG

Figure 2.3

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.

Table 2.4
Existing Land Use/Land Cover Statistics
Misery Bay Study Area

Land Use Category	Number of Acres	Percent of Area
Residential	285	1.8
Industrial/Extractive	191	1.2
Institutional/Recreational	3	Less than 1
Non-forested Uplands	452	2.9
Upland Forests	4,434	28.5
Lowland Forests	6,684	42.9
Wetlands	1,602	10.3
Beaches and Bedrock Surfaces	166	1.1
Exposed Bottomlands/Emergent Wetlands	1,530	9.8
Inland Lakes	230	1.5
TOTAL	**15,577**	**100**

Source: NEMCOG

The Natural Resource Conservation Service (NRCS) completed a detailed soil survey of Alpena County. A digital or computerized version of the soil survey maps was acquired from NRCS. Using information contained within the unpublished soil survey book, a series of maps are presented that depict hydric soils, soils with building limitations and soils with septic system limitations. **Table 2.5** is a listing of soils and acreage covered by each soil type.

Hydric Soils

Figure 2.4 is a color thematic map that classifies hydric soils. Lower density and less intensive development should be directed to these areas with severe building constraints. 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. Sites with high water tables may be classified as wetlands and a wetlands permit would be required to develop these areas. About 34 percent of the Misery Bay study area is mapped as hydric soils with a high potential for wetlands. Hydric soils are associated with lakes and streams and when covered with natural vegetation, function as important water quality buffers. Note the hydric soils (green areas) are extensive in the northern portions of North Point, along the shoreline of Misery Bay, El Cajon Bay and Whitefish/Isaacson Bay. Hydric soils can be found on Crooked Island and Sugar Island.

Building Site Development

The USDA soil survey of Alpena County rates 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 2.5.** Areas with well drained soils and slopes less than 10 percent tend to have slight limitations for building development. Lands with slight or moderate building constraints are located along the west side of North Point, near Potters Point, Rogers Cove and El Cajon Beach. Areas with slopes greater than 18 percent, high water tables, bedrock near the surface and organic soils have severe limitations. Lands with severe constraints are quite extensive. Some 28 percent of the area is mapped as a thin layer silt loam and sandy loam soils over limestone bedrock.

Table 2.5
List of Soils in Study Area

Soil Type	Soil Code	ACRES	Percent of Area
Tawas-Au Gres Complex	12B	365.42	2.68
Croswell Sand	17A	105.25	0.77
Au Gres Sand	18A	313.57	2.30
Battlefield Sand	29A	256.25	1.88
Tonkey Silt Loam	38	15.68	0.11
Rondeau Muck	68	66.40	0.49
Lupton Muck	70	55.73	0.41
Tawas Muck	71	554.42	4.06
Rubicon Sand	75B	887.79	6.51
Rubicon Sand	75D	82.10	0.60
Pits, Borrow	78	9.76	0.07
Udorthents, Loamy, Nearly Level And Undulating	83B	10.49	0.08
Histosols And Aquents, Ponded	86	573.20	4.20
Cathro Muck	127	2.49	0.02
Pits, Quarry	182	79.36	0.58
Ruse Loam	316	215.49	1.58
Au Gres-Deford Complex	368A	1224.56	8.98
Deford Muck	369	886.92	6.50
Access Denied	380	989.59	7.25
Namur Channery Silt Loam	414B	2092.61	15.34
Potagannissing Silt Loam	415A	778.37	5.71
Alpena Gravelly Sandy Loam	417B	1904.18	13.96
Alpena Gravelly Sandy Loam	417C	4.56	0.03
Chippeny Muck	419	914.03	6.70
Summerville Fine Sandy Loam	482B	443.99	3.25
Lachine Loam	483A	516.11	3.78
Elcajon Loam	484A	63.91	0.47
Water	W	229.38	1.68
Total		13641.61	99.99

Source: NRCS and NEMCOG

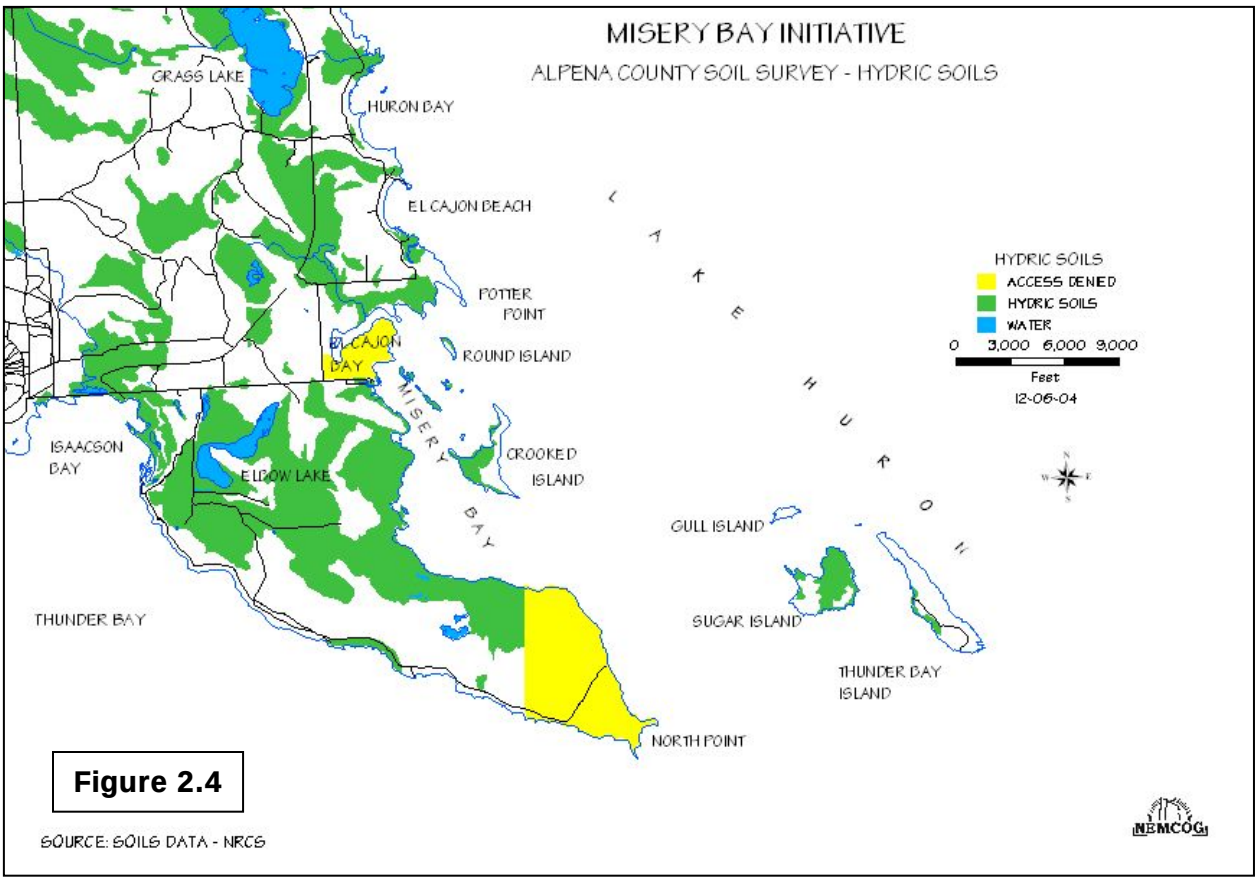


Figure 2.4

SOURCE: SOILS DATA - NRCS

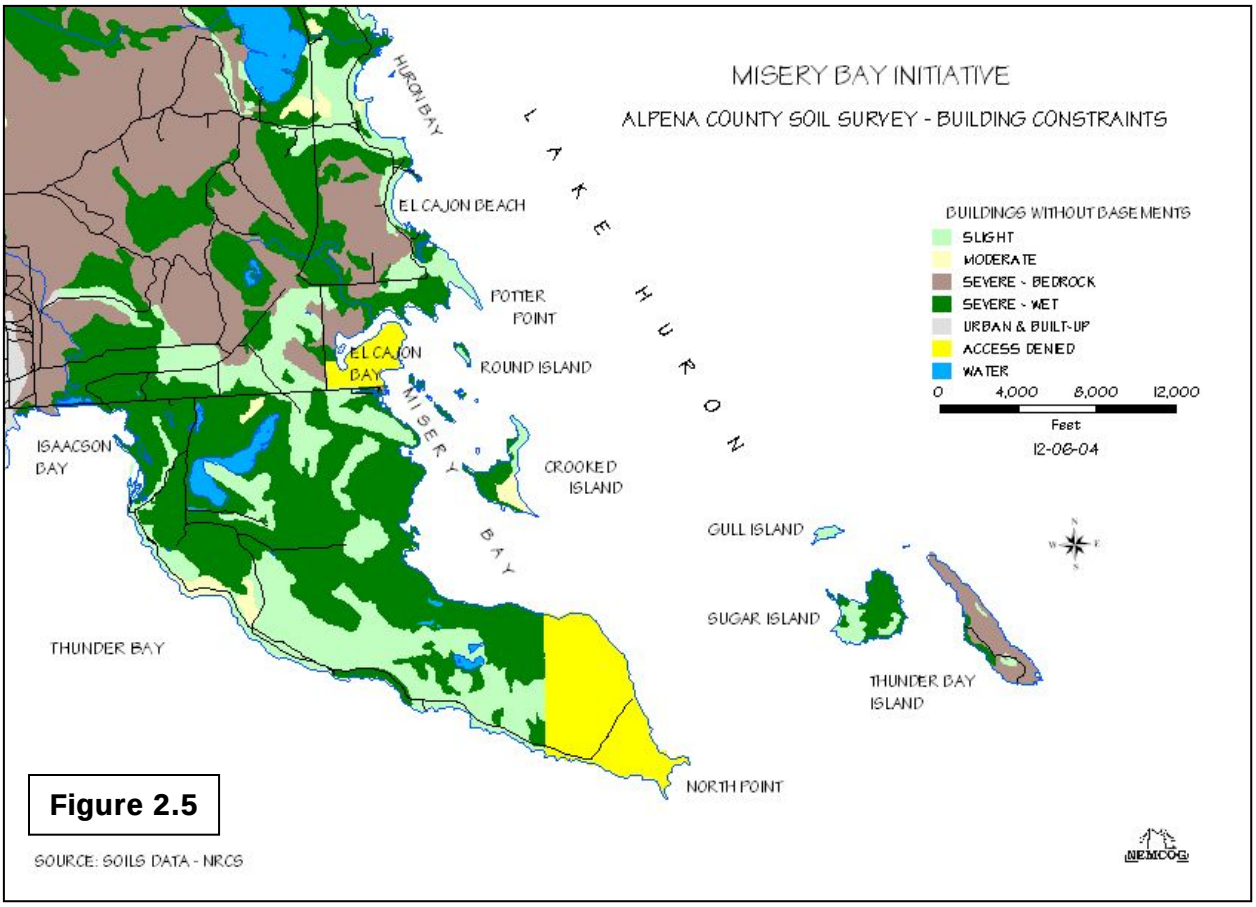


Figure 2.5

SOURCE: SOILS DATA - NRCS

Water Resources

Maintaining high quality groundwater and surface water is vital to the long term sustainability of the community. Residents of the Township must rely on individual wells for drinking water. Streams and lakes provide scenic values and recreational opportunities for residents and visitors. The water resources provide critical habitat components for a wide range of fish and wildlife species. Most importantly, these resources extend far beyond the Township boundaries. As a result, impacts to these resources can have far reaching implications. Inland lakes tend to be shallow with considerable emergent vegetation. Fluctuating water levels are common and tend to coincide with low levels of the Great Lakes. There is no public access to the several inland lakes. Elbow Lake, Grass Lake and Conway Lake are the three largest lakes, **see Figure 2.6**. Other small lakes are not named. Norwegian and Pollock Creeks are located in the study area. Norwegian is a classified as a Type I trout stream. Of course the largest water feature is Lake Huron that bounds two sides of the study area. Unspoiled beaches, low dunes and coastal wetlands abound along the coastline. Its presence influences climate, weather conditions, wildlife, and flora.

Figure 2.6

Geology and Landforms

Limestone bedrock laid down over 300 million years ago and postglacial landforms created thousands of years ago influence types and locations of present day plant communities. This section will describe the glacial and postglacial landforms or quaternary geology and underlying bedrock geology.

Glaciers

Starting some 2 million years ago, during the Pleistocene era, continental glaciers formed in the Hudson Bay area. Several times, over this two million year period, the massive sheets of ice built up and inched their way south across what is today Michigan. The massive ice sheets, more than one mile thick, advanced in a southerly direction, bulldozing their way across the landscape. The glacier pushed material in front of it, incorporated rocks and soil into the debris laden ice; and scraped, ground and broke apart the sedimentary bedrock of the Michigan Basin.

Each advance and retreat of the continental glaciers took tens of thousands of years. This reoccurring process shaped and reshaped the land; first obliterating and then creating hills, valleys, rivers and lakes, swamps and marshes. The last glacial period, called the Wisconsin era, created the landscape we know today. The glacier left behind boulders, rocks, cobble, sand, gravel, silt, clay and loam. In some areas material was deposited in unsorted masses called till plains, ground moraines and end moraines. Water flowing from melting glaciers also sorted materials, creating outwash channels, sand deltas, kames and eskers. Fine materials, captured in fast moving glacial melt water, settled to the bottom of expansive glacial lakes creating lacustrine clay and silt plains. According to a map prepared by W. A. Burgess and D. F. Eschman **(Figure 2.7)**, titled "Landform Units in Northeastern Lower Michigan," Misery Bay is part of the Devils Lake Karst Topography, a landform characterized by fractured limestone bedrock, overlain with a relatively thin mantle of lacustrine sand and gravel.

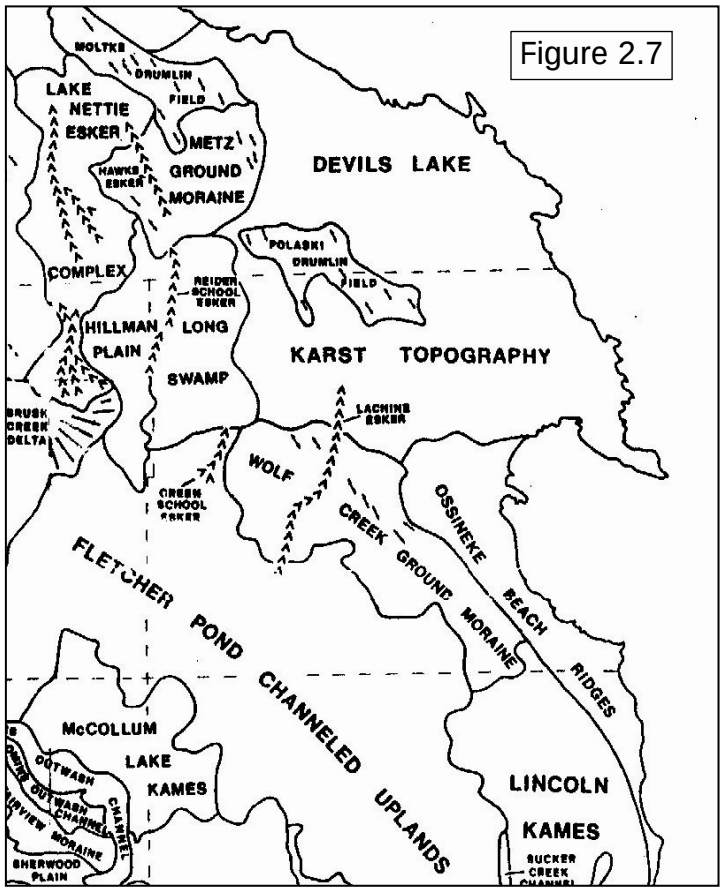


Figure 2.7

Acting like large bulldozers, glaciers broke apart the level sedimentary bedrock and scoured out the large linear depressions. Grand Lake and Long Lake to the north, as well as Misery Bay itself, were created in this fashion. North Point, and many islands and shoals in Misery Bay are stubborn remnants of sedimentary bedrock.

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 pro 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 County. 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 2.8** 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. Oak, aspen and pine forests are common on these old sand dunes. The quaternary geology map classifies the islands as exposed bedrock surfaces. While alvar or limestone bedrock pavement is present, particularly on Thunder Bay Island, a thin mantel of silt loam; sand; gravelly, sandy loam and muck soils cover the islands.

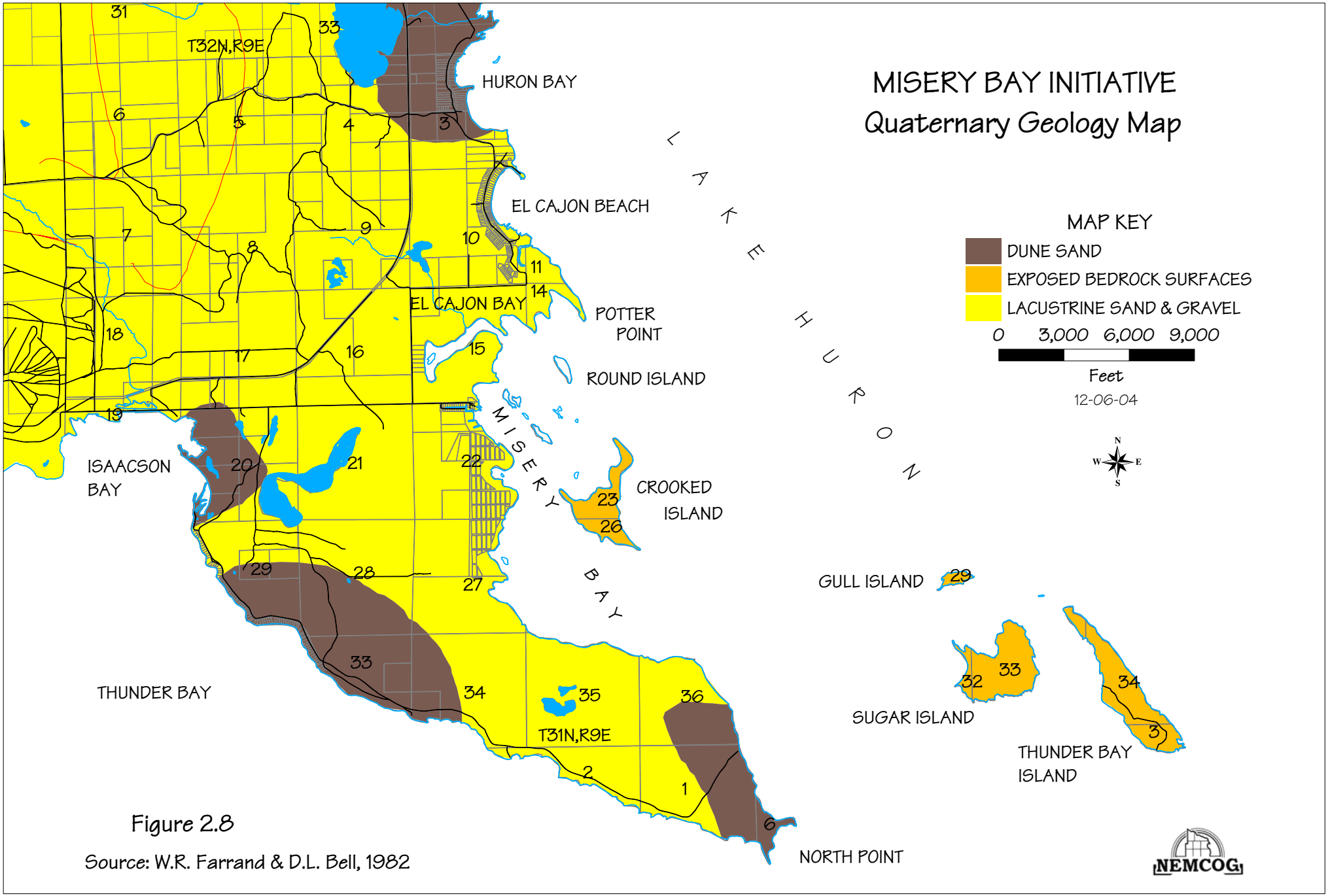


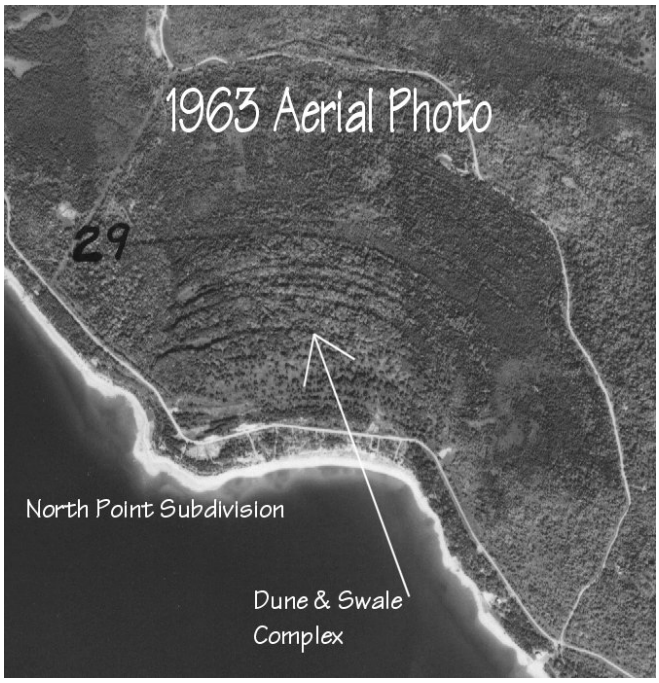
Figure 2.8

Source: W.R. Farrand & D.L. Bell, 1982

Wooded Dune and Swale Complexes

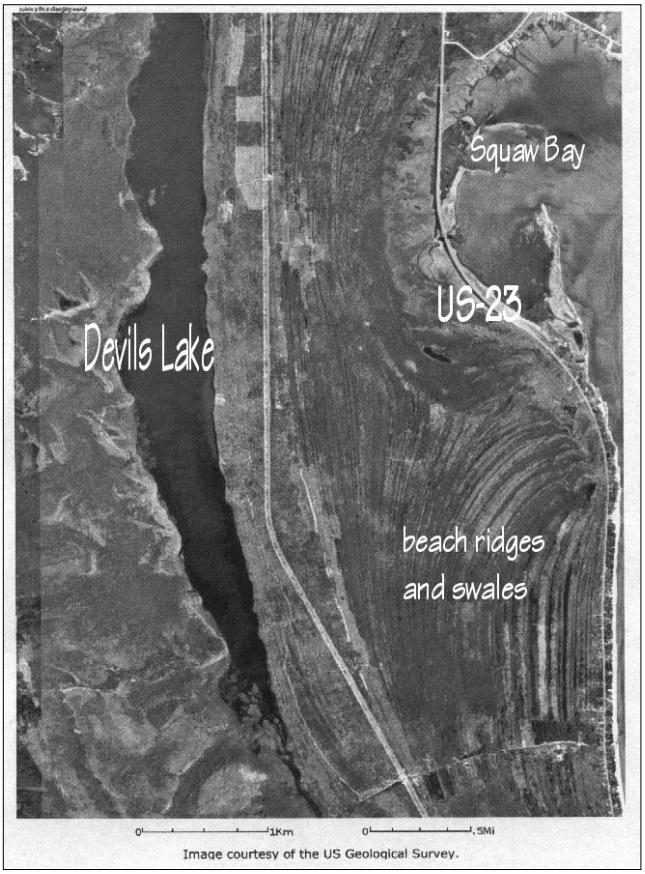
Receding post glacial Great Lakes created landforms known as dune and swale complexes. These landforms are restricted to the Great Lakes coastline and are quite rare, only 95 have been identified with 70 of those being located in Michigan.

Several fine examples can be found along the Alpena, Alcona and Presque Isle coastline. 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. Adjacent to the lakeshore, low dunes support open herbaceous plant communities, successive ridges support shrubs and trees.



Active low sand dunes are located along the west shoreline of North Point. In addition dune and swale complexes and old beach ridges can be found within the study area. There is a forested dune and swale complex located inland from Whitefish Point in Sections 28, 29 and 33 of T.31N.-R.9E. Upland forest species include red oak, white pine, red pine, red maple, white birch and quaking aspen. Northern white cedar, balsam fir, white birch, and quaking aspen are common in wet swales. Old beach ridges, as noted on the quaternary geology map are found in the northwest section of the study area. Native American archeological sites have been found on these inland old beach ridges. Other old beach ridges are located on North Point and can be identified on aerial photos. The ridges are apparent in newer clearcuts and within the coastal wetland complex in Sections 27, 34 and 35 of T.31N.-R.9E.

The Ossineke Beach Ridge landform, though outside the study area, is an excellent example of a well formed dune and swale complex. The complex runs over a mile inland, ending at a large ancient sand dune. This sand dune can be traced from the community of Black River in Alcona County, through Negwegon State Park and Ossineke continuing north into Alpena Township and City of Alpena. Sandhill Road in Alcona County as well as Piper Road in Alpena County follow this dry sandy ridge. The wide sand ridge extends into Alpena Township and the City crossing Werth Road at Hobbs Road, following the west edge of Mud Lake, continuing in a northeasterly direction, crossing the Thunder Bay River and eventually ending northeast of the Thunder Bay Recreation Center.



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 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 mantel 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 is this area is referred to as the Traverse Group. Deposits are further defined as Potter Farm Formation, Norway Point Formation, Four Mile Dam Formation and Alpena Limestone. Rich deposits of Alpena Limestone, Newton Creek Limestone and Genschaw Formation are mined and processed at the Lafarge facility west of the study area.

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 channelways and caves. In some instances the rock above the cavern collapses forming sinkholes.

Karst geology features are prominent in and around El Cajon Bay. The bay itself may have been formed by the collapse of the bedrock foundation. Earth cracks are common around the bedrock rim of the bay. A large sink hole in the bay is the outlet of an underground stream. Water discharge from the outlet empties into Lake Huron and, due to the constant flow and warmer temperature of water, the sinkhole never freezes over. When water levels in Lake Huron are high, the El Cajon sinkhole is submerged, but still visible on aerial photos. During low water levels like recent years, one can walk up to the edge of the sinkhole. The sinkhole discharge water has a different chemical composition than surface water of the bay and has a noticeable sulfur-like aroma. The photo below shows El Cajon Bay and the prominent sinkhole. Other sinkholes are located in Misery Bay and north in the Rock Port area.

> *"Flow in the bedrock aquifers of Northeast Michigan area is generally toward one of two different drainage routes. The most obvious of course is directly toward Lake Huron. The other is toward a cavernous system along a major fault line which in turn drains to Lake Huron. One can easily trace this system through a series of sinkholes and valleys from the Shoepac Lake area to Kelsey Lake and Sunken Lake to Misery Bay by Alpena. There are other faults and probably cavernous systems that branch off of the major system which also act as drains in their areas of influence. This influence is mostly limited to the ground water at the base of the drift deposits and may not have a significant effect on ground water flow closer to the surface." Ty Black*

Natural Features Inventory

The following table is the Alpena County Element List 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 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 49 elements listed in Alpena County, 30 have been found in the Misery Bay area. (Elements found in Misery Bay are shaded gray) This 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 an extensive the Misery Bay area survey were conducted, it is expected a greater number of elements would be identified. For example, in the summer of 2002, a nesting pair of piping plovers was found along Isaacson Bay.

Scientific Name	Common Name	Federal Status	State Status
Acipenser fulvescens	Lake sturgeon		T
Adlumia fungosa	Climbing fumitory		SC
Armoracia lacustris	Lake cress		T
Asplenium rhizophyllum	Walking fern		T
BOREAL FOREST			
Botrychium hesperium	Western moonwort		T
Buteo lineatus	Red-shouldered hawk		T
Cacalia plantaginea	Prairie indian-plantain		SC
Calypso bulbosa	Calypso or fairy-slipper		T
Carex concinna	Beauty sedge		SC
Carex scirpoidea	Bulrush sedge		T
Chlidonias niger	Black tern		SC
Cirsium pitcheri	Pitcher's thistle	LT	T
Clemmys insculpta	Wood turtle		SC
Crataegus douglasii	Douglas's hawthorn		SC
Cryptogramma stelleri	Slender cliff-brake		SC
Cypripedium arietinum	Ram's head lady's-slipper		SC
Dryopteris filix-mas	Male fern		SC
Emydoidea blandingii	Blanding's turtle		SC
Fossils	Geographical feature		
Gavia immer	Common loon		T
Great blue heron rookery	Great blue heron rookery		
Great Lakes Marsh			
Haliaeetus leucocephalus	Bald eagle	(PS:LT,PDL)	T
Iris lacustris	Dwarf lake iris	LT	T
Karst	Geographical feature		
Lanius ludovicianus migrans	Migrant loggerhead shrike		E
Limestone Pavement Lakeshore			
Moist Non-Acid Cliff	Alkaline Moist Cliff, Upper Midwest Type		
Northern Fen	Alkaline Shrub/Herb Fen, Upper Midwest Type		

Scientific Name	Common Name	Federal Status	State Status
Notropis anogenus	Pugnose shiner		SC
Nycticorax nycticorax	Black-crowned night-heron		SC
Pandion haliaetus	Osprey		T
Percina copelandi	Channel darter		E
Pinguicula vulgaris	Butterwort		SC
Pterospora andromedea	Pine-drops		T
Rich Conifer Swamp			
Salix pellita	Satiny willow		SC
Sistrurus catenatus catenatus	Eastern massasauga	C	SC
Solidago houghtonii	Houghton's goldenrod	LT	T
Somatochlora hineana	Hine's emerald	LE	E
Southern Floodplain Forest			
Spring	Geographical feature		
Sterna caspia	Caspian tern		T
Sterna hirundo	Common tern		T
Tanacetum huronense	Lake Huron tansy		T
Trichostema brachiatum	False pennyroyal		T
Trimerotropis huroniana	Lake Huron locust		T
Wooded Dune And Swale Complex			

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.

Vegetation Cover Type Information

Cover type/vegetation inventory maps were compiled of the study area, **Figure 2.9.** The process entailed updating and refining Alpena Township's 1993 land cover inventory. Utilizing remote sensing techniques, the update was accomplished with digital ortho-photo quads from 1992 and 1998, black and white infrared aerial photos from 1998, USDA Soil maps and MDNR cover type maps. Due to the remoteness and restricted access to private lands, limited field checking was possible. Accordingly, the vegetation mapping represents a photo interpretation based effort, not a detailed on-site vegetation inventory.

Forest types and acreage are summarized in **Table 2.6**. Aspen forests are the most prevalent upland type. These aspen types are not homogeneous but have a mix of species such as white birch, balsam fir, white spruce, and northern white cedar. While found throughout the area, note the concentration of these types on the southern part of North Point. Pine and oak forests are found on North Point growing on sandy soils and old beach ridges. Cedar-spruce-fir-tamarack forests are the most common type covering over 5,600 acres. Cedar can be found growing on shallow soils with limestone bedrock near the surface and on organic hydric soils. Extensive areas of lowland conifers (cedar-spruce-fir-tamarack) and lowland hardwoods (black ash, balsam poplar, elm, red maple and aspen) are found along the northeast portions of North Point, around Misery Bay and Isaacson Bay and further inland.

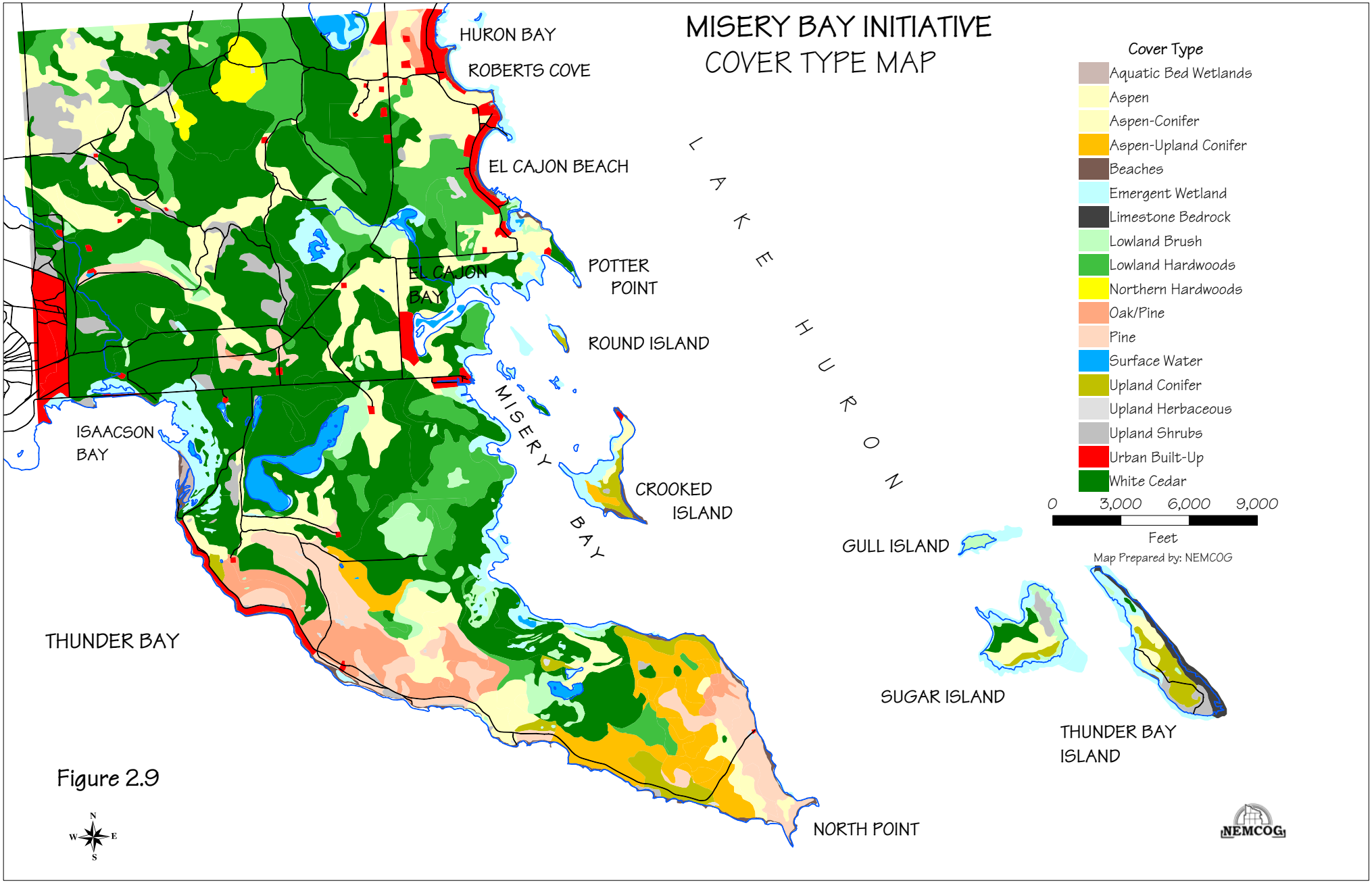

MISERY BAY INITIATIVE
COVER TYPE MAP
HURON BAY
ROBERTS COVE
EL CAJON BEACH
EL CAJON BAY
POTTER POINT
ROUND ISLAND
MISERY BAY
ISAACSON BAY
CROOKED ISLAND
LAKE HURON
GULL ISLAND
THUNDER BAY
SUGAR ISLAND
THUNDER BAY ISLAND
NORTH POINT
Cover Type
Aquatic Bed Wetlands
Aspen
Aspen-Conifer
Aspen-Upland Conifer
Beaches
Emergent Wetland
Limestone Bedrock
Lowland Brush
Lowland Hardwoods
Northern Hardwoods
Oak/Pine
Pine
Surface Water
Upland Conifer
Upland Herbaceous
Upland Shrubs
Urban Built-Up
White Cedar
0 3,000 6,000 9,000
Feet
Map Prepared by: NEMCOG
N
W
E
S
NEMCOG

Figure 2.9

Emergent wetlands are found adjacent to inland lakes and along the Lake Huron shoreline. Fens and coastal marshes are included in this wetland category. Coastal wetlands change in size and species composition as Lake Huron water levels rise and fall. During low water levels wetland vegetation expands out into the exposed bottomlands. Woody plants such as northern white cedar and balsam poplar will expand outward from the forests edge onto dryer sites. Extensive areas of emergent wetlands are found along the northeast shore of North Point, Misery Bay, El Cajon Bay and Isaacson Bay. Sand, cobble and alvar beaches also expand as lake levels fall. Areas classified as beaches were delineated from aerial photos taken during high water periods. Based on aerial photos taken during periods of lower water (1963 and 1992) and site visits during the summer of 2003, approximate boundaries of exposed bottomlands were calculated.

Table 2.6
Summary of Cover Type Inventory

Forest Types	**Acres**	**Non Forest Wetlands**	**Acres**
Aspen-Birch	1,933	Emergent Wetlands	1,021
Aspen-Conifer	578	Aquatic Beds	18
Oak-Pine	428	Lowland Brush	563
Pine	730	Low Water Bottomlands	1,480
Lowland Hardwoods	1,320		
Cedar-Spruce-Fir	5,665	**Other Types**	**Acres**
		Inland Lakes	230
Non Forest Uplands	**Acres**	Beaches/Dunes	149
Upland Herbaceous	48	Limestone/Alvar Beaches	62
Upland Brush	405	Urban Built-Up	483

National Wetlands Inventory

The U.S. Fish and Wildlife Service developed national wetlands inventory program in the 1980's. Through this effort a national wetlands inventory map was compiled for Alpena County. Digital data was acquired from the Center for Geographic Information, State of Michigan, and used to compile **Figure 2.10.** 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.

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 2.11**). A review of the presettlement vegetation map of Misery Bay Initiative area shows extensive areas were covered by spruce-fir-cedar forests and cedar swamps. The map shows pine forests growing in Sections 33 and 34 on sand deposits in a post glacial dune and swale complex. A current cover type inventory compiled for this plan found pine and oak forests growing in this same location. Logging activities over the last century have altered forest types. For example, clearcutting and wildfires increased coverage of aspen and oak forests and decreased acreages of northern hardwoods, pine and hemlock forests.

Fisheries

A variety of forage and game fish inhabit Misery Bay and Thunder Bay. The bays support whitefish, smallmouth bass, walleye, northern pike, perch, salmon and lake trout fisheries. Bedrock and boulder reefs provide spawning habitat for lake trout and whitefish. Numerous shallow areas and shoals limit fishing in Misery Bay to small boats and kayaks. Salmon fisherman ply the deeper waters off North Point.

Thunder Bay is designated a sport fishery. Commercial fishing is allowed in coastal waters south of the 45th parallel. According to the 1836 treaty, Native American could fish the Great Lakes waters north of a line drawn northeast of the Thunder Bay River mouth. Disagreement in the exact location of the southern limit of tribal fisheries has created a "gray zone." The zone is an area between Robert's Cove and North Point, including all of Misery Bay and waters around the islands. The State instituted special rules, such as nets can not be set year round. The waters are utilized as a fall tribal fisheries.

Islands

Limestone and dolomite bedrock forms the foundation of the Thunder Bay Island Group; organic deposits, sand and gravel further define their size and shape. Their size fluctuates, becoming larger as lake levels fall. In the case of Round Island and Crooked Island, during low water cycles, exposed bottomlands form land bridges attaching them to the mainland.

Due to difficult access and private ownership, it was not possible to visit all of the islands. Based on observations made on a trip to Thunder Bay Island and examination of aerial photos and ancillary data, wetlands, sand, cobblestone and alvar beaches, interior mixed hardwoods, balsam fir, and white cedar are present on the other islands. Islands range from less than one acre in size to 214 acres. Below is a list of larger islands, their owners and size.

Thunder Bay Island is the largest island and is publicly owned. The island was once home of a small fishing village and the first settlement in Alpena County. The Thunder Bay Island Lighthouse, put into service in 1832, was the third lighthouse built on Lake Huron. Today, it is the second oldest lighthouse remaining in Michigan. A U.S. Life-Saving Service Lifeboat Station was established in 1876 on the southwest shore of the island. It was built on the site of an abandoned fishing village. [1] *"This station was one of the first five stations established on Lake Huron after their construction was authorized by a 1874 Act. The Life-Saving service joined with the Revenue-Marine Service to establish the U.S. Coast Guard in 1915. The Lighthouse Service was added to the U.S. Coast Guard in 1939. The last log book for the Thunder Bay surfboat station ended in August of 1941. The U.S. Coast Guard remained on the Island until 1983 when the light became automated. All of this took place over a span of 130-140 years."*

[1] "Archaeological Survey of the Commercial Fisheries, Life-Saving Station, and Lighthouse Complex on the Thunder Bay Island Group, Lake Huron, MI" by Erin Williams, Michigan State University

Today only the lighthouse, attached keepers residence and fog horn generator building are all that remain. The Thunder Bay Island Lighthouse Preservation Society is in the process of restoring the structures. Additionally, Alpena Township is working towards acquiring the property around the structures to augment the group's efforts to restore the lighthouse.

Thunder Bay Island is a rare, distinctive, alvar ecological community with a little bluestem alvar grassland, alvar pavement, and a limestone bedrock lakeshore. Forests species found on the islands include northern white cedar, white spruce, balsam fir, white pine, quaking aspen, white birch, balsam popular and American elm. Willow, buffalo-berry, highbush cranberry, sand cherry and dogwood shrubs are common in open areas. According to a "Thunder Bay Island" web site, developed by the MSU Extension in Iosco County, there over 250 different species of plants on the island. This web site contains a listing and photos of many plants found on the island. http://www.msue.msu.edu/iosco/thunderbayisland.htm

Gull Island is owned by the Michigan Nature Association and preserved as the rookery. Islands in the bay are part of the Shiawassee Wildlife Refuge managed by the US Fish and Wildlife Service.

NAME	OWNER	ACRES
Thunder Bay Island	US Government	213.1
Sugar Island	Thomas Parker	191.7
Gull Island	Michigan Nature Association	14.6
Crooked Island	CIA USA LLC	125.3
Round Island	Kenneth Kolasa	9.6

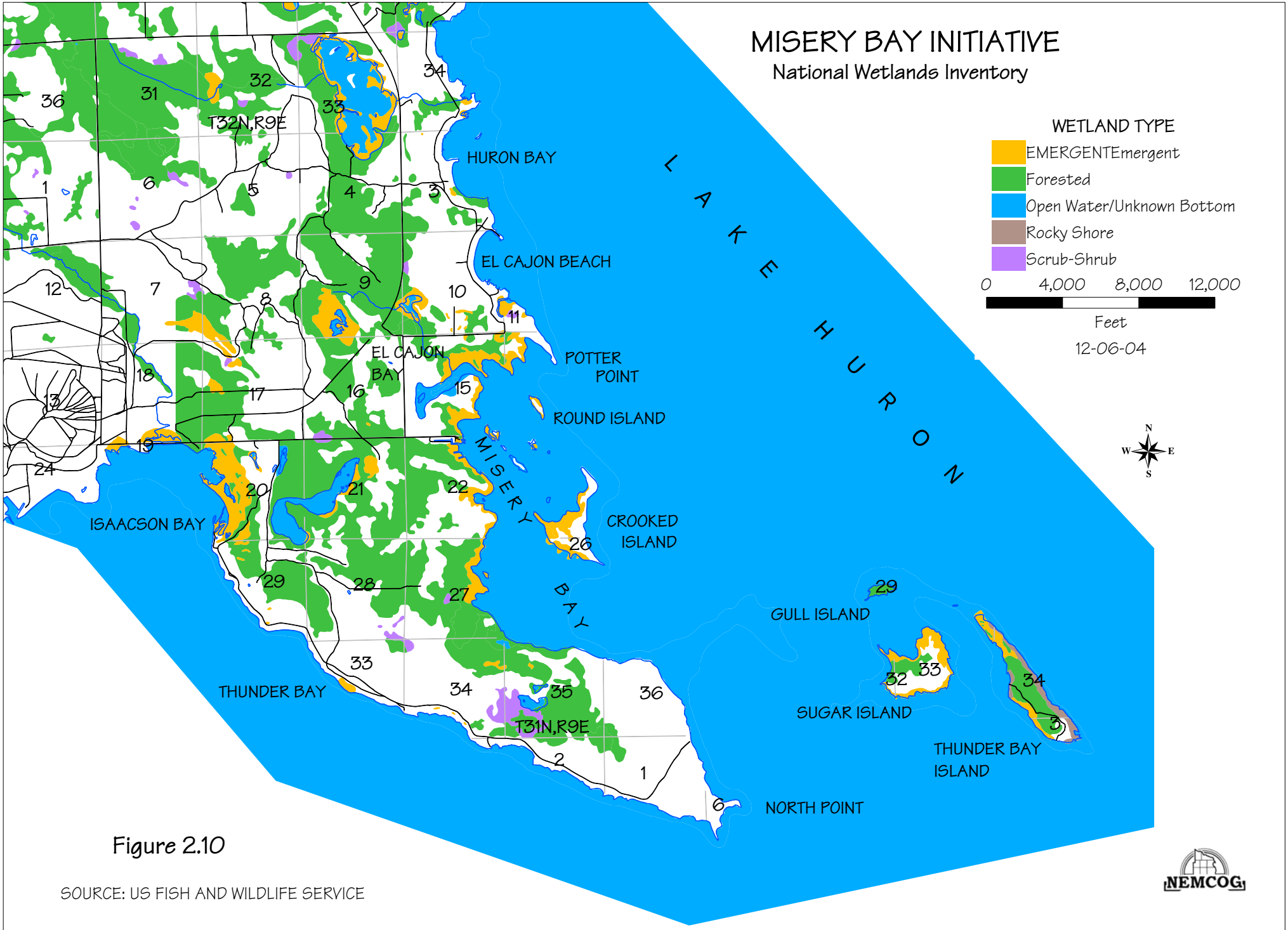


Figure 2.10

SOURCE: US FISH AND WILDLIFE SERVICE

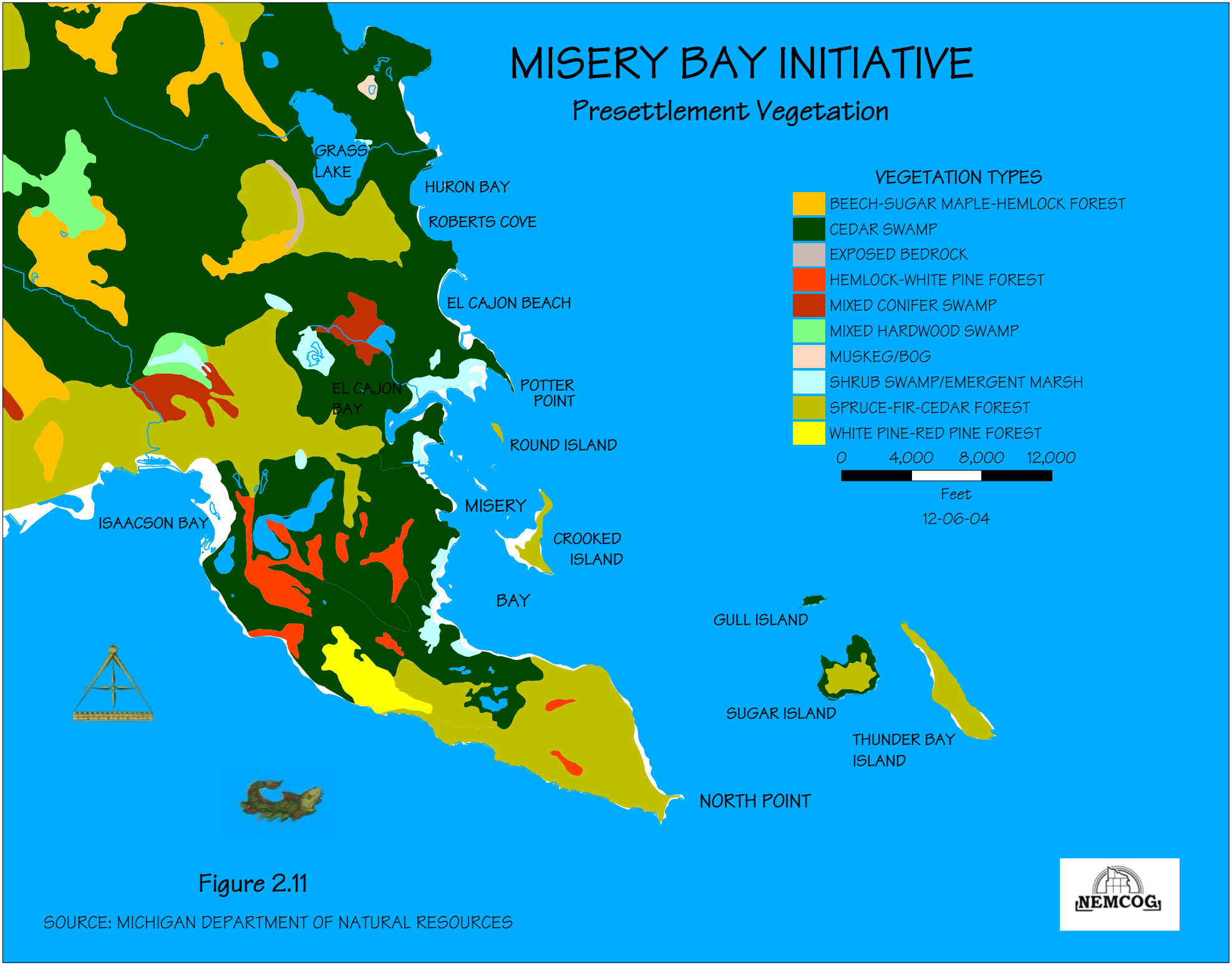


Figure 2.11

SOURCE: MICHIGAN DEPARTMENT OF NATURAL RESOURCES