5-Year Park and Recreation Plan

2023-2027

DRAFT

Saint James Township MICHIGAN

Charlevoix County, Michigan

FLEIS&VANDENBRINK
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PREPARED FOR

St. James Township

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Community Description

Introduction, Location & Township History

This Parks and Recreation Plan is an update of the St. James Township Recreation Plan, which was originally approved by the Michigan Department of Natural Resources (MDNR) in 2018. The purpose of this Plan is to provide a clear direction to decision makers regarding the future development of recreational facilities controlled by St. James Township. In addition, to remain eligible for state and federal funds, the MDNR requires that an updated plan be submitted every five years. This five-year plan update covers the years 2023 through 2027.

Before any recreation plan is adopted and enacted, it is first important to understand the needs of the Community and its residents, what recreational opportunities already exist and what future projects and programs are relevant to the residents of the Community. This input is a critical component of this plan, and the Community has united to develop a recreation plan to enhance the quality of life for everyone in the Community.

The foundation for the development of the St. James Township Parks and Recreation Plan was based on the following goals:

- Involve the community in the process to develop a Five-Year Recreation Master Plan,
- Inventory and map existing St. James Township recreational facilities.
- Build a strong foundation of St. James Township area stakeholders in addressing the future recreational needs and priorities of the Community.
- Enable St. James Township to be eligible for funding assistance based upon the Recreation Plan.
- Facilitate interagency collaboration in establishing recreation goals, objectives, and actions.
- Continue to support and implement improvements for barrier-free, Universal Access to St. James Township area parks.
- Consistency with and expansion upon goals and objectives set forth in existing planning documents that deal partially or wholly with recreation.
- Much effort has been completed as part of past studies in identifying rare species and invasive plants by performing natural resources inventories in 2012 & 2016 by the Michigan Stare University Extension. St. James and Peaine Townships have continued the important effort to build beyond these studies with the creation of the Terrestrial Invasive Species (TIS) Program.

The newly revised Recreation Plan's intended use is to guide St. James Township officials on all future recreational and parks projects within the Township. Specifically, this plan is developed in accordance with the guidelines for Community Park, Recreation, Open Space and Greenway Plans published by the Michigan Department of Natural Resources (MDNR). A five-year, MDNR-approved Recreation Plan is necessary for the government entities to pursue MDNR-administered grants. This plan is written for St. James Township, and it covers all aspects of park facilities and recreation within the community.

Due to its unique relationship with neighboring Peaine Township, as well as unique island-based stakeholder groups (such as but not limited to the Grand Traverse Band of Ottawa & Chippewa Indians, the Little Traverse Bay Bands of Odawa Indians, the Little Traverse Conservancy and the MDNR), many of the goals and objectives outlined in the plan impact the entire island and will require extraordinary cooperation. Furthermore, this plan is intended to integrate with and complement the planning processes, information and objectives of the *Beaver Island Master Plan*, which was originally adopted by both St. James and Peaine Township in 2017 and set to be re-adopted in 2022.

St. James Township is the northernmost area of the Beaver Island Archipelago, which consists of the northern portion of Beaver Island, making up about one-sixth of it, along with the outer islands, except North and South Fox Island. This includes Garden Island, Hog Island, Ojibwa Island (previously known as Squaw Island), Whiskey Island, High Island and Gull Island. Also included in the Township are the Islands of Trout, Pismire, Grape, Shoe, and Hat. This unique environment is what creates a distinctive relationship between Beaver Island (includes Peaine Township), along with St. James Township's neighboring islands that it has jurisdiction over.

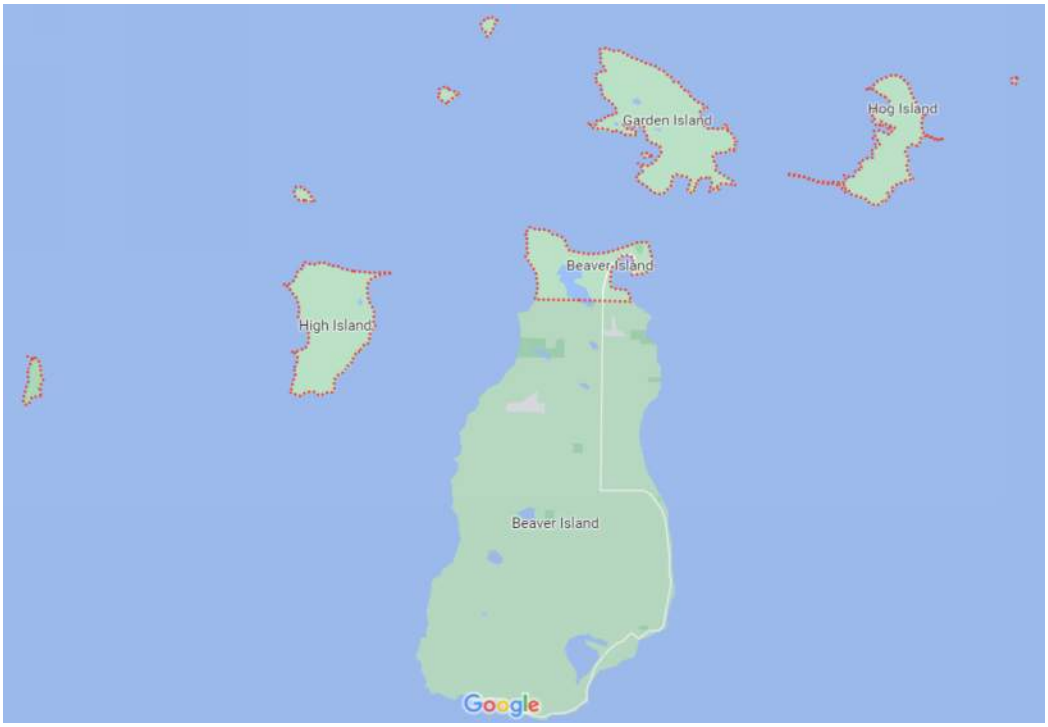

Figure 1 - Township Map

Beaver Island, "America's Emerald Isle", is located in northern Lake Michigan. It is the most remote inhabited island in the Great Lakes and is located about 32 miles offshore from the City of Charlevoix. It is the largest island in Lake Michigan with approximately 56 square miles of land, and the third largest island in Michigan after Isle Royale and Drummond Island. French Explorers called it Isle du Castor, for the castors (beavers) found there. A French settlement (abandoned 1603) was one of the earliest European settlements in the area. Beaver Island has a beautiful natural environment with plentiful dunes, beaches and wetlands, a distinctly diverse ecology and a close-knit community with a proud island heritage.

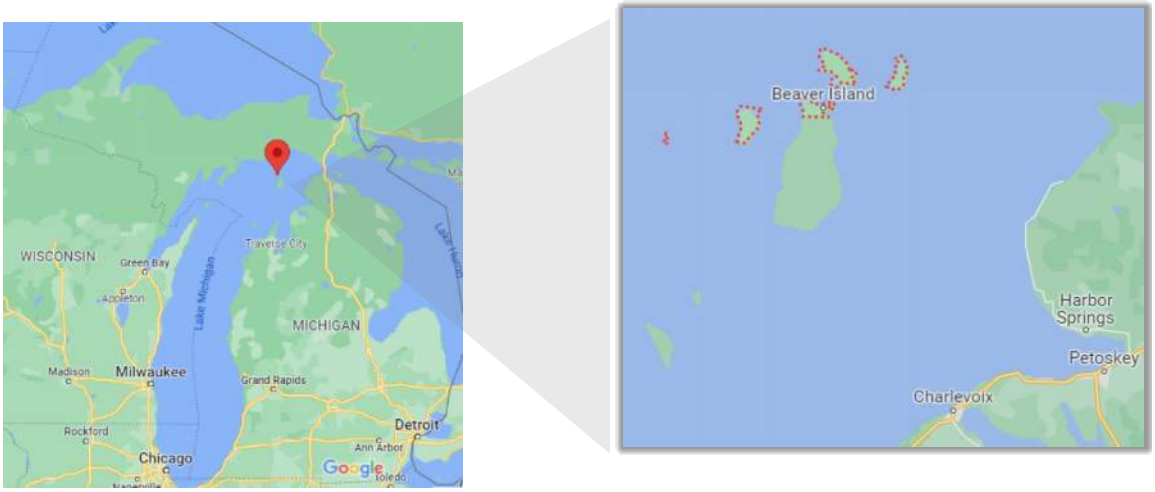

Figure 2 - Township Location

St. James Township has a total area of 315.90 square miles, of which 20.35 square miles is land and 295.55 square miles (93.56%) is water. It is one of only seven municipalities in the state of Michigan to consist entirely of islands. Access to the island's natural resources, including its forest, lakes, beaches, and Lake Michigan itself, is undoubtably a major factor in drawing visitors to the island. The well-being of the community depends on its natural resources as it has since the days when Native Americans and early settlers were living on the islands. Tourism is the backbone of Beaver Island's economy. Beaver Island has historically been a great middle-class family vacation destination, and it still is.

Oral accounts show that Native American tribes passed through Beaver Island on journeys through the Great Lakes, leaving many archaeological artifacts behind. In the mid-1700s, the Odawa migrated westward and permanently settled on Beaver Island. European settlers arrived on the Island in the early 1800s and trapped, fished, and logged on the Island. By 1850, settlers were flourishing on the Island. • Little Traverse Bay Band of Odawa Indians and Grand Traverse Band of Ottawa and Chippewa Indians have ancestral ties and trust lands within the BI Archipelago.

The township was named for James Strang, who led a faction of Mormon settlers to Beaver Island in 1848. Producing mysterious brass plates from the ground, and receiving directives from God, Strang formed a colony on Beaver Island in 1848 called St. James, naming it after himself. The colony contributed to the Island's infrastructure by building roads and homes and cultivating ground. James J. Strang, appointed by Joseph Smith Jr., presided over the Church of Jesus Christ of Latter-Day Saints (Strangite) from 1844 to 1856, when he was killed.

Photo Credit:
Beaver Island Historical Society

Irish fishermen and their families began to settle the Island in the mid-1800s. The population of the Island began to grow steadily. Calling the Island "America's Emerald Isle," these families created an Irish culture that still exists today on Beaver Island. Fishing and logging remained the mainstays of the Island's economy while the Island accepted new groups of immigrants and entered the industrial age. Tourism began in earnest on the Island in the late 1800s, when local merchants began promoting the Island as a pristine yet rustic destination. Vacation cottages were built in the early 1900s and sold to families from Chicago and other Midwestern cities.

Beaver Island faced serious economic challenges in the mid-1900s, when fish population decreased causing the commercial fishing industry to decline. The Island struggled to maintain population until the 1970s, when tourism emerged as the economic anchor of the community, and a new generation of cottages and vacation homes were built. Today, the Island remains among Michigan's most beloved and unique communities. The Island community is a mix of newcomers and long-standing families, each bringing a unique perspective.

The State of Michigan and the United States Federal Government have ownership over many islands in the Archipelago due to the variety of threatened, endangered, and rare plants and animals that live on them. Following is a map of the archipelago and a chart of those Islands located in St. James Township, along with some more specific information on their history. The Beaver Islands State Wildlife Research Area is a networked set of insular properties of the U.S. state of Michigan. The Research Area is approximately 23,154 acres in size. Properties in the Research Area include much of the southern half

of Beaver Island, almost all of Garden Island, all of High Island, all of Hog Island, all of North Fox Island, and most of the northern half of South Fox Island. All of these islands are located in Lake Michigan. The insular research area is overseen by the Michigan Department of Natural Resources.

Beaver Island Archipelago

Figure 3 – Beaver Island Archipelago Location

Beaver Island

According to data of the US census, it has 55.773 square miles of land. The more densely populated part, which comprises a mere 6% of total insular land, is within Saint James Township on the northern part of the island. After 7 years of hard work, the Northern LaBeake Michigan Island Collaborative (NLMIC) finalized their Management Plan for Beaver Island this year (2022). The islands of the Beaver Islands archipelago are listed on Table 1.1 below.

Table 1.1 – St. James Township Islands

Island:	Size:	Inhabited / uninhabited:	Ownership:	Overseen by:	As part of:
Garden Island	4,990 acrea	uninhabited	98% by the state	MDNR	Beaver Islands State Wildlife Research Area
High Island	3,495 acres	uninhabited	100% by the state	MDNR	Beaver Islands State Wildlife Research Area
Hog Island / Grape Island	2,075 acres	uninhabited	100% by the state	MDNR	Beaver Islands State Wildlife Research Area
Whiskey Island	3/8 of a square mile	uninhabited	100% by the state	MDNR	
Ojibwa Island (Formerly Squaw Island)	75 acres		privately owned		
Trout Island	80 acres		privately owned		
Gull Island	230 acres	uninhabited		US Fish & Wildlife Service	MI Islands National Wildlife Refuge
Pismire Island	2.5 acres			US Fish & Wildlife Service	MI Islands National Wildlife Refuge & MI Islands Wilderness Area
Shoe Island	3 acres				MI Islands National Wildlife Refuge & MI Islands Wilderness Area
Hat Island	10 acres				MI Islands National Wildlife Refuge

Garden Island

The name of the Island is from the Native American Ojibwe Anishinaabemowin language *Minis Gitigaan*, which translates to Garden Island. Once fished, farmed, and logged by the Anishinaabeg and other groups, Some of these native Islanders lived on the island year-round, and others lived there during the warmer months. An increasing number of Anishinaabeg from the mainland and Beaver Island owned farms on Garden Island after the treaties of 1836 and 1847, planting corn and squash. Other Anishinaabeg worked as fishermen. This Native settlement shrank during the early 1900s as most of its members moved away. Much of the land reverted to the state of Michigan as a result of the nonpayment of property taxes. The state never properly explained property tax law to the islanders. Other patches of land were abandoned. The last Garden Island resident, Peter Manatou, died in the 1940s. Most of the old-growth timber on Garden Island was cut and sawn by a short-lived sawmill that operated on the island in 1912-1913. A small town, now a true ghost town, was built near the mill and named "Success", Michigan. Garden Island is also home to a Native American cemetery, which is listed in the National Register of Historic Places.

High Island - was originally named after a perched sand dune on its western edge. In the past, Native Americans and settlers lived on the island in small numbers. High Island was the home of a timber-cutting and truck farm operation run in 1912-1927 by the House of David, a millenarian sect based in Benton Harbor, Michigan. The High Island farm grew large quantities of potatoes and other root crops much valued by the House of David congregation, who were vegetarians. Before, during, and after the House of David era, High Island was the home of several extended families of Anishinaabeg Native Americans, who were fishermen. The island supported a public school as late as 1936. However, fish yield in the Beaver Island archipelago began dropping sharply in the 1930s, and after the Armistice Day Blizzard of 1940, the remaining Anishinaabeg moved to Beaver Island. The island is used by researchers and the DNR owns several cabins currently in disrepair. High Island is currently being used by state and tribal researchers for endangered Piping Plover studies and preservation of threatened nesting areas.

Beaver Island
High Island

Whiskey Island (also called Whisky Island) - A shoal off the island was the site of the loss of the schooner Chandler J. Wells on November 20, 1884. She was carrying lumber from Manistique, MI to Buffalo, NY. Whiskey Island is home to one of most visible shipwrecks in the archipelago, the wreck of the Chandler J. Wells.

Ojibwa Island (formerly Squaw Island) - is an island in Lake Michigan and is part of the Beaver Island archipelago. The island is about 75 acres in size and is privately owned. It is located a little under two miles northeast of Whiskey Island, and a little over three miles west of Garden Island.

Squaw Island Light is a privately owned lighthouse located on the north point of Ojibwa Island (formerly Squaw Island), about six miles (10 km) north of Beaver Island. Views of the lighthouse from the water are limited due to vegetation. It was constructed in 1892 at a height of 49 feet, expanded in 1894 and was deactivated in 1928 due to being obsolete because of the construction of the Lansing Shoals Light Station offshore. A work crew from Beaver Island performed significant preservation work on the lighthouse in 2016.

Photo credit: US Coast Guard Archives

Gull Island - is the largest of approximately one dozen islands bearing this name in Michigan. Gull Island also has beaches and sand dunes on its north and east sides. On November 18, 1958, the SS Carl D. Bradley, a cargo vessel that specialized in the transport of limestone for steel mills, foundered and sank 12 miles southwest of Gull Island. The incident included the loss of 33 of the 35 men aboard.

Pismire Island- the word pismire means ant, referring to the island's tiny size.

Hog Island/Grape Island - One of the least disturbed islands in the Beaver Island archipelago, Hog Island is a natural, scenic, recreational and scientific gem. The island is largely forested (including pockets of old-growth northern hardwood), but includes extensive great lakes marshes that are important spawning grounds for perch and smallmouth bass, interdunal wetlands and uncut coniferous swamps and bogs. The island provides habitat for the state-threatened common tern, as well as, three plant species, also state-threatened, that are found only on the shores of the Great Lakes: Lake Huron tansy, Pitcher's thistle and Houghton's goldenrod. Grape Island is the southwestern most portion of Hog Island and when the connecting land submerges, it appears as a separate island.

Shoe Island - When it's not submerged, the island can be seen about a half mile south of Hat Island.

Hat Island - is roughly four-sided, with an SSE-pointing forepeak that is said to look like the upturned brim of a hat. During WWII it was used as a practice bombing site by the US Navy.

Trout Island - is an island in Lake Michigan and is part of the Beaver Island archipelago. The island is 80 acres in size, and is privately owned. There is an airstrip on the island that extends across the whole island to both shorelines. Trout Island is a little under two miles from High Island, and a little over six miles from Beaver Island.

Social Characteristics

Population

Beaver Island is the only Island in the Township that has a permanent population. Most of the township's population lives in the unincorporated community of St. James at the northeastern end of Beaver Island. The population of St. James Township decreased by 106 persons to 259 between 2010 and 2020. That is a decrease of 29.04%. The County as a whole has experienced only a very slight increase from 2010-2020 of 0.40%.

Table 1.2 - Population, 2000-2020			
	2010	2020	% Change 2000-2020
St James Twp	365	259	-29.04%
Charlevoix County	25,949	26,054	0.40%
Michigan	9,883,640	10,050,811	1.7%

Source: 2010 & 2020 US Census Data

Seasonal Population

A seasonal influx of cottage owners, visitors, and boaters is estimated to drastically increase these numbers over the permanent population of the recreational areas in the summer season (Fall and spring see more of the part time residents too). While it is difficult to be precise on the seasonal population, the magnitude of increase during spring, summer, and fall. Note that these figures are only for people who are residents for part of the year but need to be considered when looking at the recreational needs of the area as a whole. Day visitors traveling via ferry or small plane on summer weekends are estimated to add another 20,000 or more to the population of Beaver Island as a whole. According to 2020 Census, ST. James Township area has roughly 280 seasonal/vacation homes.

Median Age

While the overall population is the most important consideration, there are other characteristics to consider when planning for a community's recreation. The age distribution of a community influences the types of facilities and programs needed. Table 1.3 shows that the Township's median age (59.7) is higher than both the County and the State average. This would indicate that the Township has an older age base than the rest of the County due to a higher percentage of persons in the 18 and over age groups. It is over 80%. Of course, the Township should not ignore the other age groups since they still comprise almost 20% of the overall population, but this indicates that the Township has fewer young, growing families as full-time residents than it once did.

Table 1.3 - Median Age, 2010-2020		
	2010	2020
St James Twp	53.1	59.7
Charlevoix County	44.2	49.1
Michigan	39.0	40.2

Source: 2010 & 2020 US Census Data

Household Size

The size of households in St. James Township shown in Table 2-3 follows the Charlevoix County and Michigan trend of decreasing slightly. The general trend toward smaller household size may be due to many factors including end of the baby boomer generation, divorce, widowed older persons and young people waiting longer to get married.

Table 1.4 - Average Household Size in St James Township, 2010-2020			
	2010	2020	% Change 2010-2020
St. James Twp	2.37	2.22	-6.33%
Charlevoix County	2.26	2.21	-2.21%
Michigan	2.53	2.45	-3.16%

Source: 2010 & 2020 US Census Data

Income, Poverty and Employment

St. James Township households had a median income of $68,500 in 2020 estimates. This compares with $60,433 for Charlevoix County and $63,498 for the State of Michigan. There are 4.1% of the people in St James Township that are below the poverty level and their unemployment rate is 5.6%.

Table 1.5 - St. James Township Income, Poverty and Employment, 2020			
	Median Household Income	Poverty Level Rate	Unemployment Rate
St James Township	$68,500	4.1%	5.6%
Charlevoix County	$60,433	9.7%	4.8%
State of Michigan	$63,498	13.1%	6.9%

Source: 2010 & 2020 US Census Data

Physically Challenged

The disability status of a population may be especially significant when considering recreational needs for a community. With 21% of the total Township population affected by some form of disability, these individuals may have difficulty participating in recreational programs, accessing facilities, or even getting to designated public areas. Understanding the disability status of the Township's population may assist decision-makers in determining adequate programs and appropriate locations for recreational activities. With the passage of the Americans with Disabilities Act of 1990 (ADA), all areas of public service and accommodation became subject to barrier-free requirements, including parks and recreation facilities and programs.

Table 1.6 - St. James Township Michigan, 2020						
Label	Total		With a Disability		% With Disability	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total Civilian Noninstitutionalized Population	319	±58	67	±20	21.0%	±5.5
Sex						
Male	136	±36	29	±12	21.3%	±7.4
Female	183	±38	38	±13	20.8%	±7.2
Race And Hispanic or Latino Origin						
White Alone	317	±58	65	±20	20.5%	±5.7
Black Or African American Alone	0	±11	0	±11	-	**
American Indian and Alaska Native Alone	2	±3	2	±3	100.0%	±100.0
Asian Alone	0	±11	0	±11	-	**
Native Hawaiian and Other Pacific Islander Alone	0	±11	0	±11	-	**
Some Other Race Alone	0	±11	0	±11	-	**
Two Or More Races	0	±11	0	±11	-	**
White Alone, Not Hispanic or Latino	317	±58	65	±20	20.5%	±5.7
Hispanic or Latino (Of Any Race)	0	±11	0	±11	-	**
Age						
Under 5 Years	52	±25	0	±11	0.0%	±37.8
5 To 17 Years	17	±9	0	±11	0.0%	±66.2
18 To 34 Years	27	±22	0	±11	0.0%	±52.5
35 To 64 Years	102	±24	16	±9	15.7%	±7.5
65 To 74 Years	73	±23	25	±12	34.2%	±12.1
75 Years and Over	48	±16	26	±11	54.2%	±15.4
Disability Type						
With a hearing difficulty	(X)	(X)	29	±11	9.1%	±3.4
With a vision difficulty	(X)	(X)	5	±4	1.6%	±1.2
With a cognitive difficulty	(X)	(X)	14	±8	5.2%	±2.9
With an ambulatory difficulty	(X)	(X)	39	±17	14.6%	±5.3
With a self-care difficulty	(X)	(X)	4	±4	1.5%	±1.4
With an independent living difficulty	(X)	(X)	19	±10	7.6%	±4.1

Source: US 2020 Census Data

Physical Characteristics

Location & Transportation Network

St. James Township, as well as the southern portions of Beaver Island, can be reached by either ferry or plane from Charlevoix Michigan. The ferry is Beaver Island Boat Company. There are 2 airlines serving Beaver Island daily year-round and ferry service runs from April to around Christmas. They are Fresh Air Aviation and Island Airways.

A couple of the islands (along with Trout Island) in St. James Township have operational airstrips but they are private or state-owned.

St. James Harbor is where most of the day-to-day commerce of the island take place, especially boating and the transportation of goods, services, freight, and passengers by water.

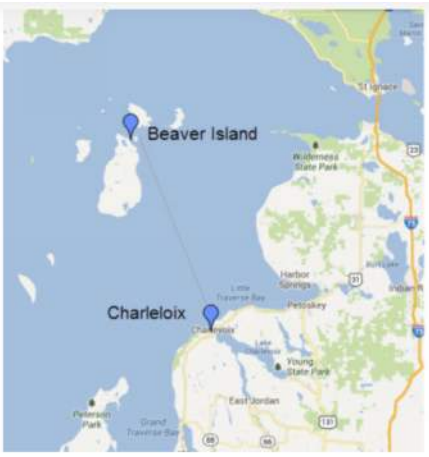

Figure 4 - Ferry location

Figure 5 – St. James Harbor in Paradise Bay

Figure 6 - Beaver Island Road Map

Beaver Island has a road system going almost completely around the island. King's Highway is the main County Primary Road along with some offshoots, totaling about 10 miles. Then there are about 80 miles of County Local Roads, along with several other roads, some being private. There is a Taxi and Delivery Service along with car rentals to enable you to travel on the island. Buses, bicycles, and snowmobiles are other means of transportation. This gives St. James Township a very rural and peaceful character.

Climate

The St. James Township's weather, like all of West Michigan's, influences the recreational opportunities available throughout the year. The area can support a variety of activities four season throughout the year. Generally, January and February are the coldest months (14°F & 13°F average daily temperatures respectively) with January having the highest snowfall (23.5 inches). July and August are generally the warmest months in the Township (76°F & 75°F average daily temperatures respectively). September and October usually have the highest average precipitation (3.6 inches) and February generally has the lowest average (1.4 inches). On average, there are 163 sunny days per year in St. James Township and prevailing winds are from the west.

Utilities Services

Electric Department

Electricity is provided by Great Lakes Energy, the third-largest electric provider in Michigan. Great Lakes Energy provides power to most of Emmet, Charlevoix, and Antrim Counties as well as Beaver Island. The Island is fed through its main underwater line extending from Cross Village in Emmett County. The Island's electric infrastructure is capable of operating entirely on generated power. In the case of emergencies, the Island's backup generators will power the Island.

Water Supply

Property owners and businesses on the Island rely on private wells for drinking water supply. No comprehensive testing of the water supply on Beaver Island has been conducted in recent years, although the Michigan Department of Environmental Quality has done some sampling on the Island in the past. The Health Department of Northwest Michigan requires that new septic systems and water wells meet certain requirements. All Township properties with public water are tested as required by EGLE.

Wastewater

St. James Township owns and operates a small sanitary sewer system on Beaver Island in Charlevoix County, Michigan. As an enterprise fund, the sanitary system costs are funded through user fees in the absence of grants or other outside assistance. Enterprise fund accounting establishes a separate financial reporting mechanism for municipal services when a fee is charged in exchange for goods or services.

Where the sanitary system is not available, waste is treated through privately-owned septic systems on individual properties for most of the Island. Particular soils on the Island may or may not tolerate traditional septic tanks. See the soil discussion in in the Natural Resources section for more information on the Island's soil types. The downtown businesses and several homes near downtown St. James are on a shared community septic system. In 2001, the Township secured a bond to construct the septic system. This system allows downtown businesses to grow with less concern for expanding individual septic tanks. If properly maintained, the community septic system reduces the risk of septic failure of the systems elsewhere in the coverage area. The maintenance and inspection of this septic system is managed by St. James Township. Parcels connected to the community septic system pay additional taxes in order to repay the municipal bond issued to construct the septic system. The septic system has required some significant maintenance, including the repair of a major pipe freeze event in 2014.

Waste Management

The Beaver Island Transfer Station and Recycle Center offers residents, non-residents and commercial customers a safe, clean and environmentally friendly location to dispose of all solid waste and recyclables. It is jointly operated by St. James Township and Peaine Township, and open year-round.

Community Services

Police Department

The Beaver Island Sheriff Office provides an on-island deputy, year-round. **(231) 448-2700; Emergencies: 911**

Fire Department

Beaver Island has a volunteer Fire Department. It is well-equipped, professionally trained, with a new 2nd station south of Hannigan's Road on East Side Drive. **(231) 448-2595; Emergencies: 911**

Emergency Medical Services

BIEMS provides 24-hour Advanced Life Support coverage to the residents and visitors of Beaver Island., BIEMS is primarily staffed by all-volunteer Paramedics, Emergency Medical Technicians and Medical First Responders. **(231) 448-2578; Emergencies: 911**

Beaver Island Post Office

A unique village post office is located in town. The staff provides friendly, conscientious service. **(231) 448-2251**.

Public Library

The Beaver Island District Library has served the community of Beaver Island and its many visitors since September of 1988. It is open year-round. Library patrons and visitors enjoy an extensive and current catalog of print and multimedia resources, along with fax and copying services, WiFi, public computers, and a variety of programming for adults and children alike. **(231) 448-2701; beaverisland.michlibrary.org**

Historical Society

The Beaver Island Historical Society was founded in 1957 to collect and share the fascinating history of Beaver Island. Beaver Island has witnessed many interesting and unique historical events and has been home to various groups including Native Americans, a Mormon branch known as the Strangites, Irish immigrants, fisherman, lumberjacks, and many more. The Historical Society operates two museums on the Island, the Print Shop Museum, lighthouses and the Marine Museum, as well as two additional historical sites, Heritage Park and the Protar Home. Several resources and services are offered by the Historical Society to visitors, including genealogical research, copies of archival photos, and a series of historical journals and other books for purchase. The museums are open daily in the summer and upon request year-around. **(231) 448-2254; beaverislandhistory.org**

Photo credit: LTBB Archives

Land Use

The future land use plan depicts the general preferred organization of land uses in the community. This plan for Beaver Island was developed with careful consideration of several factors, including existing land use patterns, demographic trends, the location of environmental features, desired community character, public input from the planning process, and the availability of utilities and road infrastructure. The future land use plan guides the development of the zoning plan and ultimately influences changes that may be made to the Zoning Ordinance.

The map below identifies the land use patterns within Beaver Island as part of the 2017 Master Plan. As can be seen on the map below, St. James Township, the northern portion of the Island, is comprised largely of the harbor area, downtown, medium-density residential and low-density residential development. Peaine Township, the larger southern main portion of the Island, is slated to be mostly agriculture, public open space, woodland residential, low-density residential, medium-density residential, and commercial development.

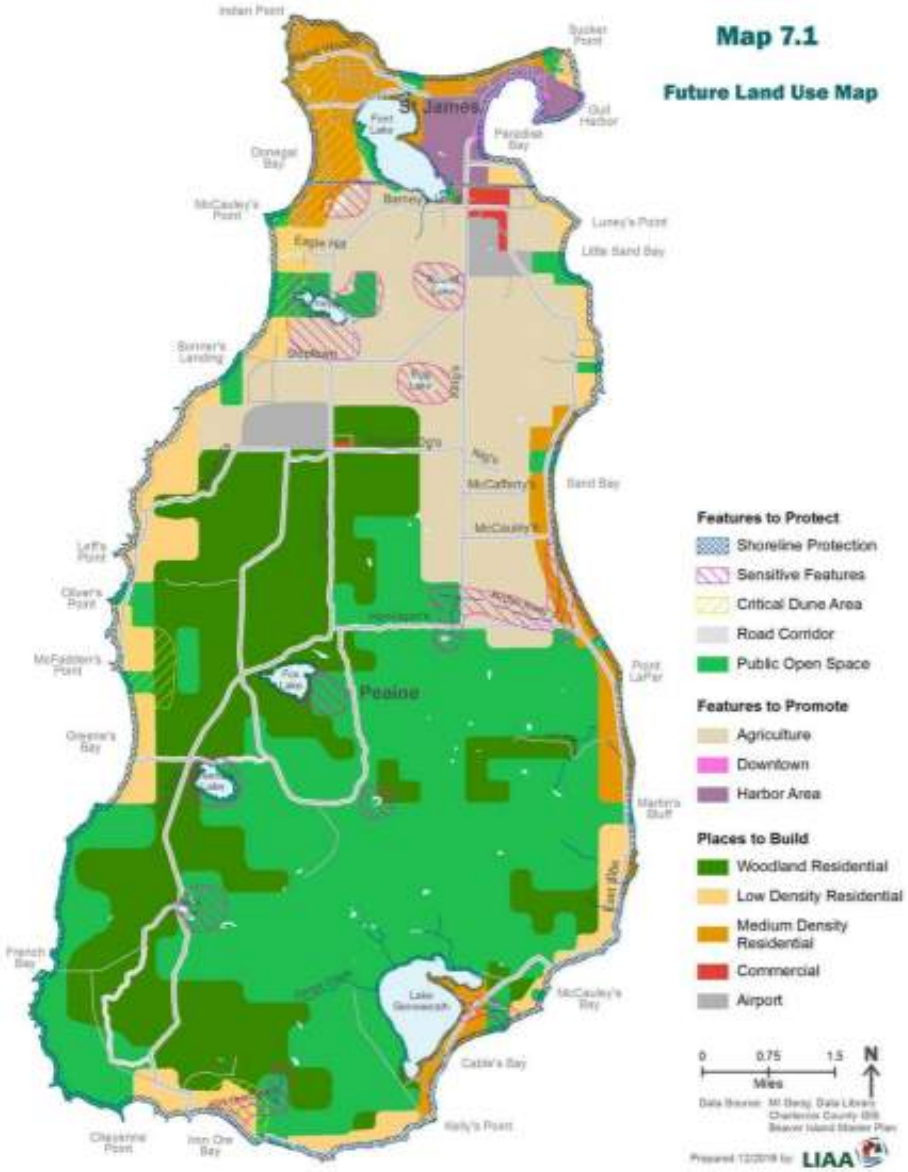

Figure 6 - Future Land Use Map
Source: Beaver Island Master Plan, 2017

Administrative Structure

St. James Township is governed by an elected Township Board consisting of five members: Supervisor, Clerk, Treasurer, and two trustees. The Board is directly responsible for the operation of its recreational assets. Township staff are responsible for much of the day-to-day maintenance of those assets. St. James Twp now has its own Maintenance Director, Joel Meinstma, who oversees all St. James Twp properties as well as the sewer and marinas. The harbor master is entrusted with the responsibility to oversee the proceedings of the harbor and is a vital role for the township.

Many recreational activities are implemented by non-governmental island organizations, such as the Chamber of Commerce, the Beaver Island Historical Society, the Beaver Island Association, Little Traverse Conservancy and Central Michigan University's Biological Station. Active citizens also play an important role in supplementing recreational activities and facilities. For example, a new citizen-based trail committee worked to develop a comprehensive water trail plan for the island.

The Township Board adopts the annual levy and budget of the Township. The current St. James Township budget (April 2022 - March 2023) allocated approximately $78,200.00 for Parks and Recreation. A detailed breakdown of budget expenditures is provided in Table 2.1.

Table 2.1 - Parks and Recreation Budget for Three Fiscal Years

Fiscal Year	2020/2021	2021/2022	2022/2023
Expenditure Item	Approximate Amount		
Wages	$17,200	$15,200	$18,000
Supplies & Equipment	$2,200	$5,500	$16,400
Professional & Contractual Services	$14,000	$7,000	$4,700
Planning for Special Projects	$5,000	$10,000	$10,000
Fireworks	$500	$5,000	$7,500
Capital Outlay	$100	$180,100	$10,100
Portable Toilet Pump Out	$4,000	$5,700	$6,000
Repair & Maintenance	$1,500	$1,700	$2,600
Miscellaneous - Permits	$3,100	$2,500	$2,700
Miscellaneous – Public Safety	$100	$200	$200
Approximate Total	$47,700	$232,900	$78,200
Approximate total GF Revenue	$592,770	$762,065	$583,330
% Devoted to Parks & Recreation	8.0%	30.6%	13.4%

These expenditures support the following recreational areas: B. McDonough Ballpark, JF Gillespie Public Beach Playground Park, Public Restrooms in Village, Boat Launches, Township Campground, Gull Harbor Natural Area, Whiskey Point Lighthouse and Open Area, Township Tennis Courts, Waterways Trail, and several Pocket Parks around the Harbor.

In addition, the 2017-2018 Municipal Dock Fund reflected income and expenditures of approximately $45,000.00 for the summer boating season. Income is from boaters. The Municipal Dock uses the DNR Reservation system and rates are set by the Michigan Waterways Commission. The dock is open from May through September and is run by a part-time harbormaster and two dock assistants. Campground Fees collected was $4,100.00.

St. James Township also works with the Beaver Island Association (BIA). The BIA represent the combined interests of their membership on issues that affect the fundamental character and beauty of Beaver Island. The BIA's mission is to work with local governments to support property owners' views, concerns and investments by:

- Providing a forum for discussion of island governance and property taxes
- Representing membership concerns through township government liaison
- Support preservation and wise use of natural resources, plants, and wildlife of Beaver Island by:
- Collaborating with tribes, environmental organizations, schools, and government agencies
- Proposing environmental conservation policies and / or methods
- Sponsoring environmental education programs and public lectures and presentations
- Publishing a semi-annual newsletter and a continuously updated website
- Monitoring and controlling invasive species
- Cleaning up beaches and campgrounds
- Helping with forest fire prevention

A new partnership among residents of Great Lakes island communities has launched in 2018 called the Great Lakes Islands Alliance (GLIA). The concept was spearheaded by the Michigan Office of the Great Lakes Director Jon W. Allan. Allan envisioned a collaborative approach for the several dozen islands in the Great Lakes with permanent, year-round communities. The GLIA membership currently includes 50 people from 14 island communities of which the Beaver Islands are active members. .

The GLIA partnership is a binational network of volunteer island residents, advocates and leaders from across the Great Lakes and beyond. The alliance will encourage the building of relationships, foster the exchange of information, and help leverage resources to address challenges and embrace opportunities for the benefit of islands.

Recreational Inventory

An essential element of a recreation plan is the inventory of local and regional, public and private recreation facilities that are available to a community's resident. Such an inventory provides a basis from which a comparison can be made of existing recreation opportunities with the community's identified recreation needs. Involving advocate organizations and utilizing the knowledge of the Township staff will help facilitate this element of the inventory process. Further, this facility inventory establishes the foundation from which a recreational improvement program can be developed and implemented.

Township Recreational Facilities

St James Township has a mix of all types and sizes of park facilities ranging from small parks to special use parks. Beaver Island has many natural areas used for rustic tourism such as hiking and fishing, and also that emphasis protection of natural resources such as woodlands, fish/wildlife, and plants. In addition, there are a number of more traditional recreational amenities such as playground, ballfields, and parks

Following are properties that are owned fully or in part by St. James Township, although assets owned by non-profit organizations are also included. In addition, there are some that are not owned by the Township but are within its boundaries. Accessibility is further discussed after the inventory. Maps of recreational assets (including non-motorized trails, the birding trail and the proposed water trail) follow. The service area for all items on the list is all of Beaver Island, which includes both St. James and Peaine Townships.

Table 3.1 - St. James Developed Recreational Assets – Twp/Gov't Owned

Asset Name	Type	Location / Size	Ownership*	Purpose / Use	Aaccess	Accessibility Rating - Public Facilities**
St. James Twp. Campground	Camp-ground	Northern Shore, -40 acres	SJT & CCRC	12 rustic campsites, pit toilets, water pumps	Open to Public	3
Beaver Island Municipal North Marina	Marina	St. James Harbor, ~1 acre	SJT & PT	50-slip dock, harbormaster building with restrooms, picnic	Open to boaters; public	3
Beaver Island Municipal South Marina	Marina	St. James Harbor, ~1 acre	SJT & PT	25-slip dock, harbormaster building with restrooms, picnic	Open to boaters; public	3
Jewell Gillespie Park	Park	St. James Harbor, ~1 acre	SJT	Public beach, with playground equipment, parking	Open to Public	2
LaFreniere Park	Park	St. James Harbor, 1 lot	SJT	Small park, benches, flower gardens	Open to Public	2
Heritage Park	Park	Donegal Bay Rd., across from library	SJT[2]	Outdoor historical displays	Open to Public	

Accessibility Rating**
1 = None of the facilities/park areas meet accessibility guidelines
2 = Some of the facilities/park areas meet accessibility guidelines
3 = Most of the facilities/park areas meet accessibility guidelines
4 = The entire park meets accessibility guidelines
5 = The entire park was developed/renovated using the principals of universal design

Table 3.1 (Con't) - St. James Developed Recreational Assets – Twp /Gov't Owned						
Asset Name	**Type**	**Location / Size**	**Ownership***	**Purpose / Use**	**Aaccess**	**Accessibility Rating - Public Facilities****
Harbor Light Park	Park	Whiskey Point	SJT	Lighthouse, greenspace, lake frontage	Open to Public (lighthouse	3
St. James Twp. Hall	Facility	St. James Harbor, 0.25 acre	SJT	Meeting Room	Limited Use	
Tennis Courts	Park	North of Donegal Bay Rd, ~.75 acres	SJT	2 tennis courts, picnic tables, small park	Open to Public	2
Bud McDonough Memorial Baseball Field	Park	Near St. James Harbor, over 2 acres	SJT & PT	Baseball/Softball Field	Open to Public	2
Gull Harbor Natural Area	Park / Trails	East of St. James Harbor, 14 acres	SJT	Trails, ponds, wetland lake frontage, woods	Open to Public	1
Beaver Island Veterans Memorial Park	Park	St. James Harbor, ~1/2 acre	SJT[1]	Monuments, benches, greenspace	Open to Public	3
Font Lake Boat Launch	Access	Northern shore, small strip of frontage	SJT & PSJA	Boat Launch	Open to Public	1
St. James Twp Government Offices	Facility	37830 King's Hwy	SJT	Twp office, outdoor chimney and swift edv charging station	Open to Public	3
Boat Launch Site	Access	Gallagher Avenue & Main Street	CCRC	Boat ramp	Open to Public	
Iron Ore Bay Public Access	Park / Access	South End Rd., 22 acres and 600' of lakefront	SJT & PT	Beach, picnic tables, pit toilets	Open to Public	2
Donegal Bay Bike Path	Trail	SE out of St. James Campground	SJT[3]	Paved bike path	Open to Public	4

Ownership & Ownership Notes*
SJT = St. James Twp
PT =Peaine Twp
BI = Beaver Island
CCRC = Charlevoix County Road Commission
BIHS = Beaver Island Historical Society
POSJA =Port of St. James Association

LTC = Little Traverse Conservancy
PABI = Preservation Association of Beaver Island
SJT1= Leased from Wolverine Power Cooperative
SJT2 = Leased BI Historical Society
SJT3 = Controlled by SJT through easement rights with private property owners

Accessibility Rating**
1 = None of the facilities/park areas meet accessibility guidelines
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5 = The entire park was developed/renovated using the principals of universal design

Table 3.2 - St. James Recreational Assets – Non-profit or Private						
Asset Name	**Type**	**Location / Size**	**Ownership***	**Purpose / Use**	**Aaccess**	**Accessibility Rating - Public Facilities****
Port of St. James Association (Mt. Pisgah, Donegal Bay Park	Assoc. Prop.	NW corner of the island, including ~500' of lake frontage	POS JA	Hiking trails, picnic pavilion, campground	PSJA property owners and their guests	
Beaver Island Marine Museum	Facility	St. James harbor	BIHS	Indoor and outdoor historical displays	Open to Public	
Beaver Island Print Shop Museum	Facility	St. James Village	BIHS	Indoor historical displays	Open to Public	
Beaver Island Community Center	Facility	Harbor area, ½ acre	PABI	Auditorium, kitchen, game area, radio station studio	Open to Public	
Beaver Island Water Trail	Water Trail	Various	Various	Various	Open to Public	
Beaver Island Birding Trail	Trail	Encompasses ~12,000 acres	Various	Nature trail (both hiking and driving) for bird viewing	Open to public	
Stanhope Family Nature Preserve	Nature Preserve	13 acres	LTC	Trails, forest	Open to Public	
George & Althea Petritz Nature Preserve	Nature Preserve	Northeast of town, 27 acres and 500' of lakefront	LTC	Trails, forest, lake frontage	Open to Public	

Ownership & Ownership Notes*
SJT = St. James Twp
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Table 3.3 - St. James Recreational Assets – Vacant						
	Type	Location / Size	Ownership*	Purpose / Use	Aaccess	Accessibility Rating - Public Facilities**
Edward. B Wojan Public Beach Park	Park	St. James Harbor - 2.9 Acres	SJT	Beach – Undeveloped property currently under acquisition	Undeveloped	1
Resale Shop	Facility	North of Donegal Bay Rd	SJT & PT	Fire Department Auxiliary Resale Shop	Charitable Business	
Donegal Bay "Sunset Beach" Property 1	Open Area	Off Island Woods Rd. N, 1 lot	SJT	Vacant	Undeveloped	- -
Donegal Bay" Sunset Beach" Property 2	Open Area	Off Island Woods Rd, 1 lot	SJT	Vacant	Undeveloped	-
Vacant Harbor Frontage Lot	Open Area	St. James Harbor, 66' of frontage	SJT	Vacant	Open to Public with restrictions	
Font Lake Property 1	Open Area	Across from boat launch, ~2.3 acres	SJT	Vacant	Undeveloped	-
Font Lake Property 2	Open Area	South side of Font View Ct, ~1/2 acre	SJT	Vacant, Font Lake Frontage	Undeveloped	-
Former DNR Land and Building	Facility	Harbor Area, 3 acres	SJT	Harbor frontage with a house and garage, open area and forest	Now vacant residence of	
Kings Highway Property	Open Area	West side of Kings Hwy, south of Hannon	SJT	Vacant lot	Undeveloped	-

Ownership & Ownership Notes*
SJT = St. James Twp
PT =Peaine Twp
BI = Beaver Island
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Township Recreational Facilities – Expanded Descriptions

Harbor View Park and Public Restrooms - is located on Main Street of St. James across from the Beaver Island Municipal South Marina. Restrooms, baby changing station, picnic tables, solar charging station for phones and laptops, drinking water and bottle dispenser are located here for public use at all hours.

LaFreniere Park - is a very small park located in the heart of downtown St. James, directly adjacent to the Beaver Island Boat Company dock. The park has a paved walkway and patio area, with benches, all surrounded by flower gardens, bushes, and a few small trees. The park does include some sandy lake frontage. Due to its small size and proximity to commercial properties on either side, the park is not advertised as a beach, and use of the park is mostly limited to the garden area. Although its size may preclude it from becoming a public beach, it is possible that the property could be a launching site for paddlers of kayaks, paddleboards, and other portable boats.

Heritage Park - is leased to the Beaver Island Historical Society and has many exhibits of trains and carriages used on the Island in its past. It is also a great picnic area and is located across from the Beaver Island Public Library on Donegal Bay Road.

Beaver Harbor Light Park - is located at Whiskey Point, on the mouth of the harbor. By far its most notable feature is the Beaver Island Harbor Lighthouse, the current iteration of which was built in 1870 and is still active. The park also contains a small monument to Beaver Islanders who have been lost at sea, and a few park benches. The St. James Township Hall is located near the property, as well as the Central Michigan University Biological Station's boathouse—a former United States Coast Guard Lifesaving Station—from which Great Lakes research is conducted. The hall, itself a former Coast Guard building, also has on display the fourth-order Fresnel lens that was once installed in the lighthouse. The lens is viewable from the outside of the building, via an access ramp. Most of the property of the park is an open, grassy field. Although there is lake frontage, there is no development for any marine activity, and the beach is not particularly sandy or welcoming for bathers. It is, however a stop on the Beaver Island Water Trail. In the future, it is possible that the township may wish to increase the beach or maritime recreation capacities of the park. There is also need for a public restroom at this property, as there are no such facilities on this part of the harbor, despite being a popular destination for tourists.

Jewell Gillespie Park and Beach - is a public beach and playground on the harbor. Two of the four lots that make up the park are co-owned by Peaine Township. The park is a fairly small, sandy beach with a variety of playground equipment located in downtown St. James. Jewell Gillespie Park is an extremely popular swimming beach during the summer months, especially during the peak of the island's tourist season in July and August. The park contains a sandy beach, with playground equipment, as well as a small grassy area with picnic tables and a family-style outhouse. Additional beach area and a paved parking lot were all added to the park in 2001, but the beach and the adjacent road remain very crowded during peak season. Due to its popularity, the township needs to upgrade to a restroom/changing room with running water, tied into the municipal sewer. Drinking fountains, or some other means for beachgoers to fill water bottles, are also needed. The township would also be interested in increasing the size of the park, if the adjacent properties were to become available.

Iron Ore Bay Beach - is owned by both St. James and Peaine Townships and is located on the south end of Beaver Island. It is well worth the drive as it is a wonderful sand beach with views of the Fox Islands. Restrooms are across the road from the parking area and there is an Emergency Phone at the parking area.

Donegal Bay Beach - is one of St. James Township's premiere beaches and is located on the west side of the Island. This stretch of beach has a beautiful sandy shore with great swimming and stunning views of High Island. This beach is also known as SUNSET BEACH or Sunset Corner and offers truly magnificent sunsets. Located three miles west of St. James Harbor on Donegal Bay Road - it is easily biked to.

St. James Township Campground - located at the end of the Donegal Bay Trail and Bike Path. It is a little over a mile from the Ferry Dock in St. James to the Campground. Tent and RV camping is available at the St. James Township Campground There are 11 rustic sites and 6 electric sites as well . Recently installed outdoor showers and portable restrooms are available free for all campers. The campground is run under the supervision of a Camp Host located on site and is available to assist campers as needed.

Beaver Island Municipal Marina (North & South)

Boaters in the harbor are served by the two Township owned marinas. Both of these sites need to be upgraded to meet growing demand. With a renewed focus on tourism island-wide, it is in the utmost interest of both St. James Township and the island at large to capitalize on the harbor's natural beauty and shelter by making sure that its supporting facilities are the best that the island can offer, and on par with the expectations of modern boaters.

Marina South

Marina North

The Beaver Island Municipal Marina is located on Paradise Bay right in the heart of downtown St. James, just a few minutes' walk from many of Beaver Island's most popular destinations. The Municipal Marina includes two locations. The South Marina is located next to the ferry dock and is open from June 3-September 5. The South Marina has twenty-five slips, of which twenty-three are for transient boaters and two are seasonal slips. Sixteen of these slips have no minimum length for boats: five of these have a maximum length of 25', two have a maximum of 30', and nine have a maximum length of 35'. The remaining nine slips have a minimum length of 35' and a maximum of 60'. All of the slips have water and power.

The South Marina docks are barrier-free and handicap accessible. No wheelchair lifts are available for loading/unloading from boats to the dock at this time. The harbormaster building, including the restrooms, showers, laundry, and lounge are all barrier-free and ADA compliant.

St. James Township purchased the north marina property from the Anderson family in 2019, the previous owners, thanks to a donation from the JA Woollam Foundation. The 50-slip north marina features public green space, launch. The North Marina with fuel dock is open May 15 - September 30. Both locations offer WIFI, lounges, restrooms with showers, ice, and laundry facilities.

Marina South

Marina North

The conservation easement, which is part of the gifting agreement, allows St. James Township to operate the marina, provide for boat fuel sales, opens up land for public access to greenspace and boat launch, including an area for a kayak launch, creates greenspace on both sides of the road and adds additional boat trailer parking and limits car parking on the harbor side of road to enhance the view.

Paradise Bay, sometimes known as Beaver Harbor, St. James Harbor or simply “The Harbor,” is a remarkable example of a natural, sheltered harbor. It is extremely popular with boaters, as is evidenced by the many public and private docks that dot its shores, as well as the many boats that pepper its waters throughout the summer months. The harbor is a cornerstone of the island’s economy, as the transportation of freight and passengers both depend on its shelter. The town of St. James and the majority of the island’s retail and commercial businesses are all located on its shores.

Beaver Island’s economy depends on recreational tourism. Paradise Bay is undeniably the hub of recreational boating on the island. It is one of the only places to launch a boat. It is the destination of anyone boating to the island on private vessels. It is the staging point to get to anywhere else around the island, and to the outer islands—such as Garden Island or High Island. The harbor is also an extremely important point of refuge for boaters—both recreational and commercial—during poor weather.

Annual Maintenance Schedule - The harbormaster building and docks are closed down each fall, and re-opened every spring. A bubbler system is in place throughout the winter months. Although much of the maintenance and upkeep of the BIMD is performed on an as-needed basis, a thorough inspection of the docks, property, and building are performed each spring, and any major repairs (winter damage, etc.) are carried out at that time. Lawn and landscaping maintenance, as well as tightening or any other maintenance of the dock boards, are all performed as needed throughout the spring and summer. Licensed plumbers and electricians perform any needed maintenance or repairs of those systems as needed. Various items, such as the loaner bicycles, washers/dryers, and handheld marine radios are replaced infrequently, but as needed.

Dredging – History. In 2013, St. James Township was approved for $1 million for dredging under the Michigan State Waterways Commission’s emergency dredging plan. Due to the subsequent rise in lake levels, however, no actual dredging took place.

Future Dredging - St. James Township does not anticipate the need to dredge the area near the BIMD in the next five years.

Gull Harbor Natural Area

The Gull Harbor Natural Area was made possible by a consortium of grants and supporters: St. James Township, Central Michigan University Biological Station and the Michigan Department of Environmental Quality Coastal Management Program.

The Preserve is a coastal wetland that is accessed via the Gull Harbor Road (locally known as Car Wash Road) between Whiskey Point and Sucker Point. Trails and seating areas are in place while the landscape is constantly changing due to Lake Michigan flux of high/low water levels along this coastal shoreline. The signage is down due to high water but is located east of the Little Traverse Bay Conservation Area on Gull Harbor Road.

Font Lake Boat Launch

The Font Lake Boat Launch is located on Donegal Bay Road roughly two miles from St. James Harbor - directly across from Font Lake Road. Font Lake boating is limited to small craft due to shallow waters, loon nesting and floating vegetative mats. Slow speeds of any motor craft is highly recommended and encouraged. All vehicles and trailers are to be parked on Font Lake Road in widened berm area.

Beaver Island Water Trail

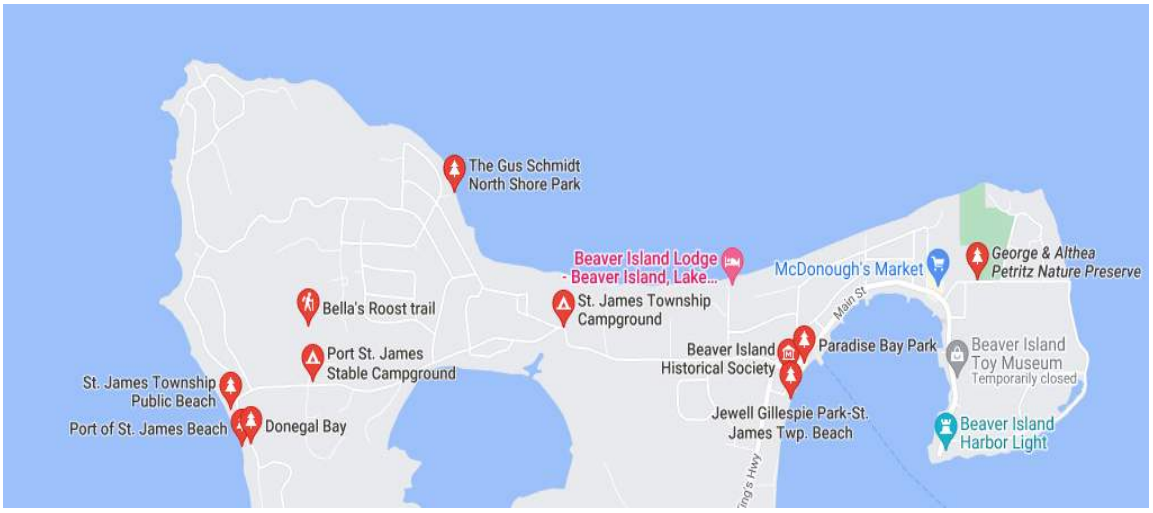
The Beaver Island Water Trail is a 42-mile (68 km) paddling trail that circumnavigates the entire Island. While some parts of the Island (such as Paradise Bay and inland lakes) are more family-friendly areas to paddle, most of the Water Trail is geared toward adventure paddlers who are comfortable paddling in the unpredictable conditions of Lake Michigan and accustomed to rustic access sites and overnight beach camping. If you are a novice paddler, consider a trip to the Island's harbor or inland lakes, or consider hiring a paddling guide. A detailed guidel of the water trail is inlcuded in the appendix of this 5 year plan.

Beaver Island Water Trail

Lake Michigan Boat Launches

St. James Township does have arrangements for public boat launching at two separate locations in the harbor. One of these is at the aforementioned former Anderson's Marina which is now owned by the Township and renamed Beaver Island Municipal Marina North.

The township also maintains an easement on another boat launch, located at the end of Gallagher Street, just to the west of Anderson's Marina. Although this area is usually somewhat less crowded, there are still limiting factors to its usefulness as a public boat launch. As with Anderson's, there are no existing parking facilities, forcing vehicles and trailers to park along Gallagher Street. Not only does this cause the road to be narrower, but it also blocks the line of site of pedestrian and vehicular traffic. On particularly busy days, it also can lead to the blocking of private driveways, as well as of the nearby St. James' Episcopal Church. In addition to the parking problems, the adjacent property is a tug and barge shipping business. This could cause safety concerns for both the shipping crew as well as the public.



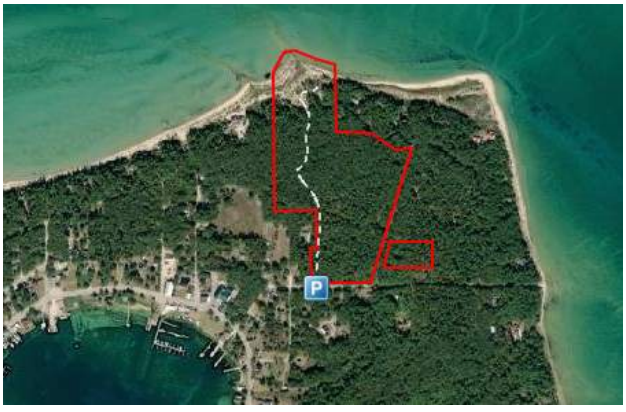
Map of Park Facilities

Former DNR Property

The Former DNR Property, which includes a boat launch area and a submerged dock, is an integral piece of the future for the harbor. The property is approximately three acres, along the west side of the harbor. Across the road from the waterfront is a house, utilized by the summer deputy, with a large backyard and over an acre that is currently wooded. Within the past ten years, plans were drawn up to install a boat launch, fishing pier, and a small park at this property, but these plans never came to fruition. While something of this nature remains a possibility, the township may wish to pursue other projects at this site. One such idea is a small park with a kayak/small craft launch site. Another is the possibility of installing a fishing pier or small boardwalk at this site. The yard behind the house is fairly flat and could be a good place for a parking lot. The wooded area behind the house's backyard could stay wooded and serve as a small park, or cleared to increase parking or open space. The largest problem associated with the lakefront of this lot is the relatively industrial nature of the adjacent properties, many of which are used by fuel barges, fishing boats, and other commercial maritime activities.

Non-profit Recreational Facilities

George and Althea Petritz Nature Preserve– Little Traverse Conservancy



Located at the northeast end of Beaver Island, this 27-acre preserve is within walking distance from St. James Bay and town. A trail from the road takes you to the beach.

In 2005, John Woollam started a vision of land protection for this beautiful corner of Beaver Island. Over the next several years, he made a series of six purchases to form the Petritz Preserve and then named it in honor of the family from whom he purchased the original 13 acres. In his description of the preserve, he wrote, "People, animals, plants, and trees allowed. All other human-made structures or objects are prohibited. I would like it to remain a place to appreciate nature quietly."

Stanhope Family Nature Preserve – Little Traverse Conservancy

Comprised of 13 acres of mixed upland hardwood forest, the property lies adjacent to township property along Gull Harbor Road and parallels the shore. A section of road east of the preserve parking is currently flooded (2022). The purchase of this land was funded by Ray and Ann Stanhope in 2020. A primary part of our motivation was to ensure that people could still easily hike through the Limestone Ridge Trail where it comes through there.

Beaver Island Archipelago

As previously mentioned, many of the islands within the Beaver Island archipelago fall under the jurisdiction of St. James Township, except North Fox Island and South Fox Island, which are not part of Charlevoix County. Ojibwa Island (formerly known as Squaw Island), Trout Island, and a small fraction of Garden Island are privately owned, while the rest are publicly owned by either the State of Michigan or the United States Federal government. Although these public properties are not owned by the township, they technically fall within its boundaries and should be treated as recreational assets.

Beaver Island Archipelago

Table 3.4 – St. James Township Islands

Island:	Size:	Inhabited / uninhabited:	Ownership:	Overseen by:	As part of:
Garden Island	4,990 ac	uninhabited	98% by the state	MDNR	Beaver Islands State Wildlife Research Area
High Island	3,495 ac	uninhabited	100% by the state	MDNR	Beaver Islands State Wildlife Research Area
Hog Island / Grape Island	2,075 ac	uninhabited	100% by the state	MDNR	Beaver Islands State Wildlife Research Area
Whiskey Island	3/8 of a square mile	uninhabited	100% by the state		
Ojibwa Island (Formerly known as Squaw Island)	75 ac		privately owned		
Trout Island	80 ac		privately owned		
Gull Island	230 ac	uninhabited		USFWS*	MI Islands National Wildlife Refuge
Pismire Island	2.5 ac	uninhabited		USFWS*	MI Islands National Wildlife Refuge & MI Islands Wilderness Area
Shoe Island	3 ac	uninhabited			MI Islands National Wildlife Refuge & MI Islands Wilderness Area
Hat Island	10 ac	uninhabited			MI Islands National Wildlife Refuge

*US Fish & Wildlife Service

School Recreational Facilities

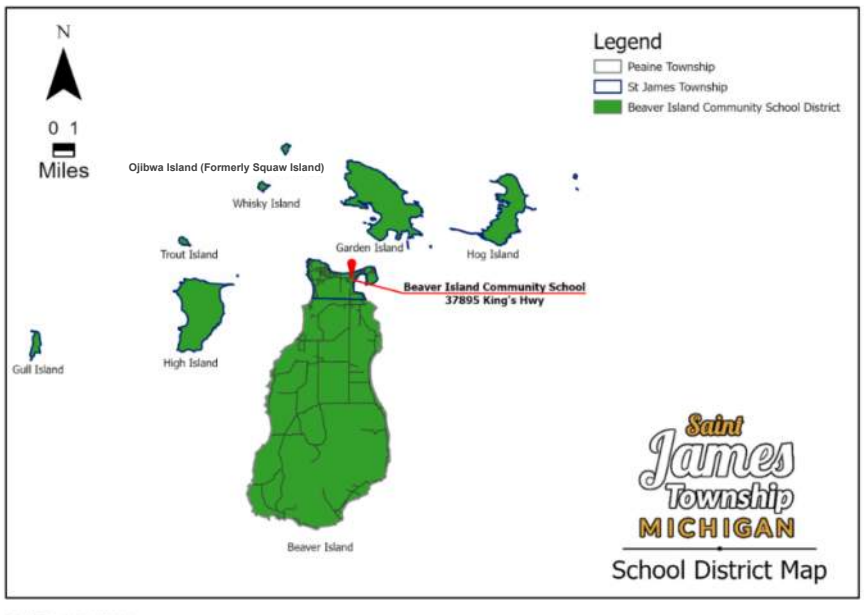
Public Schools

In addition to the Township recreation facilities, there is a public school with recreation facilities located in the township. Beaver Island Community School serves the entire archipelago in Charlevoix County. It is one of only four insular school districts in the state.

Table 3.5 – Beaver Island Community School				
School	**Address**	**Grades**	**Enrollment***	**Facilities**
Beaver Island Community School	37895 Kings Hwy Beaver Island, MI 49782	Pre-K through 12th grade	49 (2021)	multi-purpose field/Soccer field, basketball hoops, playground, gym

**Source: Munetrix*

BI Fit is a unique community collaboration between Island residents and the Beaver Island Community School (BICS) that creates the opportunity for Island residents to exercise in the BICS gymnasium. In addition to walking the perimeter of the gym, members can work out on various exercise equipment, including a treadmill, exercise bike, and a rowing machine in the BI Fit Zone.



***Beaver Island Community School* Map**

Regional Recreational Assets

Table 3.5 – Regional Recreational Assets				
Facility Name	**Location / Size**	**Ownership***	**Purpose / Use**	**Access**
Peaine Township Hall	Kings Hwy	Peaine Twp	Meeting rooms and kitchen	Meetings, community events
Peaine Township Park and Font Lake Access	Inland, west of Peaine Twp Hall	Peaine Twp	Picnic tables, covered shelter, outhouses, boardwalk to Font Lake	Public
Bill Wagner Campground	East side of Peaine Twp on Lake Michigan, 14.7 acres	Leased by DNR to Peaine Twp	Primitive campsites, outhouses, fire pits, beach access, boat ramp for small boats	Public; camping fee
Beaver Head Lighthouse	South End Road, Peaine Twp, 45 acres	Charlevoix Public Schools	52 steps to tower; steps to rocky beach	Public
CMU Biological Station	East Side Drive	Central Michigan University	Beach frontage, trail, guided nature tours	Public
Kuebler Trail	Access on Allen's Lakeview Rd, Sloptown Rd	Private ownership and Little Traverse Conservancy	4 miles of trail, old narrow-gauge railroad bed	Public for hiking
McCauley's Point	South end of Donegal Bay, 0.4 sq mi	DNR	Rocky beach access, shorebird habitat, Pitcher's thistle	Public
Barney's Lake Nature Preserve	Barney's Lake Rd, interior woods and 2,200 feet of lake frontage, 120 acres	Little Traverse Conservancy	Canoe, kayak and rowboat storage; fishing; hiking trail through woods	Public; no hunting or ORVs
Bonner's Bluff State Beach (Bonner's Landing)	At the end of a private road off Sloptown Rd, 0.5 x 0.2 mi	DNR	1,500 feet of public beach on Lake Michigan	Public; access over private land
Miller's Marsh Nature Area	West Side Drive, 230 acres	Central Michigan University	Diverse ecosystem includes a wetland dominated by sedges, turtles, and a beaver lodge; 1-mile walking trail, picnic table, outhouses	Public

Table 3.5 – Regional Recreational Assets				
Facility Name	Location/Size	Ownership*	Purpose/Use	Access
French Bay Road and French Bay South and North	Off of West Side Drive, Peaine Twp, 0.6 x 0.45 mi (South), 0.2 x 0.45 (North)	Part private ownership and part DNR	Trail known for dwarf iris, rocky Lake Michigan bay, 0.45 mi of shoreline	Public
Greene's Lake Public Access	Greene's Lake Rd	DNR	Fishing	Public
Fox Lake Public Access	Fox Lake Rd	Peaine Twp	Inland lake, fishing, kayaking, canoeing, picnic table, outhouse	Public
McFadden's Point	On Greene's Bay, 0.5 x 0.25 mi	DNR	Ecologically important for rare parabolic dunes	Public; access over private land
Oliver's Point	West side off of Mrs. Redding's Trail, 0.5 x 0.4 mi	DNR	Trail to Lake Michigan, public beach, 0.4 mi of shoreline	Public; access over private land
Little Sand Bay	Off of East Side Drive, 60 acres, 1,300 feet of lake frontage	Little Traverse Conservancy	Parking lot, trail, boardwalk, Lake Michigan beach, bench	Public
Martin's Bluff	East Side Drive	DNR	Trail along bluff, picnic table, rope railing to beach below	Public
Lake Geneserath Public Access	Off of East Side Drive, south end of island	DNR	Public boat launch, large fishing lake (489 acres), outhouse, trail	Public
Cable Creek Trail and Cable Bay Beach	0.2 miles of shoreline	DNR	Scenic trail, picnic table, beach, bridge over creek	Public
Beaver Island Golf Course	Kings Hwy	Private	9-hole golf course, driving range, club and cart rental	Public; fee

Map of Recreational Facilities

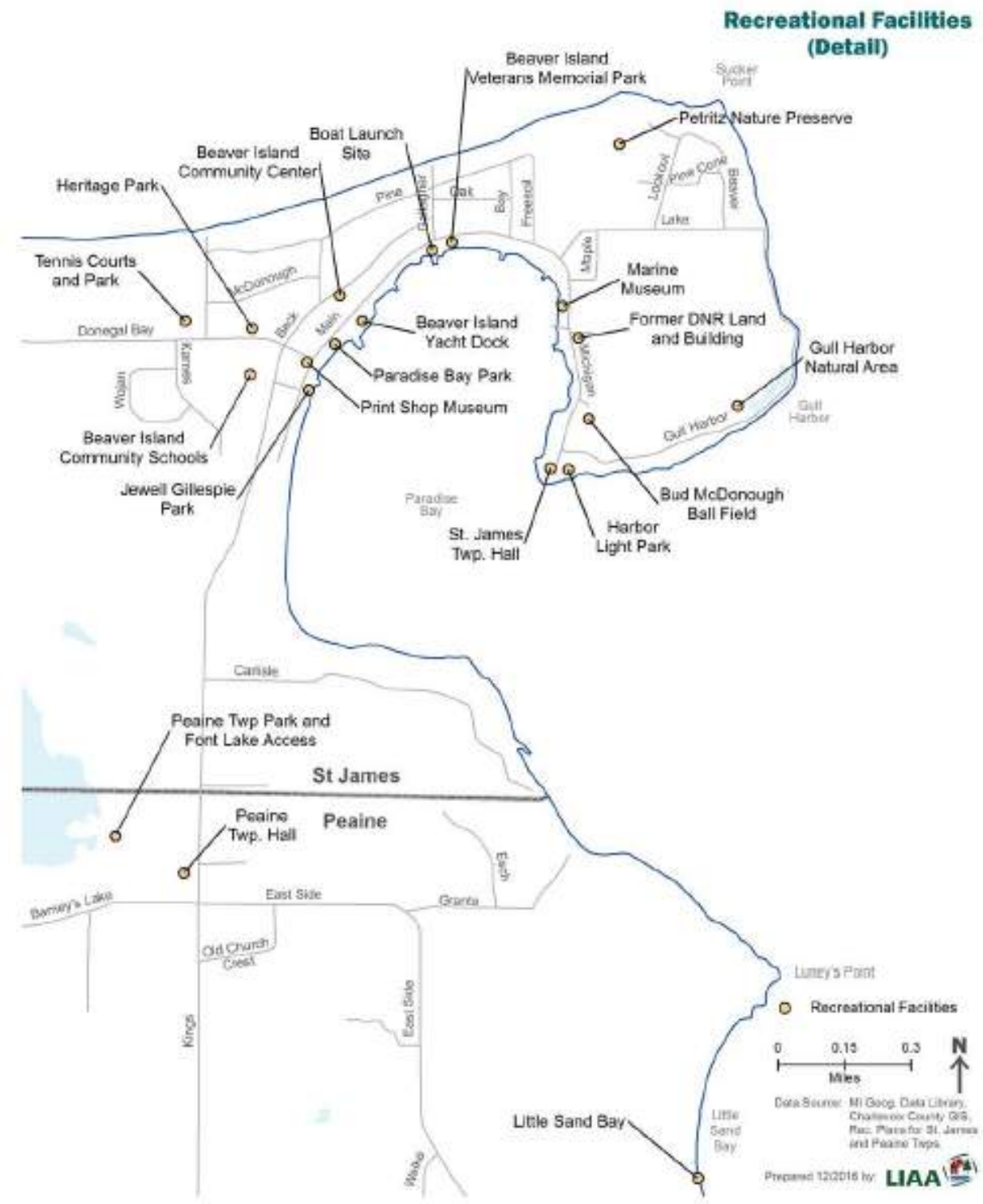


Figure 3.4 – Map of Recreational Facilities (Detail)

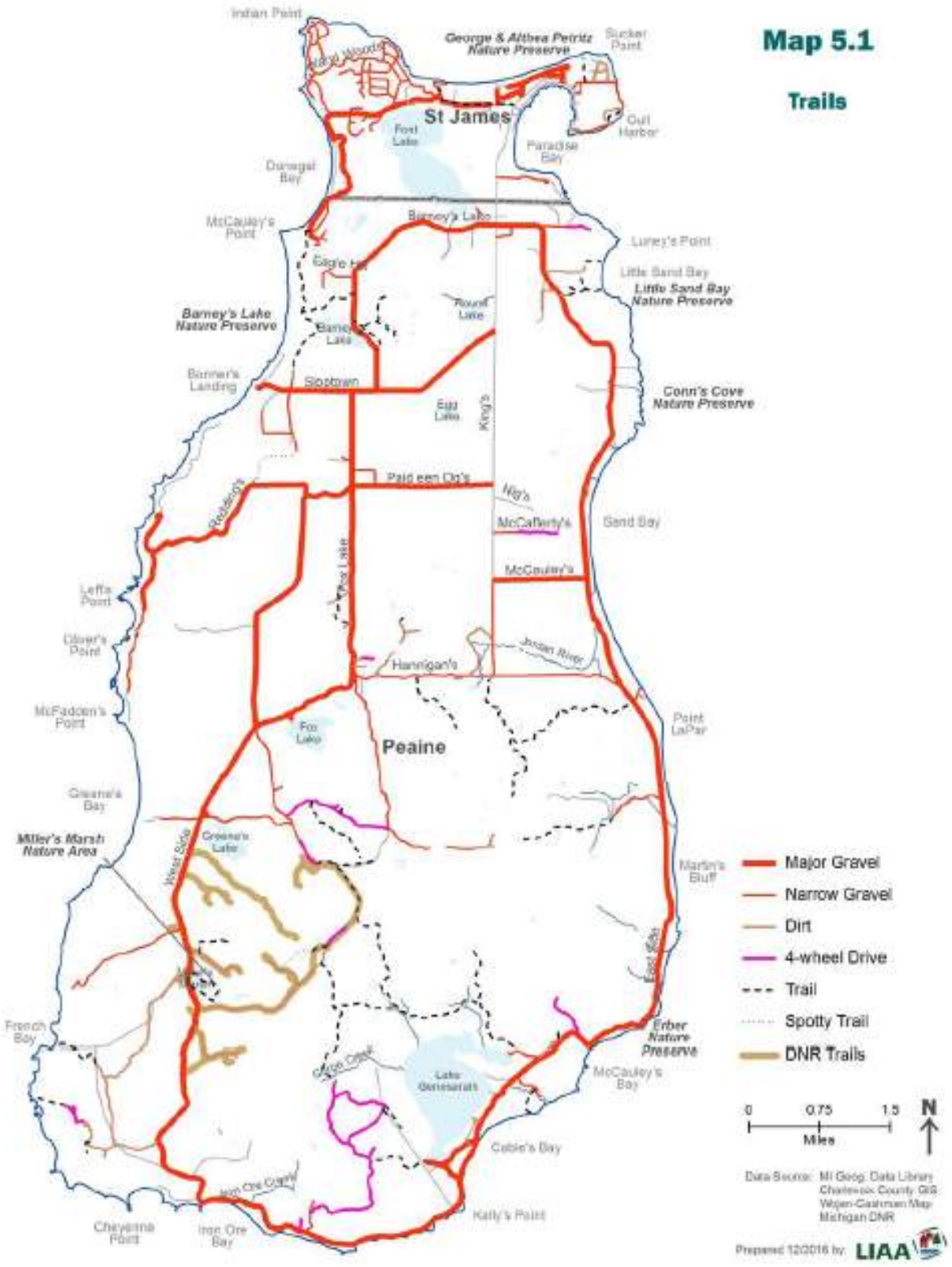


Figure 3.5 – Trails Map

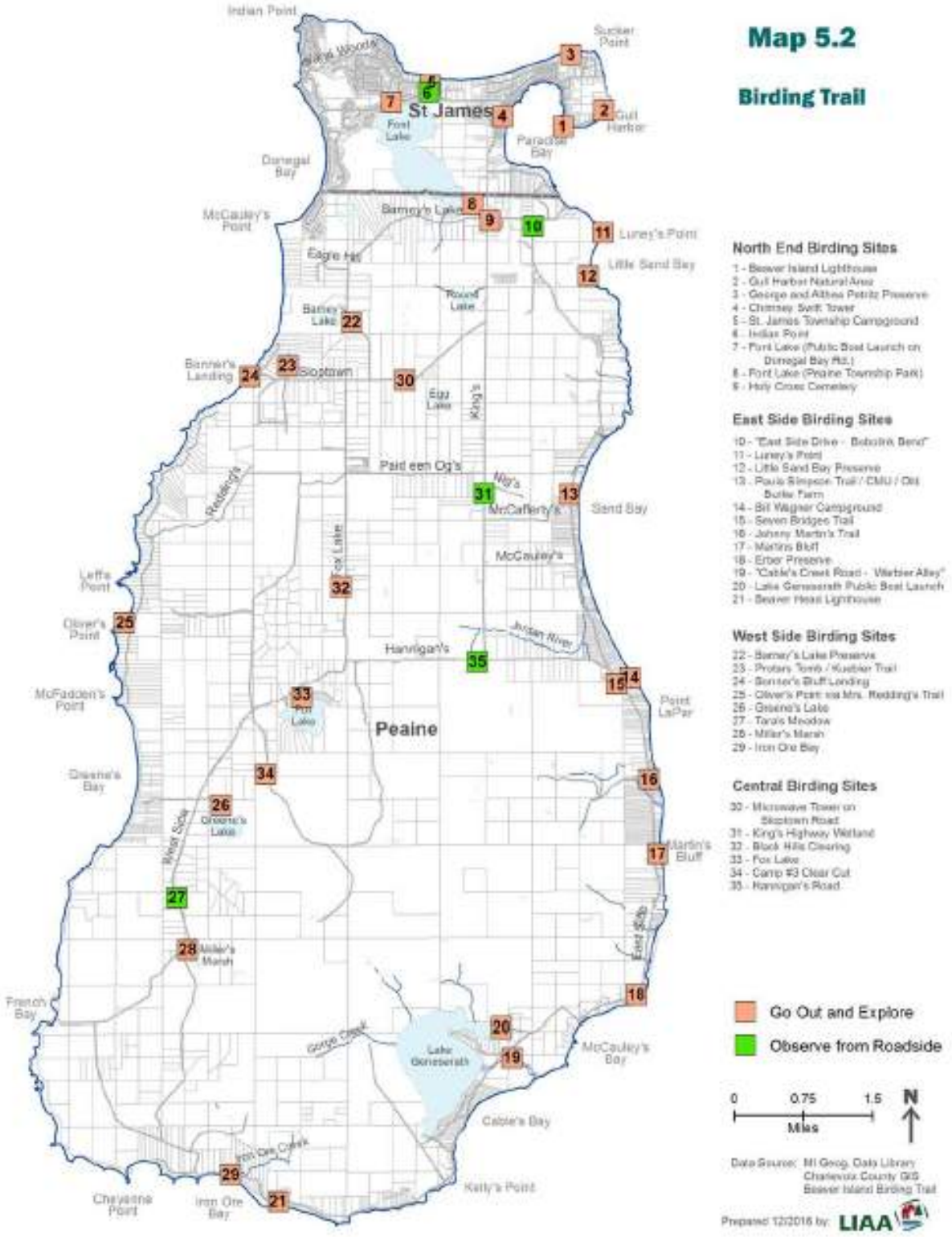


Figure 3.6- Birding Trail Map

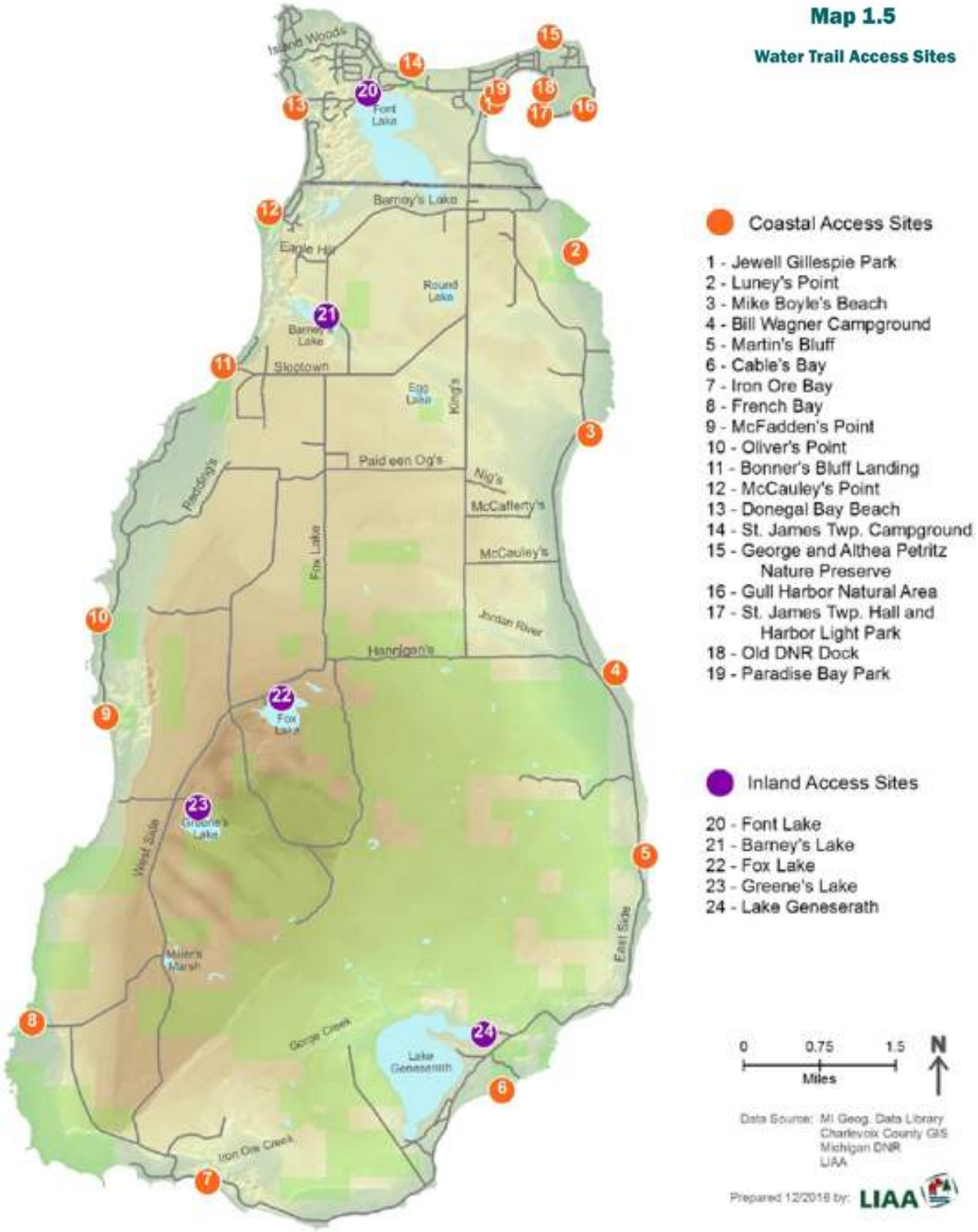


Figure 3.7 – Water Trail Access Sites

Barrier Free Evaluation & Universal Design

The ultimate goal is to provide recreation opportunities that include everyone. With the passage of the Americans with Disabilities Act of 1990 (ADA), all areas of public service and accommodation are subject to barrier-free requirements, including parks and recreation facilities and programs. This planning process should include methods to ensure that the Township park and recreation system is accessible to persons with disabilities. The accessibility evaluations for St James Township have been conducted by the township supervisor and deputy supervisor as part of the recreation planning process. In planning for the water trail and for recent campground improvements, the advice of Access Recreation Group, LLC, of Jenison, MI was sought. The township anticipates working further with Access Recreation Group for a more complete assessment of its sites and certainly in any new project planning.

Accessibility Assessment

The evaluations were based loosely on the United States Access Board's Section 15 – Recreation Facilities, the Accessibility Guidelines for Buildings and Facilities, Americans with Disabilities Act, and used the ranking criteria suggested by MDNR's Guidelines for the Development of Community Park, Recreation, Open Space, and Greenway Plans (2016). These criteria are based on the 2010 ADA Standards for Accessible Design.

The criteria are as follows: ADA Ranking System Rank Interpretation

1. None of the facilities meet accessibility guidelines.
2. Some of the facilities/parks meet accessibility guidelines.
3. Most of the facilities/parks meet accessibility guidelines.
4. All the facilities/park meet accessibility guidelines.
5. The entire park was developed/renovated using the principles of universal design.

When looking at areas to determine their accessibility to all people, we started by asking these simple questions:

Can a person who has a sight or hearing disability, uses a wheelchair, uses a walking aid such as crutches or braces, has a mental disability that affects learning and understanding, safely and independently:

1. How to get from the arrival place to the activity area?
2. How to do what others do in the area?
3. How to move around the area?
4. How can barriers be removed?
5. What is getting in the way?

Common components that need to be looked at to answer these basic questions include parking, paths of travel from parking, street or sidewalk to activity areas, the activity areas themselves, signage, support facilities such as restrooms, surfacing, and communications required for recreation programs and general use of a facility or area.

Universal Access

Another often overlooked category is Universal Access. This practice goes way beyond typical Americans with Disabilities Act (ADA) regulations to practice "common and equal experiences for all." The goal of universal access is, throughout concept and design phases, to incorporate technology, materials and other considerations that promote equal opportunities for people of varied abilities. These concepts

should be kept in the forefront as a prime consideration in the 5-year Master Plan and individual parks or projects as they develop and progress.

Table 3.5 – Universal Access	
Type of Recreation Facility	**Universal Access Design Considerations**
Archery range	▪ All stations ▪ Route to retrieval area for each target ▪ Targets also usable with cross bows ▪ Arrow back stop to limit retrieval distance ▪ Larger maneuvering spaces to accommodate archers with shooting assistants
Beach	▪ Routes over the beach and into the water, can be portable/temporary matting if it needs to be taken in and out for beach cleaning/dragging or in the off season ▪ Wide enough for side by side walking/passing ▪ At beach route end have an accessible area at the water's edge large enough to park multiple chairs while the owners are in the water ▪ With a transfer system at the water's edge so people can get down to the ground level and into the water
Boardwalk wetland and water access	▪ 6 feet minimum width so two people can walk side by side or people can pass ▪ Edge treatment to prevent roll/step off ▪ If side rails are used, **more than 25%** must lowered for easy viewing in various places along the boardwalk ▪ Interpretive information in a variety of alternative formats such as auditory, large print, Braille, pictures, etc.
Campgrounds	▪ All sites and amenities ▪ Accessible surface on all sites, including rustic sites ▪ Larger spaces to accommodate side lifts on campers and vehicles ▪ Accessible tables, grills (15“ minimum, 34“ maximum height), and fire rings on all sites ▪ Centrally located restrooms on easy routes from each site
Camping Cabins and Yurts	▪ Larger clear space and maneuvering spaces in between all furnishings, including when all are in use (beds, tables/chairs with people seated at the table, shelves within lowered reach ranges, lowered wall hooks, etc.) ▪ Larger clear space thoughtfully located for typical portable items such as coolers, luggage, equipment/food bins/tubs, etc.
Canoe/kayak/boat launch	▪ Wider route so someone can hand wheel boat on dolly to launch pulling boat next to them if they are in a wheelchair or two person carry down ▪ Accessible surface to water's edge and into water at launch ▪ More gentle slopes for easier entry and exit when hand wheeling a boat

Table 3.5 – Universal Access	
Type of Recreation Facility	**Universal Access Design Considerations**
	▪ Some type of "rack" to stabilize boat at a transferable height then some type of mechanism/roller system to move, while seated in the boat, into the water Some means of transfer assistance such as overhead bars ▪ Some type of wench system to help pull boat out of water back into the rack to exit/transfer out. ▪ If there is a dock provide a transfer system on the dock so a person can be seated on the dock to transfer over to a boat in the water that is in some type of a stabilizer rack ▪ Adaptive kayaks available for use ▪ Shore station with a platform (instead of "V" rack) with a transfer system on the deck of the shore station, located next to a dock so someone could roll/get on the platform and lower it to the right level to transfer into a boat
Fishing dock/pier and observation/viewing decks:	▪ More than 25% of the rails are lowered in various locations or no rails at all with only an edge treatment to prevent roll off ▪ Sitting benches (all with backs and arm rests) scattered about so anglers can choose to sit or stand to fish ▪ Tackle box stands next to one bench end (not both) leaving one end clear space for sitting side by side with someone in a wheelchair ▪ A variety of fish landing cutaways strategically placed ▪ Variety of accessible opportunities—over-water fishing, shore fishing, in-water fishing, etc. ▪ Transition plates between access route and deck/pier
Nature center	▪ All interpretive information in a variety of alternative formats such as auditory, large print, Braille, pictures, etc. ▪ Creative use of technology such as mp3 players for auditory descriptions (this gives the info. directly to the individual) closed loop assistive listening devices and closed-circuit captioning of all interpretive presentations ▪ All displays at lowered heights for sitting or standing viewing ▪ All operating mechanisms that are operable with one hand and do not require tight/pinch/grasp/wrist twist to operate
Parking	▪ More than minimum number of accessible spots ▪ Each connected directly to an accessible route to the park elements and NOT into the traffic flow ▪ Thoughtfully located nearest the activity entrance, which might require multiple lots (some near the beach, some near the playground, some near the bathhouse, etc.)
Picnic areas and elements: Pavilions, picnic tables, grills, fire rings, water pumps, etc.	▪ All located on accessible routes ▪ all tables, grills, fire rings, water pumps, etc. accessible ▪ Level routes onto pavilions with no changes of level from path to pavilion surface

Table 3.5 – Universal Access	
Type of Recreation Facility	**Universal Access Design Considerations**
	▪ Wider routes and clear space with firm surface around all elements so someone with mobility limits can easily move around the element (table, grill, etc.) ▪ A variety of table styles, some with clear sitting space on the side, some with extended tabletops on the end ▪ Some fixed tables to ensure they remain accessible (not moved off into a grassy or sandy area, etc.) ▪ Clear space all around each element so people can approach and use the grill, fire ring, etc. from the front, back and either side ▪ Grills you can lower/raise the cooking surface with one hand ▪ Raised fire building surfaces so you can place wood without learning too far over from a standing or seated position
Playgrounds	▪ Ramps and transfers ▪ Has both ramp and transfer access to all play components ▪ Ramps to every “getting on spot” or “sit/stand & do it spot” of every play component ▪ Transfer system from the ground up to the main deck located near the exits of slides and climbers furthest from the ramp onto the structure ▪ Only unitary safety surface such as poured-in-place or rubber tiles NOT any loose fill materials like shredded rubber, wood chips, engineered wood fiber, or any other non-unitary surface material ▪ On deck transfer platform at the entry point of every slide ▪ On deck transfer platform with one open transfer side and one side with transfer steps to every entry/exit point of every climber, so kids climbing up can get down to the deck to move to another component, as they may have left an assistive device at the ground ▪ A good variety of things to manipulate that make noise or music, have high contrast/bright colors, games that two kids can play (to foster social interaction), Braille and sign language panels to teach awareness, easy to operate with just one hand with a whole fist (does not require tight/pinch/grasp/wrist twist to operate) ▪ Different high contrast colors for decks versus transfers so kids with low vision can perceive a change in level ▪ Play panels are located at heights so they can be used from a seated position or standing
Restrooms	▪ More than the minimum number of accessible units ▪ Multiple unisex/single user toilet rooms/units so opposite sex care givers can assist; also good for parents of young children of the opposite sex so kids aren’t sent alone into the multi-user restroom ▪ Thoughtfully located near areas of activity such as play areas, beaches, fishing piers, etc.

Table 3.5 – Universal Access	
Type of Recreation Facility	**Universal Access Design Considerations**
	▪ Accessible door pulls and water faucet handles - all accessible port-a-johns, again big enough for individual use or care giver/parental assistance.
Skiing/sledding hill	▪ Accessible route to top (no steps), possibly using a “magic carpet” lift ▪ Level surface for sled mounting at hilltop ▪ If staffed, provide ATV transport, or have policy that allows personal ATV use Transfer at hill bottom to help transfer
Sports fields/courts **Fields: soccer, football, baseball, etc.** **Courts: tennis, basketball, bocce, horseshoes, etc.** **Other: skate parks, frisbee golf**	▪ Routes to both sides of all fields and courts, not just end zones ▪ Accessible seating spaces both ground level and elevated if risers/bleachers are provided ▪ Accessible seating spaces scattered throughout all viewing areas and levels with companion seating on both sides of the space ▪ All lowered service windows at all concession areas ▪ Wider gate openings into court areas (tennis, bocce, basketball) and skate parks to accommodate wider sports wheelchairs ▪ Routes to both horseshoe pits and along both sides of the route between pits ▪ Level routes onto bocce courts with sitting benches at both ends
Trail: nature trail, walkway, pathway, etc.	▪ Multi-use trail - 8 feet, with slopes under 2%, wider width so two people can walk side by side or people can pass ▪ Walkways within a site – at least 6 feet wide and have slopes under 2% ▪ Regional trail system - at least 10 feet wide, with 1-foot buffers on either side, with slopes under 2% ▪ Unitary surface like concrete, boardwalk or asphalt, crushed aggregate/screenings that have been “stabilized” or natural soils enhanced with soil stabilizers ▪ Transition plates between trail and pedestrian bridges, decks, etc. ▪ Contrasting color treatment of the surface and textured surface treatments such as brushed concrete at intersections or interpretive stations to cue people who have vision impairments that there is something to pay attention to at that spot ▪ Close to level cross slopes (side to side) and very gentle running slopes, no steep sections, larger (greater than 60” X 60”) level areas at all turns and intersections ▪ Thoughtfully laid out on the site to maximize the experience with minimal difficulty ▪ Accessible amenities such as benches, restrooms, drinking fountains, etc.

Recreational Programs

Youth Programs

- Story Hour
- Movie Night

Adult Programs

- Pickleball
- Dark Sky Events
- Time for Art
- Games Galore
- Tennis
- Senior Tai Chi
- Bingo
- Chair Yoga
- Arthritis Foundation Exercise Program

Past MDNR Grant Status

Acquisition - Gull Harbor Nature Preserve	
Project No.	Michigan Natural Resources Trust Fund TF-XX
Project Year	1992
Cost	$60,000
Status	Completed
Provided for portion of $80,000 purchase of 13.4 acres, 1,374 feet of Lake frontage.	

St. James Campground Improvement Project	
Project No.	Passport Grant Program RP18-0049
Project Year	2019 (To be completed in 2023)
Cost	$150,000 Grant $50,000 local match
Status	Ongoing
Rehabilitate and upgrade marina at municipal dock.	

Acquisition - Karnes Beach Property	
Project No.	Michigan Natural Resources Trust Fund TF-22-0215
Project Year	2022
Cost	$525,000.00 + $210,000 local match
Status	Ongoing
Purchase of property to be designated as Edward B. Wojan Park	

Other County, State & Federal Grant funding

- **U. S. Fish and Wildlife Grant** - 2021 Beaver Island Archipelago Terrestrial Invasive Species Support 2022/2023 In Process
- **DNR Fish and Wildlife Memorandum of Agreement** - 2021, 2022 Terrestrial Invasive Species Support
- **DNR Waterways Grant** - 2021 Upgrade St. James Municipal Marinas - Completed 2021
- **Grand Traverse Band of Odawa and Chippewa Indians** - 2021 Upgrade North Marina Fuel Dock - Completed 2021
- **John A. Woollam Foundation** - 2021, 2022 Upgrade St. James Municipal Marinas - Completed 2022

- **Charlevoix County Parks Millage Grant -** 2021 Harbor View Park Improvement - Completed 2022
- **Charlevoix County Parks Millage Grant** - 2022 St. James Campground Improvement - In Process
- **Federal Coastal Management (through MDNR)** - 2000 Gull Harbor Nature Preserve Trail. $5,000 of installation of benches and paths – Completed
- **MDNR Harbor Development Program** – 2003 Beaver Island Municipal Dock (aka St James Mooring Facility or Beaver Island Yacht Dock). $1,100,000 - Completed

Natural Resource Inventory

Topography & Landforms

The Beaver Island Archipelago is composed of erosion-resistant rock that protruded above the water after retreating glaciers had carved out the basin that holds Lake Michigan.

Beyond being a local point of interest, “The Big Rock” is actually the largest known glacial erratic on Beaver Island. A glacial erratic is simply a rock that isn’t naturally found in the area. “Big Rock” was carried by a glacier to Beaver Island from north of Lake Superior. It is a type of rock called igneous which is part of the Canadian Shield. Most of the rock’s mass is believed to buried underground.

Hat Island and Shoe Island were formed during the Wisconsin glaciation when a melting glacier randomly dumped a large quantity of boulders and gravel in a spot that became part of the lakebed.

Healthy, ecologically diverse sand dunes surround the perimeter of Beaver Island, especially on its western side. These dunes are spectacular natural features, but also very fragile ecosystems susceptible to human and natural disturbances. Beaver Islanders have a strong commitment to managing dynamic coastal dunes to allow their natural processes to shape the landscape and adapt as conditions change.

Michigan law provides for the protection and regulation of a subset of the coastal sand dunes in Michigan; specifically, those that are designated and mapped as Critical Dune Areas by the Michigan Department of Environmental Quality (EGLE). Beaver Island and High Island have designated Critical Dune Areas. Earthmoving, vegetation removal, and/ or construction activities within a Critical Dune Area require a permit under state law. St. James and Peaine Townships also each have locally administered Critical Dune Ordinances.

The slope of land plays an important role in determining the suitable use and development of property. Moderate slopes (10% - 25%) and areas of extreme slope (25% or more) may limit higher density developments from occurring. These limitations include a heightened risk of erosion and the difficulty in installing private septic systems. However, areas consisting of moderate and extreme slopes are very sparse within the area. They are generally limited to portions of the west sides of Beaver Island and High Island. On High Island, the sand, blown by the lake's prevailing winds, has piled up into a sand dune elevated 780 feet above sea level, or 199 feet above the level of Lake MI. The remaining region consists of fairly level terrain which presents little to no restrictions for future development. *Photo credit: Binney Girdler*

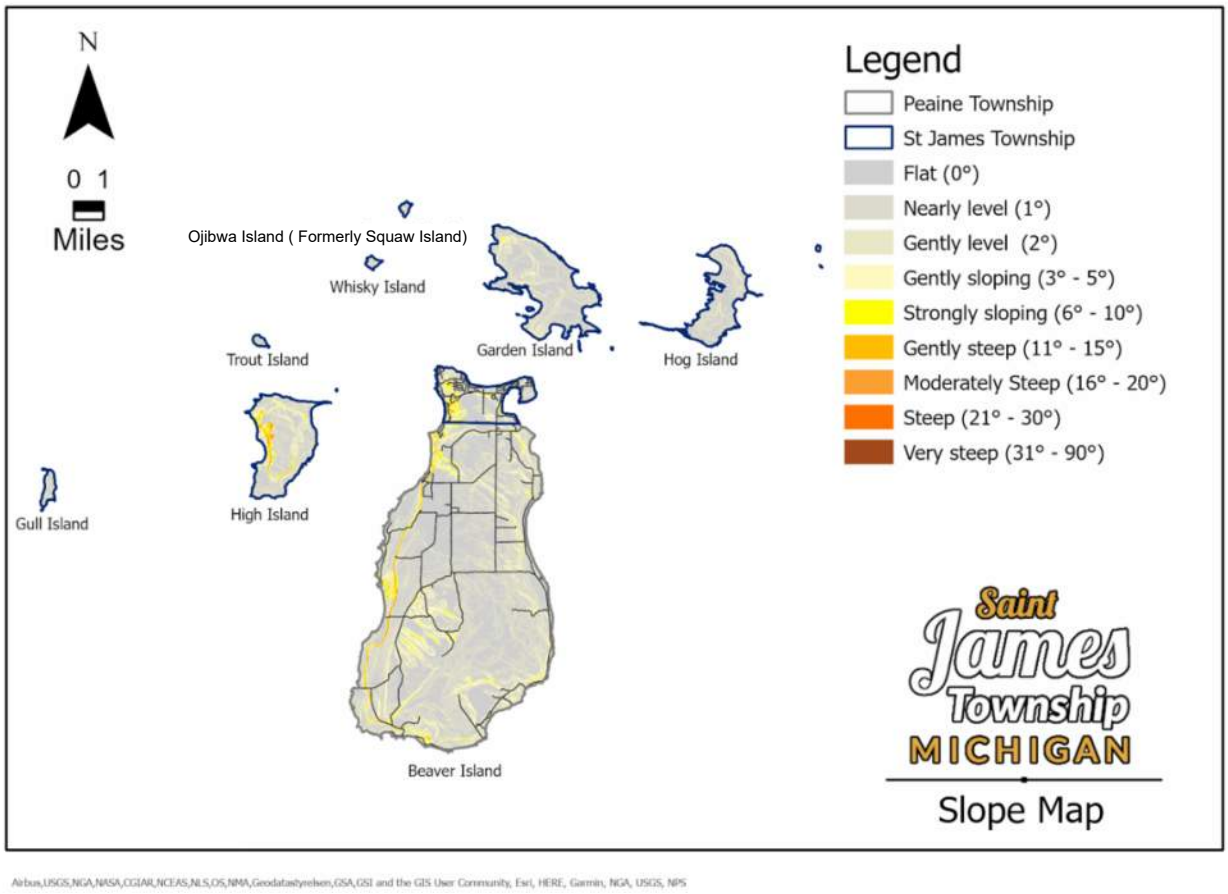


Figure 4.1 - Slope Map

Woodlands

Beaver Island has a number of forest types including boreal, dry-mesic northern, and mesic northern forests. Each of these hosts a unique mix of tree species. Major forest cover on the Island includes northern hardwoods, lowland deciduous forest, and lowland coniferous forests. Additional field work and surveys were conducted during the 2016 fi eld season. MNFI conducted surveys of ten previously known element occurrences on state land and documented fi ve new natural community element occurrences on state land. Nine different natural community types are represented in the 15 element occurrences surveyed. Surveys assessed the element occurrence ranking, classification, and delineation of these occurrences and detailed the vegetative structure and composition, ecological boundaries, landscape and abiotic context, threats, management needs, and restoration opportunities associated with each site. Additional information on the MNFI reports from 2102 and 2016 are in the appendix of this 5-year plan.

According to Dr. Dave Ewert, Senior Scientist at The Nature Conservancy, “the interior forests of Beaver Island include mixed hardwood forests dominated by sugar maple, dotted with wetlands and small lakes

that are often ringed by tamarack, black spruce, white cedar, and other conifers. Small pockets of red and white pine contribute to the diversity of the interior forests. Forests near the immediate shoreline are frequently dominated by spruces, balsam fir, white cedar, pines, and eastern hemlock. Openings, including old fields, pastures, and clear-cuts, are scattered around the island.” Today, many acres of hunting lands are managed by the DNR and the Island’s Wildlife Club. Other areas are used for recreational trails, foraging, and peaceful residential neighborhoods. Fox Lake’s public access site is well known for its proximity to “Big Birch,” one of the oldest birch trees in Michigan.

Most of the old-growth timber on Garden Island was cut and sawn by a short-lived sawmill that operated on the island in 1912-1913. However old-growth northern hardwood and boreal softwood groves still exist on Hog island. Gull Island is the only island to have a substantial forest ecosystem. Balsam fir and northern white cedar grow in the island's humid, boreal climate.

Wetlands

Coastal wetlands on Beaver Island comprise a vast portion of the interior of the island, near the many inland lakes and especially on the Island’s eastern side. Coastal wetlands are unique as they have hydrological connection to Lake Michigan and fluctuate with water level changes. Coastal wetlands provide a wide range of important ecosystem services, including filtering and cleaning water naturally; providing critical habitat to fish, reptiles, and amphibians; and reducing the impact of extreme rain events by absorbing flood waters. All coastal wetlands are regulated under state and federal law. Coastal wetlands are also great places for bird watchers to congregate during migration seasons and can be wonderful places for kayaking and other passive recreational activities. Much of the Island’s wetlands are in public ownership, though some are privately owned or for sale.

Coastal wetlands provide unique habitat to plants and animals. This photo is of a coastal wetland area in Paradise Bay.

Garden Island is surrounded by relatively cool, shallow water, making the area ideal for sport and commercial fishing. The island itself is relatively low and spotted with many ponds and wetlands. The island is well known as a place of endangered and rare herbs and wetland plants. Hog island is characterized by a number of wetland areas that are home to a variety of rare plants and animals. Its low, swampy terrain is of significant interest to naturalists because it is one of the least-disturbed islands in Lake MI. It is very difficult to reach, even by boat.

Hydric soils are also identified. These are soils that have formed in the presence of water for sustained periods. They can be used to help locate wetlands, especially those that have been disturbed or altered by fill or excavation. Hydric soils may be unsuitable for certain types of development and can be an indicator of high groundwater levels.

Prior to park & recreation development, the Michigan Department of Natural Resources (MDNR) should be consulted to review the results of a wetlands determination. The impacts of development within wetland areas should be carefully considered, and a permit from the MDNR should always be obtained if regulated wetlands are to be impacted.

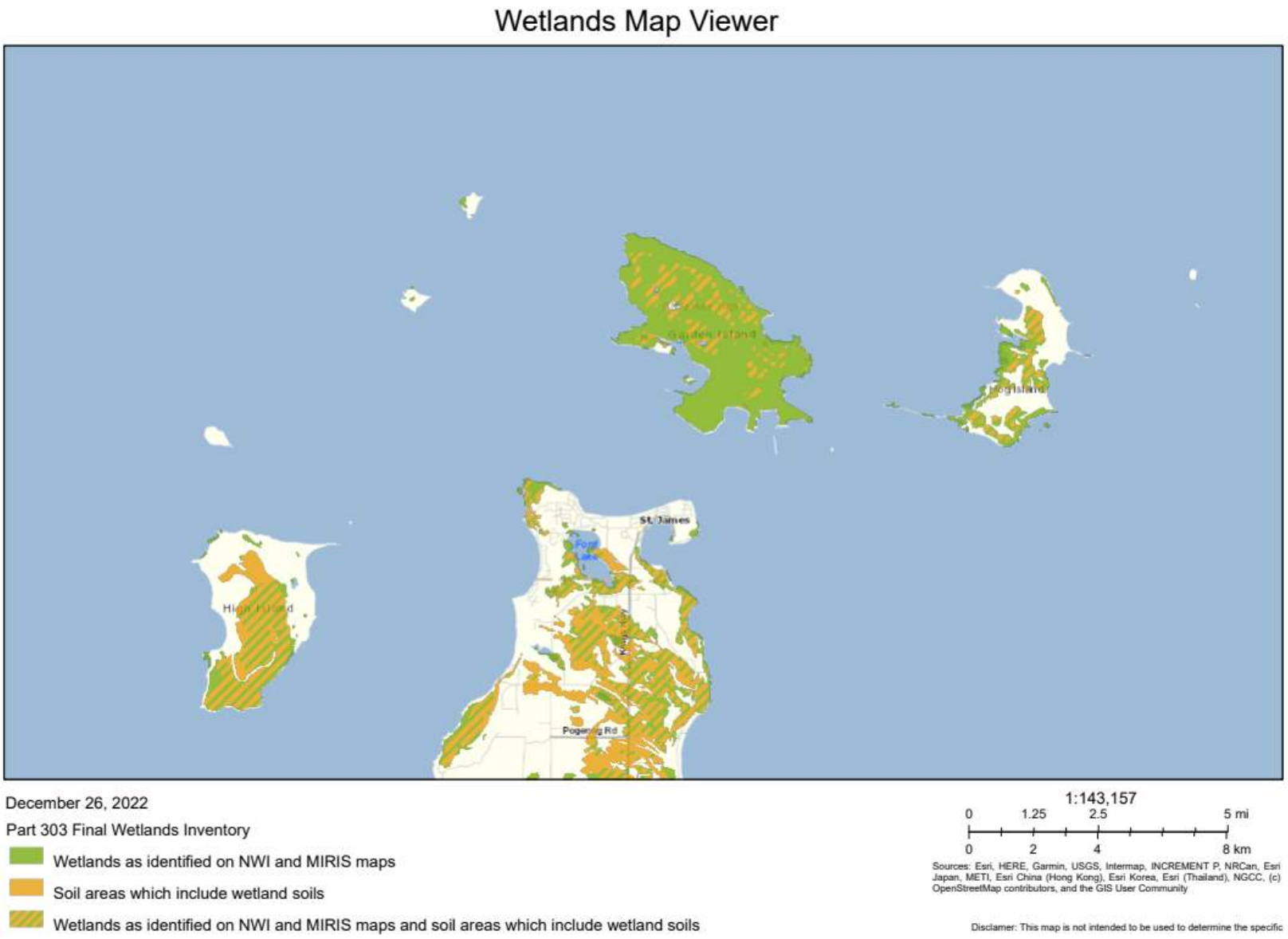


Figure 4.2 – Wetlands Map A

Figure 4.3 Wetlands Map B

Soils

The soil composition of the Island can help inform land use and identify where particular management practices are most appropriate. Some soils are better for development, some are better for farming, and others are best suited to remain undeveloped and unfarmed. There are four main soil classifications, or associations, on Beaver Island (see Map 2.5):

The **Deer Park-Dune Land Eastport Association,** which is well-drained, nearly level to very steep sandy soils on beach ridges and dunes. This soil type is found along the coastline and is difficult to farm or build on.

The **Kalkaska-Mancelona Association,** which is well-drained to moderately well-drained, nearly level to gently sloping sandy soils on lake plains and valley trains. Much of this soil is forested. This soil type is difficult to farm.

The **Roscommon-Charlevoix-Mackinac Association,** which is poorly to moderately poorly drained, nearly level to gently sloping sandy and loamy soils on lake plains. This soil type is conducive to wetland areas and poorly suited to farming.

The **Emmet-Leelanau Association,** which is well-drained, nearly level to very steep loamy and sandy soils on moraines. This soil type may be suitable for construction and farming.

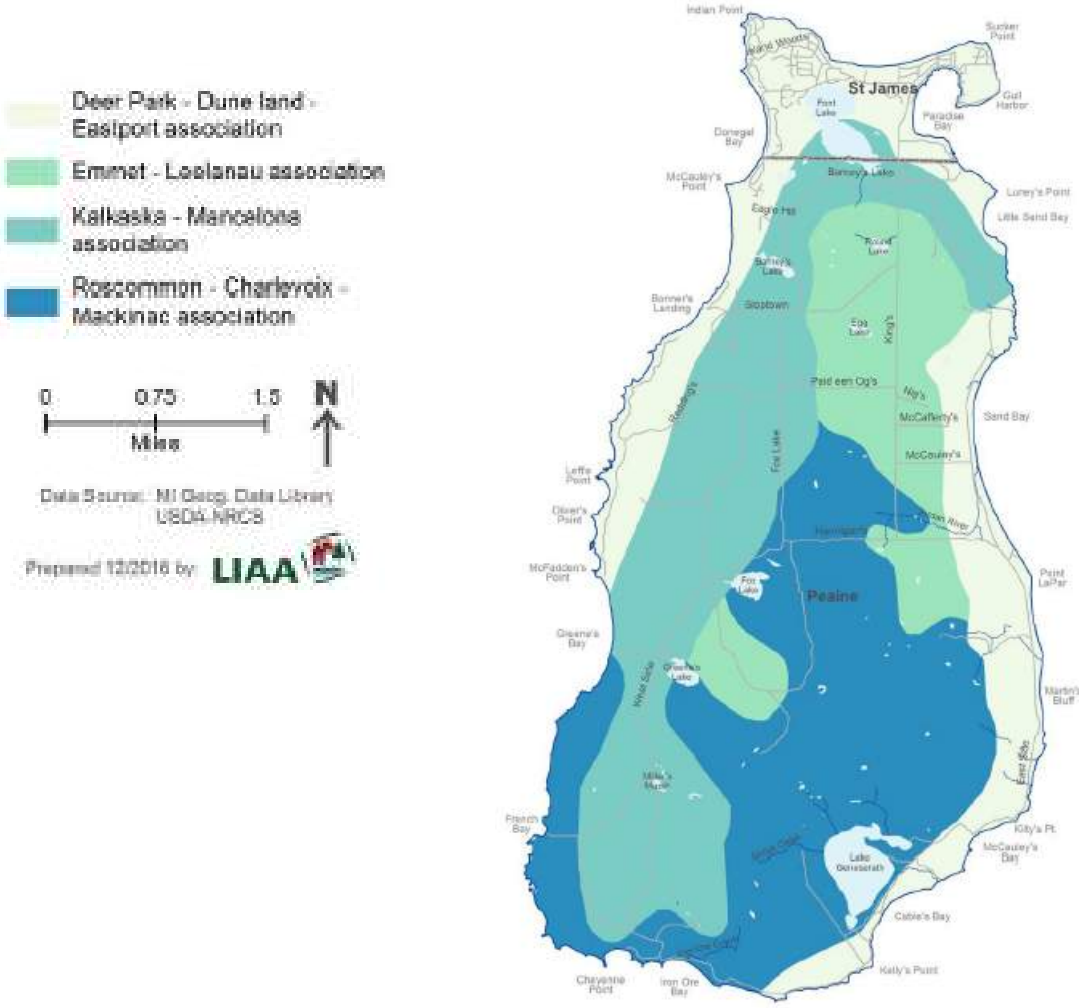


Figure 4.3 – Soils Map

Water Resources & Drainage

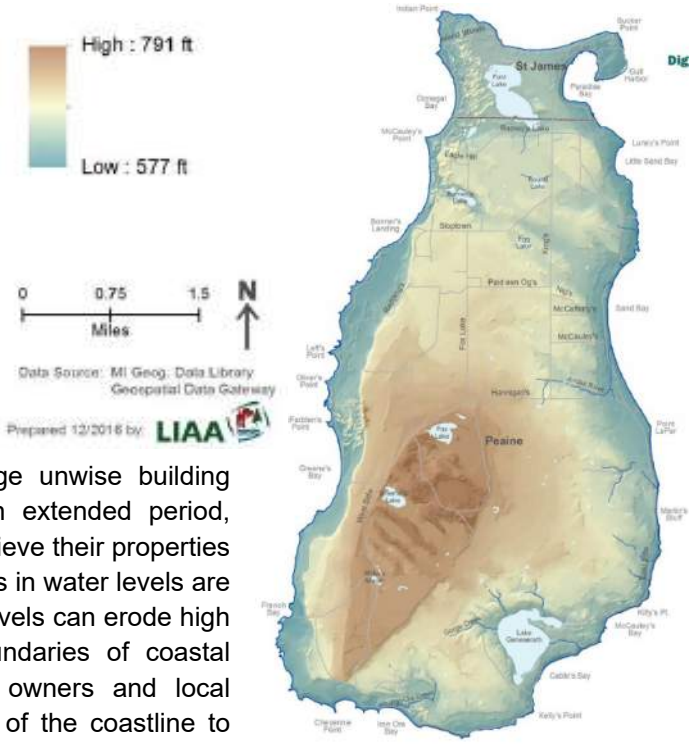
The most notable resource in St. James Township is obviously Lake Michigan, surrounding the entire township, and Beaver Island. Approximately 40 miles of Lake Michigan coastline help define the unique identity of the Island. Inland lakes and streams form a critical network of connected waterways in the interior of the Island, providing important habitat and a variety of recreational opportunities. The main inland lakes include, from north to south: Font Lake, Round Lake, Barney's Lake, Egg Lake, Fox Lake, Greene's Lake, Miller's Marsh, and Lake Geneserath. Prominent streams include Iron Ore Creek and Cable's Creek.

Many types of wetlands surround the inland lakes, including fens and bogs. Each of the Island's wetland communities support unique species of plants and animals. In the past, wetlands were once seen as "swamps" with a negative connotation. Many wetlands were drained and filled for use as agricultural lands or residential development. Beaver Island has proactively preserved and maintained many of its natural wetland areas, allowing the Island to reap the many benefits of access to these unique landscapes.

While flooding is a natural process, aging infrastructure and infrastructure that is not properly sited can be severely damaged in the event of a heavy precipitation event, coastal storm, or heavy ice melt. Certain areas of Beaver Island experience recurrent flooding, particularly dirt roads. Culverts that restrict the flow of water, and pavement in areas that promote the speed of runoff, can exacerbate the negative impacts of flooding. Placement of culverts should be near or within natural wildlife movement corridors. Install culvert parallel to the stream flow and perpendicular to the road it crosses to allow for line of sight and minimize the length of culvert the animal or fish will have to pass through.

Floodplains

Just as living along Lake Michigan is beautiful, it can also be dangerous. In the short term, severe storms can cause high winds and powerful waves to envelop the shoreland. These waves are capable of damaging docks, boats, and piers and can put human safety in danger. Evidence collected over the last several decades shows that severe storms in the Great Lakes region are increasing in both frequency and in intensity due to changing weather patterns (see the next section on climate change).



In the long term, decadal lake level changes can create a false sense of security and encourage unwise building practices. When water levels are down for an extended period, lakefront property owners might be tempted to believe their properties have permanently extended. However, fluctuations in water levels are a natural Great Lake process, and higher water levels can erode high bluffs, consume beaches, and stretch the boundaries of coastal wetland systems. It is important for property owners and local governments to understand the dynamic nature of the coastline to prevent development in unsafe areas. Using proper setbacks are one easy way to regulate this development.

Fish and Wildlife

As the largest Island in Lake Michigan, Beaver Island is a critical stopover site for migratory birds. Some of the bird species found on Beaver Island are familiar residents like chickadees, woodpeckers and grouse, while others visit the archipelago as part of their annual cycle. In the winter, northern visitors such as snowy owls, horned larks, snow buntings and long-tailed ducks can be found. However, the greatest diversity of species can be seen during spring and fall migration, as well as during the summer breeding season. Large flocks of warblers, vireos, sparrows and thrushes feed along the coastal forests and dunes as they migrate in spring. Many of these birds take advantage of a plentiful food source in May: the large swarms of non-biting midges that emerge from Lake Michigan. The Island's 35 birding locations can be easily located by the bright Birding Trail signs along the road. Bald eagles (species of concern), common loons (threatened), and osprey (species of concern) can be regularly seen on the Island

Font Lake is approximately 382 acres and is the Island's second largest lake. Part of its western shore is dotted with homes, while a publicly accessible boat launch is available on the north end. The "floating islands" near the south edge of the lake are vegetative mats that move and are used as nesting sites by loons and other waterfowl.

Barney's Lake is about 45 acres in size and is a premier fishing location on the Island. The lake has been stocked in the past with largemouth and small mouth bass and continues to provide habitat for bass, northern pike, and is home for native wildlife such as loons and beaver. . An access site is available on the northeastern shore.

Barney's Lake Preserve, which consist of 337 acres, is located about three miles southwest of St. James. The original preserve was donated to the Little Traverse Conservancy in 1988 by the heirs of Bernard and Margaret O'Donnell. Bernard O'Donnell (great-grandnephew) and Theresa Gacek (great-great-grand niece) were instrumental in carrying out the family's wishes that the land is kept in a natural state and available to the public. In 2007, a 173-acre addition to the preserve was donated by Terry and Beverly Scully. And in 2014, another 40 acres were purchased at a bargain sale from Jon and Sally Fogg with funding from the J.A. Woollam Foundation. The site has 4,900 feet along Barney's Lake and 1,770 feet along Lake Michigan.

Fox Lake is 75 acres in size and this highest elevation lake is located in the southwestern interior of the Island. **Fox Lake** supports a variety of fish and features a small walking trail and 2 points of public lakeside access. In the past, this marl-bottom, bowl-shaped, 18-foot-deep lake was one of the best Rainbow Trout lakes in the Midwest.

Round Lake is connected to a wetland complex known as "Cornelius' Swamp" and serves as a stopping point for ducks and geese in the spring. This shallow lake, on the edge of a restricted pheasant preserve, provides a welcome splashdown in the spring, but by early July the water can be gone for the summer.

Greene's Lake is 62 acres in size and is located in the southwestern interior of the Island. Greene's Lake is shallow and freezes totally most winters. Many rare bullfrogs, insects, and other animals live in the rich wetlands surrounding the lake.

Miller's Marsh is a small lake in a larger wetland complex that is owned by Central Michigan University. Many butterflies, plants,beavers and bullfrogs live in this unique natural landscape.

Lake Geneserath is the largest of the Island's lakes with an area of 480 acres and 5.3 miles of shoreline. With depths reaching 55 feet, the lake provides many opportunities for fishing species such as bass, northern pike, perch, bluegill and walleye. It is remote yet publicly accessible and knowingly fishable. It is located in the southeast corner of Beaver Island, which is in Charlevoix County. The eastern shore of the lake is less than a half mile from Lake Michigan, while the western and northern shores have complexes of forested and unforested wetland. Deer and other wildlife frequent its shores.

High Island's Great Sand Bay, on the western side of the island, is one of the last suitable Great Lakes nesting sites for the Michigan-endangered piping plover. Many terns breed on a sandspit on the northeast corner of the island.

Hog Island also provides vital spawning ground for yellow perch and small-mouth bass and draws many rare and unique birds during migration. It is also home to common tern, which is listed as threatened within Michigan.

Pismire Island is a tiny triangle of glacial gravel. It contains almost no permanent vegetation and is best known as a breeding place for Lake Michigan birds.

Hat Island and **Shoe Island** are good nesting places for freshwater seabirds, including herring gulls, Caspian terns and other fish-eating birds. Hat Island supports one of the largest colonies of Caspian terns in Lake Michigan.

Gull Island supports nesting colonies of black-crowned night herons. Gull Island, like the other Lake Michigan islands within the Michigan Islands NWR, is managed as a satellite refuge of the Seney National Wildlife Refuge. It is the largest of the four Lake Michigan islands in the Michigan Islands NWR, and the only one to have a substantial forest ecosystem. Balsam fir and northern whitecedar grow in the island's humid, boreal climate. Gull Island also has beaches and sand dunes on its north and east sides

Plants

The Beaver Island Archipelagos offers many beaches that provide habitat for some of Michigan's rarest plants, like the Lake Huron tansy, and pitcher's thistle.

Hog Island - Three endemic riparian plant species, Houghton's goldenrod, the Lake Huron tansy, and Pitcher's thistle, have been identified on Hog Island. All three plants are listed as threatened within Michigan.

Despite its name, **Egg Lake** functions more like a bog than a lake! The lake is hard to access but supports many of the rarest plant species in Michigan. Because of its plentiful biodiversity, many conservation groups have prioritized Egg Lake as an important natural area in need of greater protection from human disturbance.

Natural Resources, Rare Species, and Invasive Plants

Much effort has been completed as part of past studies in identifying rare species and invasive plants by performing natural resources inventories in 2012 & 2016 by the Michigan Stare University Extension. These studies are:

- High Island Rare Species and Invasive Plant Survey - August 1, 2012
  The Little Traverse Bay Bands of Odawa Indians
  Report Number 2012-03

- Natural Community Surveys of Beaver Island
  Michigan Natural Features Inventory - December 31, 2016
  Little Traverse Bay Bands of Odawa Indians Natural Resources Department
  Report Number 2016-25

These studies provide baseline information is critical for facilitating site-level decisions about biodiversity stewardship, prioritizing protection, management and restoration, monitoring the success of management and restoration, and informing landscape-level biodiversity planning efforts. This report summarizes the findings of MNFI's ecological surveys and also presents a prioritization of stewardship and monitoring of the natural community element occurrences found on Beaver Island. The complete studies are included in the appendix of this document.

St. James and Peaine Townships have continued the important effort to build beyond these studies with the creation of the Terrestrial Invasive Species (TIS) Program. This program is a part of a community effort to curb and/or eradicate invasive species spread in the Beaver Island Archipelago, while promoting

the knowledge, awareness, and protection of threatened & endangered species. This program is intended to create a local base of information and rapid response action plans towards invasive species management efforts with the assistance of the community and all groups currently working throughout the Islands towards the goal of protecting and valuing our native ecosystems.

The TIS Program has two main goals:

1. To provide educational outreach to private landowners on Beaver Island aimed at increasing landowner awareness and engagement in protecting threatened and endangered species and rare communities.
2. To monitor and manage invasive plant/insect species at priority locations and protect threatened and endangered species.

In order to increase awareness and engagement, the TIS Crew has been developing three different educational outreach events on the Island this year. Design educational content, such as fact sheets, monitor displays, and a guide on how to identify threatened, endangered, and invasive species that will be distributed. The TIS crew is also sending out survey letters to help gather an understanding of what Island residents already know about invasive, threatened, and endangered species that are found throughout the Islands.

The Charlevoix, Antrim, Kalkaska, and Emmet (CAKE) Cooperative Invasive Species Management Area (CISMA) was established in 2015 as a joint effort between local conservation districts and various non-profits. Their mission is to protect the natural resources, economy, and human health of Northern Lower Michigan through collaborative outreach and management of invasive species. The TIS works in concert with CAKE CISMA to further this shard vision.

Description of Planning Process

Community recreational facilities cannot be effectively provided without some basis from which the type, quantity, location, need, and priority for that facility has been determined. Several methods for determining a community's recreation needs and priorities have been identified. These include observed use levels for existing facilities, comparisons of recreational facilities between similar communities, unique opportunities for certain types of facilities, guidelines or standards based on quantity per population, and projected population growth, to identify a few methods.

Existing recreation opportunities can be compared to recreation standards to determine deficiencies. However, great care must be taken to apply common sense and knowledge of the community. These standards will be used only in conjunction with other methods to determine recreation deficiencies and priorities.

The purpose of the strategic planning process was to receive direct input from key individuals within the community relative to the identification and ranking of the community's current recreation needs. The issues and needs were identified and discussed with community leaders and two visioning sessions on December 14, 2022 & December 21, 2022 that are incorporated into this document. Notice of the 30-day comment period was placed on the St. James Township website, the News on the Net website, WVBI Radio, the Beaver Island Community Calendar, the Beaver Island Forum, and the Beaver Island Message Board.

The previous recreation plan was developed through a set of planning and public input processes. The processes began in May of 2017, when the St. James Township board asked Deputy Supervisor Patrick Cull to research and develop a plan for public comment and board consideration by early 2018. In addition, the public input processes of the recent 2017 *Beaver Island Master Plan* and *Water Trail Development Plan* were major resources and guides, as both processes included extensive discussions and recommendations regarding recreation and were driven by community input. Additionally, other recent 5-year Recreation Plans were reviewed, such as the previous St. James and Peaine Township plans, as well several Recreation Plans from other townships in Charlevoix County.

Community survey results from the 2017 Beaver Island Master Plan were extremely helpful in creating the goals and objectives found in the past plan and carried over into this update. Throughout 2017, the St. James Township Board reviewed all of these survey results, especially those related to their three special areas of concern: blight, access to high-speed internet, and recreation. After reviewing these survey results and several rounds of discussion at its public meetings, the Township Board drafted preliminary goals for the Township. Those goals that dealt with recreation were used as the starting point for the goals and objectives ultimately listed in this plan.

In addition, the Township facilitated several discussions with individuals and organizations on the island (including the newly founded Beaver Island Trails Association) to discuss the preliminary recreation goals for the township.

On January 19, 2023, the Township facilitated a large public input meeting at Beaver Island Community School. Notice for the meeting was placed on the St. James Township website, the News on the Net website, WVBI Radio, the Beaver Island Community Calendar, the Beaver Island Forum, and the Beaver Island Message Board. Approximately ___ people were in attendance, and those unable to attend in person were able to view the meeting over a livestream on the Internet. The bulk of the discussion was related to the preliminary goals and objectives developed by township officials. A review of the comments from the public input meeting can be found in *Appendix A*.

In response to comments and suggestions provided during and after the 30-day public comment period, Township officials worked to develop a *final* parks and recreation plan. The *final* plan was then formally adopted following a formal public hearing in January ____ 2023. A copy of the notice for the public comment period, a notice for the public hearing, the resolution for adoption and the meeting minutes can be found in the appendix of this five year plan.

Goals and Objectives

In defining the action program, the formulation of community goals and objectives for the provision of recreation is a vital component. The goals and objectives represent the purposes for a community's role in providing recreation to its residents as well as outlining the direction that the community's effort should take in the long term. Goals are the general targets for which a community aims for while objectives are the specific steps that can be taken towards that goal. A recreation plan identifies those actions that can be undertaken to implement the objectives and fulfill the community's goals. The goals and objectives for the Township in meeting the recreation needs of residents are outlined below.

Goals & Objectives

Goal 1

Maximize the recreational opportunities afforded by the township's existing assets and its natural resources.

Objectives

Natural resources and habitats are preserved by acquiring, managing, and restoring valuable resources such as open space (rivers, streams, greenways, view sheds, forests, and other habitat areas).

Potential Actions

- Provide superior and unique recreational activities and facilities, which emphasize the natural environment.
- Work with other surrounding communities to revive initiatives that promote each other's natural features and cross promote so people can better learn about the natural resources, ecological values and history.
- Work with surrounding communities to revive the initiatives, programs and funding to protect the area's existing assets and natural resources.
- Promote low water and native planting restoration whenever practical, especially in the addition of bioswales, rain gardens and stabilization plantings in areas of erosion.

Goal 2

Provide recreation opportunities that focus and take advantage of area's water resources.

Objectives

Many past survey respondents commented on the surrounding natural beauty as a focal point. They also responded that they also felt it was important to develop recreational opportunities that take advantage of what our water resources have to offer. This can be very important to local residents as well as those interested in visiting the community. Lake Michigan and Font Lake offer recreational opportunities and can be seen as an economic development tool.

Potential Actions

- Develop opportunities with other agencies in our community to educate our residents about our local natural resources.
- Increase and improve accessibility to Lake Michigan, possibly Beaver Island's greatest and most distinct resource.
- Construct a new public boat ramp/launch in the harbor. Designate areas for public parking for boaters and their trailers.
- Build a fishing pier on the harbor. Enhance fishing, canoeing and kayaking opportunities as opportunities present themselves.

- Enhance and expand our use of our natural resources for festivals and special events.
- Promote stormwater run-off quality control measures to improve water habitat for fish.
- Assist in creation of Beaver Island Water Trail.
- Explore recreational facilities and uses at Edward B. Wojan Public Beach Park based on public input and workshops. .

Goal 3

Explore opportunities to enhance how parks and recreation can be an engine of substantial economic activity in the community.

Objectives

Identify opportunities where local parks facilities, programs and local officials can better engage with their communities' economic development entities.

Potential Actions

- Local parks shape perceptions of a community and its overall quality of life that help build a sense of place.
- Investments in improving a community's quality of life can create a virtuous cycle: high quality-of-life locations attract workers, which attract employers, which in turn attract even more investment and jobs.
- Many new residents and business owners are first introduced to places as visitors or tourists; positive recreational experiences can influence both business and talent recruitment.
- Park and recreation leaders should identify persuasive metrics that speak to the role and contributions that their agencies make to business attraction and retention.
- Ensure that local residents, including young people, have connections and opportunities related to nearby outdoor assets to foster community pride, good stewardship, and local economic benefits

Goal 4

Provide additional non-motorized trails for recreational and transportation use.

Objectives

Providing the community with a non-motorized trailway system which is our "safe highway" across the community connecting our schools, parks and the downtown district is a high priority in our community.

Potential Actions

- Expand the accessible trail system in the Township with a focus on continuing to connect our existing parks, neighbors and destination points.
- Lengthen bike trail to Donegal Bay as part of phase II extension of this trail.
- Explore connection of trail system to Peaine Township.
- Explore cooperative effort with the surrounding communities and the Charlevoix County Road Commission to promote, manage, oversee, plan and seek joint funding for trails in the regional area and to avoid duplication of efforts and to enhance the connect-ability of the trails and ensure the best regional outcomes.
- Install pathways, wayfinding signs, interpretative kiosks, and respite stations within greenways.
- Develop system of wayfinding signage to aid users in navigating and utilizing park facilities

Goal 5

Provide comprehensive community-based recreation opportunities that improve the overall quality of life for all St. James Township area residents.

Objectives

The various input received from the community during this planning process has provided many suggestions for improvements in our park facilities and recreational programs. St. James Township will continue to use these suggestions to guide their planning for the future.

Potential Actions

- Continue to add amenities and support facilities to the current Township park facilities based upon community input and current needs of the community.
- Provide recreational opportunities for people with disabilities.
- Ensure that improvements and upgrades to existing park facilities are handicap accessible, where feasible.
- Construct restroom facilities, play areas, ADA parking, picnic facilities and other recreational facilities as priority items if identified in community workshops.
- Promote low water and native planting restoration whenever practical, especially in the addition of bioswales, rain gardens and stabilization plantings in areas of erosion.
- Look at options for improving educational and interpretive signage in all the parks including signs for persons of various disabilities.

Goal 6

Provide quality leisure time activities with special consideration given to improving the resident's health and fitness.

Objectives

The Community's recreational facilities and programs offer the community an opportunity to enjoy nature and take part in activities that will improve health and fitness. The Township realizes the importance of providing top quality park facilities and programs and also would like to continue to improve the health and fitness of its residents.

Potential Actions

- Provide both passive and active programming for a variety of ages and abilities of the population.
- Add recreational facilities based upon recreation trends and input from the community.

Goal 7

Protect the valuable community asset that the Municipal Marina and the role the waterfront plays in the community.

Objectives

Provide for improvements at the Municipal Marina that are up-to-date and meet the needs of the Boating Community

Potential Actions

- Evaluate yearly the marina infrastructure including docks, seawalls, utilities, bathroom, shower, laundry facilities, parking and other amenities for necessary improvements and upgrades. .

Goal 8

Acquire and retain Public land for future generations.

Objectives

As the Township continues to grow, local officials need to be conscious of the need to acquire additional park land as it becomes available.

Potential Actions

- Retain existing parkland and acquire new public lands to meet the future recreational needs of the community.
- Preserve and protect open space and other important natural features in the township area.
- Develop programs for evaluating future land acquisition.
- Preserve floodplains and wetlands for recreation purposes whenever possible.
- Acquire property adjacent to existing park properties whenever possible to allow for the greatest flexibility and offer economy of sharing infrastructure when expanding or adding recreation activities to existing dedicated parklands.

Goal 9

Create community awareness of the Township area recreational opportunities and promote them to our local citizens as well as to visitors of the community.

Objectives

Several respondents indicated in the past that they were not aware of all the parks that were available in our local community. They also indicated that they were not aware of all the adult and youth recreational programs that we offered in our local recreation department.

Potential Actions

- Develop additional print and web-based media to describe existing recreational opportunities available to the residents of our service area.
- Develop additional print and web-based media to describe and highlight our existing park facilities.
- Develop mapping for identifying and communicating which trails that are open/closed to ORV's.

Goal 10

Develop a system of park and recreation facilities that promote four season use.

Objectives

Provide residents with opportunities for recreation that provide multiple seasons of use within the Township and the respective park facilities.

Potential Actions

- Construct compatible yet diverse uses within the parks that promote spring, summer, fall and winter uses.
- Explore options for all-season facilities such as warming shelters and restrooms in the parks as appropriate.
- Explore options for community pool with Beaver Island Community School.

Goal 11

Continue the improvement and development of Universal Design Concepts at any and all township park locations in accordance with the park's development master plan.

Objectives:

Develop new and expanded facilities and programs at the park including new restrooms, picnic facilities, paved parking, walking paths, new play equipment and lighting.

Potential Actions

- Improve restroom facilities at the Township Campground facility as well as other Township parks.
- Provide for universally accessible play areas, picnic facilities and shelters
- Provide paved parking areas and trails to provide barrier-free access to all areas.
- Provide additional non-motorized trails to better connect community destinations and areas.
- Improve signage for any visually or physically impaired park users.
- Make the island's recreational assets more easily accessible to its own citizens.

Goal 12

To enhance the quality of life in the Township by providing multi-generational, fully accessible and safe recreational facilities that are responsive to the needs of *all* residents with high quality recreational facilities that efficiently utilize available resources.

Objectives

- Develop a variety of recreational facilities that reflect the changing and diverse needs of the Township residents.
- Improve existing recreational facilities to more effectively fulfill the needs of Township residents and to encourage regular use of these facilities.
- Develop certain recreational facilities as identified with community input and establish priorities for their development.
- Utilize design, construction, and maintenance practices that maximize the benefits provided for the resources expended.
- Plan improvements that offer both active and passive recreation opportunities.
- Develop unique recreational opportunities for elderly and physically challenged citizens. Every recreational opportunity should be fully accessible to all individuals whenever possible.
- Provide play areas that are in conformance with the "Playground Equipment Safety Act".

Goal 13

Create new partnerships and foster on-going collaboration.

Objectives

As Michigan continues to struggle, it is important to take advantage of collaborations and partnerships as a cost-effective way to offer recreational programs in the community.

Potential Actions

- Encourage the cooperation and participation of adjacent communities in the formation of a regional recreational advisory board in an effort to combine resources and avoid duplication of facilities and services.
- Encourage the participation of volunteers in the development of recreational facilities.
- Encourage the participation of area youth in planning and maintenance of recreational facilities.

- Utilize public and private sector cooperation in the promotion of recreation and the improvement of recreational opportunities. These organizations should include but not limited to the Beaver Island Chamber of Commerce, Bever Island Historical Society, Beaver Island Archipelago Trails Association, Port of St. James Association, My Sister Heart Inc., Beaver Island Rural Health Center, Beaver Island Cultural; Arts Association, Patron of the Arts In Rural Communities, the Preservation of Beaver Island Association, Beaver Island Wildlife Club, Amik Circle Society, the Beaver Island Community Development Corporation, the Great Lakes Islands Alliance, Charlevoix County and Networks Northwest, the Little Traverse Bay Bands of Odawa Indians (LTBB), the Beaver Island Community School, the Cooperative Invasive Species Management Area (CISMA) Serving Charlevoix, Antrim, Kalkaska, and Emmet Counties (CAKE) and other organizations that may be identified.
- Encourage the participation of volunteers in the development of recreational facilities.

Goal 14

Reduce the impact of invasive plants on preserves, help other landowners manage invasive plants on their lands, and educate the public about this environmental problem.

Objective

Reduce adverse impacts from invasive and native species, pests, and diseases.

Potential Actions

- Continue the alliance with the Cooperative Invasive Species Management Area (CISMA) Serving Charlevoix, Antrim, Kalkaska, and Emmet Counties (CAKE).
- Work with partner communities under the Great Lakes Islands Alliance (GLIA), which is a binational network of volunteer island residents, advocates and leaders from across the Great Lakes and beyond. The alliance will encourage the building of relationships, foster the exchange of information, and help leverage resources to address challenges and embrace opportunities for the benefit of islands.
- Create additional educational opportunities through the Terrestrial Invasive Species (TIS) Program. This program is intended to create a local base of information and rapid response action plans towards invasive species management efforts with the assistance of the community and all groups currently working throughout the Islands towards the goal of protecting and valuing our native ecosystems

Goal 15

To continually foster the unique history of the island and protect those properties and resources that contribute to the identity of the community.

Objective

Strive to preserve the cultural and natural heritage of the community and focus on the importance for achieving sustainable development

Potential Actions

- Work with the Charlevoix County & Networks Northwest to preserve and enhance the Beaver Head Lighthouse that served such a critical role in the safety of shipping for over a century.
- Continue the efforts to partner with the Beaver Island Historical Society to preserve and share the unique history of Beaver island and the Archipelago.

Goal 16

To continually improve the quality of and the opportunities for recreation in the Township by reassessing community recreation needs, trends, and characteristics.

Objectives

- Periodically update this Recreation Plan.
- Develop an expanded survey to ensure public needs and desires in areas of parks & recreation.
- Expand and develop community park advocates through the ongoing efforts of the existing parks & recreation advisory board.
- Provide opportunities for the involvement of Township residents in the identification, selection, and development of recreational facilities.
- Monitor the effectiveness of the Township's efforts in fulfilling identified goals and objectives by providing opportunities for Township residents to evaluate the progress of recreational development.
- Monitor the effectiveness of the Township's efforts in providing fully accessible opportunities for Township residents.
- Facilitate regular meetings of the Recreation Board.

Action Program

Recommended Actions

A variety of factors, including community characteristics, population trends, existing recreation facilities, and identified recreation needs, contribute to the formulation of specific recommendations for plan implementation. These specific recommendations represent the actions that can be undertaken to achieve the objectives that have been directed towards a community's recreation goals. These recommended actions also represent the substance and purpose of a recreation plan - the development of a strategy for effectively closing the gap between existing recreation opportunities and recreation needs.

The following recommendation and capital improvement schedule outlines and assigns relative priorities to activities and projects that can be implemented in both the short-term and long-range future to improve recreational opportunities in the Township. Those activities and projects that can be undertaken during the five-year planning period (2023-2027) have been summarized in a Capital Improvement Schedule (Table 8-1). This schedule includes cost estimates as well as possible funding sources for each suggested project.

While these projects are recommended for implementation during the planning period, they are highly dependent upon financial and administrative feasibility. It is also suggested that the Township take advantage of any unscheduled opportunities that may arise. Such opportunities can be evaluated and included in this plan as an amendment to the schedule.

Please note: The capital improvements are listed in no particular order. The matrix provides a target year, the project location, a description, an estimated range of likely costs, revenue sources, and goals. It is intended to be used as a guideline for planning.

Capital Improvement Schedule

Table 8.1 - Capital Improvement Schedule

Year	Project	Est. Cost	Justification	Funding Source
2023	St. James Twp. Campground	$200,000	Goal 3,5,10,11,12	$130,000 MNTRF Grant $70,000 Local Match
2024	Edward B. Wojan Public Beach Park ▪ birding/wildlife viewing station(s) ▪ Access point Island water trail ▪ kayak & small non-motorized boat landing ▪ handicapped accessibility to water ▪ picnic pavilion ▪ outdoor performing arts venue ▪ public restrooms	$600,000	Goal 2,5,10,11,12	$600,000 SPARK Grant Or $300,000 MNTRF Grant $300,000 Local Match
2025	Marina North Improvements	$300,0000	Goal 3,5,7,12	$150,000 - Waterways Grant $150,000 Local
2026	Donegal Trail – Phase 2	$200,000	Goal 3,4,5,6,12,13	$130,000 MNTRF Grant $70,000 Local Match
2027	Miscellaneous ADA Improvements At Various Parks	$200,000	Goal 5, 11,12,13	$130,000 MNTRF Grant $70,000 Local Match

Abbreviations

MDNR - Michigan Department of Natural Resources
LWCF - Land and Water Conservation Fund
TAP -Transportation Alternatives Program
MDOT – Michigan Department of Transportation
MNRTF- Michigan Natural Resources Trust Fund
Waterways - Michigan Department of Natural Resources Waterways Program

Financing Mechanisms

The following paragraphs briefly outline existing sources of funds for financing the future recreational improvements in the City.

1. General Funds

The Township's general fund has been the primary source of funds for operating and maintaining its current facilities. Future site improvements, acquisition, and development will remain dependent on these tax-supported funds, as will the continued operation and maintenance of these facilities. Consequently, recreation planning has to be coordinated with the yearly budgeting process for the City's general funds.

2. Donations and Gifts

The availability of donated land, labor, equipment, and funds from individuals and organizations is an attractive and effective way to improve recreational opportunities in The City. Over the past few years, several groups and individuals have contributed significantly. Such support should be encouraged to continue.

3. Multi-jurisdictional Funding

One of the primary goals of establishing a trail authority comprised of adjacent townships would be to establish a joint source of funding for acquisition, development and maintenance of multi-jurisdictional trail projects. It is too premature to discuss levels or formulas for financial participation/contribution, but by forming such a coalition, the individual townships will collectively be in a stronger position in seeking future matching grants than if pursuing projects individually.

4. Non-Local Financial Assistance

Many communities seek outside sources of funds to supplement their local sources when providing recreational improvements. There are several programs administered by the Michigan Department of Natural Resources (MDNR) that can provide some financial assistance to local recreation projects. Funding amounts available to communities vary from year to year depending on Federal support and State legislative agendas.

The Transportation Alternatives Program (TAP) is a competitive grant program administered by the Michigan Department of Transportation that funds projects such as nonmotorized paths, streetscapes, and historic preservation of transportation facilities that enhance Michigan's intermodal transportation system and provide safe alternative transportation options. These investments support place-based economic development by offering transportation choices, promoting walkability and improving the quality of life. The program uses Federal Transportation Funds designated by Congress for these types of activities. Some key information on the TA program is as follows:

- Funding with be reduced from the current $23 million a year to $14-16 million a year. Project funding will be more competitive than previously with the average per capita award in the $44-50 per person range.
- Minimum match is still 20% however historic average is 34% and the 2011 average was 44% local match to grant. Any project request for over $2,000,000 total project cost must be 50%-50%. The most favorable grant request will likely be in the $500,000 range.
- Regional Trails will still be a priority, as will urban area streetscapes. Museums and historic preservation projects will be phased out for funding consideration.
- Preliminary grant application review with regional staff is encouraged to determine competitive nature of project and gather suggestions from TE staff. Project narratives should focus on intermodal transportation opportunities as they relate to the larger picture in the community, traffic calming, improving safety and improving water quality through best management practices.

The **Michigan Natural Resources Trust Fund** (MNRTF**)** is administered by the MDNR. The MNRTF program utilizes the royalties from oil, gas, and other mineral developments on state-owned lands to help finance the acquisition and the development of outdoor recreation facilities. The CMI program is the result of the passage of Proposal C of 1998.

Any unit of government, including school districts, may apply for grants to develop or acquire land(s) for public recreation or resource protection purposes. Application forms are available on February 1 of each year. The application deadlines are April 1 and September 1, of each year. The MDNR submits a list of recommended projects to the legislature the following January and funds are available after legislative appropriation, usually the following fall.

All local units of government must provide a local match of at least 25 percent of total project costs. For **MNRTF** development projects, the minimum funding request is $15,000, and the maximum is $300,000. Proposals must be for outdoor recreation or resource protection purposes. Outdoor recreation support buildings and other facilities are eligible for development funding, as is the renovation of existing recreation facilities.

All applicants must have a current DNR-approved community recreation plan, documenting the need for project proposal.

In addition, any private individual may nominate land for public acquisition under this program. All nominations are reviewed by the MDNR for possible acquisition and the landowner is not required to be the person nominating a parcel of land for public acquisition. Nomination forms are available at any time from the DNR Recreation Division, and may be submitted to the Department year round.

The Federal Land and Water Conservation Fund (**LWCF**) program makes money available to the States for land acquisition and development of outdoor recreation facilities. From 1965 to 1996, the Department of Natural Resources (DNR) received over $100 million in LWCF assistance for more than 1,500 projects, over 1,100 of which have been grants to local governments. The objective is to provide grants to local units of government and to the State to acquire and develop land for outdoor recreation.

Applications are evaluated on established criteria including project need, capability of applicant, and site and project quality. At least 50 percent match on either acquisition or development projects is required from local government applicants with a $30,000 minimum and $100,000 maximum funding limit. The Michigan Department of Natural Resources (MDNR) makes recommendations to the National Park Service (NPS), which grants final approval. Criteria are spelled out in the "Recreation Grants Selection Process" booklet given to all applicants.

PA 32 of 2010 created the Local Public Recreation Facilities Fund to be used for the development of public recreation facilities for local units of government. Money for this fund is derived from the sale of the **Recreation Passport** which replaces the resident Motor Vehicle Permit (MVP) — or window sticker — for state park entrance. The passport will be required for entry to state parks, recreation areas and boating access sites. Ten percent of remaining revenue will be used to fund the **Recreation Passport local grant program**. A 25% minimum local match is required for the Passport grant program with a maximum grant amount of $150,000 and a minimum of $7,500.

The grant program may only be used for local development projects. The program is focused on renovating and improving existing parks, but the development of new parks is eligible. In addition, projects must fulfill the following requirements in order to be eligible:

- Current annual capital improvement plan (CIP) – plan must include the proposed project. If your community does not have a CIP, you must have a current approved recreation plan on file with the DNR.

Organizations with an interest in developing fishing conditions in their areas may be able to get financial assistance from a program established through the ***State Game and Fish Protection Fund***.

This fishing development grant is offered through the MDNR and can be as much as $200,000 annually, in cash or in-kind services. Projects eligible for funding include: culvert modifications for improved stream flow; livestock or sheet erosion control projects; the development of spawning riffles, fish cover structures, or spawning reefs; and the construction of fishing piers and rough fish barriers.

The MDNR accepts grant proposals from organized fishing groups and local units of government. In all cases, projects are able to approach other sources such as the federal government for additional matching funds.

The ***Historic Preservation Grant Program*** is administered by the Department of State with funds made available through the National Park Service of the Department of Interior. The intent of the program is to conduct surveys of architectural, engineering, archaeological, and historic resources, to identify and nominate eligible properties to the National Register of Historic Places, and to plan for the protection of those cultural/recreational resources.

The funds for this program are apportioned by the National Park Service directly to the State, which, in turn, allocates funds on a project-by-project basis to local governments, organization, and individuals.

In Michigan the Historic Preservation Grant program is administered by the Michigan Department of State. The amount of assistance is up to 50% of the project expenses. Grantees are reimbursed at the completion of the project for work done within the days of a contract between the Department of State and the grantee. EXPENSES INCURRED PRIOR TO THE EXECUTION OF A CONTRACT ARE NOT ALLOWABLE PROJECT COSTS AND WILL NOT BE REIMBURSED.

The **Inland Fisheries Grant Program** offers grants up to $30,000 for projects that enhance the state's aquatic resources. This program may be applicable to the scenic overlook fishing platforms and educational kiosks.

The Townshipis committed to review all available funding sources and prepare the necessary plans, reports, cost estimates, and funding applications, to achieve the goals of this recreation plan.

Waterways Program Grants are funded through the Michigan State Waterways Fund from state marine fuel tax and water craft registrations. By law, administration of the Waterways Program is through the Michigan Department of Natural Resources (DNR) and overseen by the Department's Parks and Recreation Division.

Grants provide funding assistance for design/engineering and construction of public recreational harbor/marina and boating access site/launch facilities throughout the state. Only local units of government (city, City, township, or county) and public universities are eligible. Applicants may cooperate with community/sports organizations in the implementation of projects. On-site investigation by DNR, Parks and Recreation Division staff may be required to determine suitability of proposed work. Applicant may also be required to document area boating demand. Greater priority may be given to projects for which a local applicant documents match capabilities equal to or greater than the percentage of project

cost they are required to provide. The local match can include in-kind expenses as long as they are well-documented.

Applications, and all required information, must be received by 5:00 p.**m, April 1st.** If April 1st falls on a weekend, the deadline would be the last State working day prior to April 1st. The application review and funding process for projects is from April 1st until an appropriation is approved by the Legislature. This can take up to 18 to 24 months. Notification of approval for engineering and smaller sized construction projects may occur within six months after completed application form and proper documentation are received. Funding for construction is not released until permits are secured.

Communities, non-profits, and municipalities can submit projects by applying for a **Patronicity crowdgranting campaign**. Crowdgranting is the effort of leveraging broad based crowdfunding against a sponsor's matching grant to improve communities.

Public Spaces Community Places projects include:

- Public Plaza & Green Space Development
- Access to Public Amenities
- Farmer's Markets, Community Kitchens, Pop-Up Retail/Incubator Space
- Alley Rehabilitation
- Any other place based (or public space improvement) project

The Public Spaces, Community Places program is a public placemaking initiative created by the Michigan Economic Development Corporation. Projects that meet the program's parameters and successfully crowdfund their goal will receive a matching grant from the MEDC of up to $50,000

5. Millage

In an effort to raise matching funds or fund projects with local money, many community leaders have placed ballot proposals before their residents for a dedicated increase in their existing mill property tax to fund park maintenance and repair, including care for new parks and newly acquired parks, compliance with the Americans with Disabilities Act (ADA), as well as safety and security improvements. Establishment of a Park Improvement/Development, Maintenance and Repair Millage will assure that parks and facilities will be maintained at the level of quality expected by park users and that new parkland will have adequate amenities.

Appendix

High Island Rare Species and Invasive Plant Survey

Prepared by:

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Michigan Natural Features Inventory
P.O. Box 30444
Lansing, MI 48909-7944

For:
The Little Traverse Bay Bands of Odawa Indians

August 1, 2012

Report Number 2012-03

Michigan Natural Features Inventory

MICHIGAN STATE UNIVERSITY EXTENSION

DRAFT

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Cover photos: top left, fascicled broomrape (Photo by Bill Parsons), top right, Lake Huron tansy (Photo by Michael R. Penskar); lower left, Pitcher's thistle (Photo by Bill Parsons); and lower right, Lake Huron Locust (Photo by Bill Parsons).

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Executive Summary

High Island is one of two islands within the Beaver Island Archipelago which are part of the 1855 Little Traverse Bay Bands of Odawa (LTBB) Reservation. This project created a partnership between the Michigan Natural Features Inventory (MNFI) and LTBB to assess the current status of the natural features on the island and educate one another about these and other important island features. Early and late season surveys were conducted for 19 rare plants, seven avian species, three invertebrates, and five priority invasive plants. Target species were selected based upon their known or reported occurrence in the northern Lake Michigan area or the presence of suitable habitat as determined through aerial photo interpretation.

Occurrences of state and federal threatened Pitcher's thistle, state threatened fascicled broomrape and Lake Huron tansy were relocated and their status and spatial extent updated. The last reported surveys for these species were from 30, 53, and 25 years ago, respectively. The Pitcher's thistle occurrence is one of the largest and highest quality populations in Michigan. The Lake Huron tansy, restricted to Midwest Great Lakes shores, is one of 128 occurrences in Michigan, and the western disjunct species, fascicled broomrape, is one of only 20 occurrences known in the state.

Weather conditions prevented passage to the island during the optimal survey window for piping plover, bald eagle, merlin, osprey, Caspian tern, common tern, and northern goshawk, and none of these species were documented nesting on the island during in 2011. However, a pair of bald eagles was observed flying near Lake Maria during reconnaissance surveys in 2010 and a pair of merlins were observed flying south of the eastern landing point in August, 2011.

Surveys for the dune cut-worm were also limited by weather conditions and no specimens of this species were collected during two nights of trapping. This species was last observed on the island in 1935. The Lake Huron locust, last reported in 1966, was found in abundance in the western dune complex and in foredunes at three other locations. These observations comprise a single, large element occurrence for this species. No suitable habitat was found for Hine's emerald dragonfly.

Invasive species were not overwhelming on the Island, presenting an opportunity for effective rapid response and on-going early detection monitoring. They were notably absent in the western dune complex, however, a single occurrence of bittersweet was mapped in the main blowout. Identification to the species level was not possible at the time of survey in 2011 and spring surveys when the leaves are unfolding or later during the flowering or fruiting stage are recommended. If identified as the highly invasive Oriental bittersweet, intensive surveys in the vicinity of this occurrence are warranted to delineate the entire extent of the infestation. Immediate control measures are urgently recommended if this is determined to be Oriental bittersweet.

Significant patches of spotted knapweed and bouncing bet, were found in the foredunes on the east side of the island extending up towards the northeastern sand spit. Medium and small patches of invasive phragmites, cat-tail, and reed canary grass, were found on the northwest and eastern coastal wetland areas and are likely to occur in the remaining coastal wetlands. Monitoring and treatment of invasive phragmites has already begun and should be expanded to include other coastal invasive species such as invasive cat-tail and reed canary grass.

Dedicated surveys of trails and other disturbed areas, as well as representative vegetation types are encouraged so that prioritized rapid response efforts can be implemented effectively throughout the Island. Particular attention should be paid to protecting high value sites, containing source populations and disrupting dispersal pathways.

In spite of limited survey time on the High Island, significant rare species data were captured that affirm the Island's ecological importance. These data, however, likely under-represent the natural features on the island and further surveys are recommended for all target species. Of particular interest are the dense areas of boreal forest at the southern end of the island which merit spring surveys for rare orchids and the V-shaped bluff in the southern region of the island which merits surveys for seeps that might harbor rare ferns or fern allies.

The diminutive dunewort should be targeted in the western dune complex and attempts should be made to relocate stitchwort, last documented there in 1986. Trapping for the dune cutworm in these dunes is also a high priority since surveys were limited in 2011. While this species was last documented 23 years ago, the western dune complex remains a high quality, relatively undisturbed ecosystem, and could still harbor this species.

Surveys of the remaining shoreline are recommended to determine the full extent of the rare species documented to date, particularly pitcher's thistle, Lake Huron tansy and Lake Huron locust. These coastal areas, as well as the V-shaped bluff in the southern end of the island may provide habitat for rare snails which could be targeted in future surveys. Early season surveys for shore birds and raptors are also warranted and should be expanded to include neotropical migrants and marsh-dependent species.

Surveys to delineate and assess the status of the natural communities on the island are also encouraged as they provide habitat for rare and vulnerable species. A systematic threat analysis for these communities would be highly beneficial. Maintaining the health and integrity of these ecosystems will allow the diversity of native species, both common and rare, to thrive on the island.

These findings provide important data for consideration when identifying conservation targets for High Island and devising management strategies for their protection.

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Introduction

High Island harbors numerous features that contribute to the rich biodiversity and cultural value of the Beaver Island Archipelago. It is one of two islands within the archipelago which are part of the 1855 Little Traverse Bay Bands of Odawa (LTBB) Reservation. Previous surveys by the Michigan Natural Features Inventory (MNFI) identified several natural community and rare species occurrences on the island; however, these data are now outdated and incomplete. Also, few data are available about the status of invasive plants, such as *Phragmites australis* ssp. *australis* (non-native phragmites) and *Centaurea stoebe [Centaurea maculosa]* (spotted knapweed), that pose a significant and imminent threat to the island's natural features. This project created a partnership between MNFI and LTBB designed to accomplish a number of goals including: 1) gathering current data on previously identified natural features on the island, 2) identifying and filling survey gaps, 3) identifying and mapping priority invasive plant species, and 4) educating LTBB natural resource staff about MNFI's survey methods and the natural features of the island.

The LTBB provided state of the art, 2010, digital orthophotos for the interpretation and identification of natural feature inventory targets. They also provided transportation to the island from Beaver Island and helped guide us during field surveys. Surveys focused on rare and vulnerable plant and animal taxa and selected invasive plants, while gathering general ecological information to inform future survey work. These data are important for defining conservation targets and developing management strategies for their protection.

Organization of the Report

This report provides overviews of the study area, access and timing of surveys, aerial photo interpretation, and selection of survey targets first, as these are common to the three main components of the project. It is then divided into separate sections for rare plants, rare animals, and invasive species, each with its own methods, results, and discussion sections. The overall findings are summarized in the executive summary. The appendices include plant species lists for selected natural communities, detailed species accounts for rare species documented on High Island, and NatureServe element occurrence rank specifications.

Study Area, Access and Timing of Field Surveys

Surveys for this project were conducted on High Island, located in northern Lake Michigan, just north of Beaver Island, Charlevoix County, Michigan (Figure 1). The survey crews set up a home base on Beaver Island and accessed the island using an 18 foot Lund boat piloted by LTBB staff. Two survey periods were selected, coinciding with when the majority of targets were most easily detected, e.g., during breeding and flowering periods. Early season field inventories were planned for the week of June 5-11, 2011 and late season surveys for the week of July 31-August 6, 2011. Emphasis was placed on accessing high priority sites identified from the aerial photo interpretation, although to a large extent surveys were ultimately influenced by the ability to access shoreline areas by boat and by the dictates of weather. Bad weather conditions

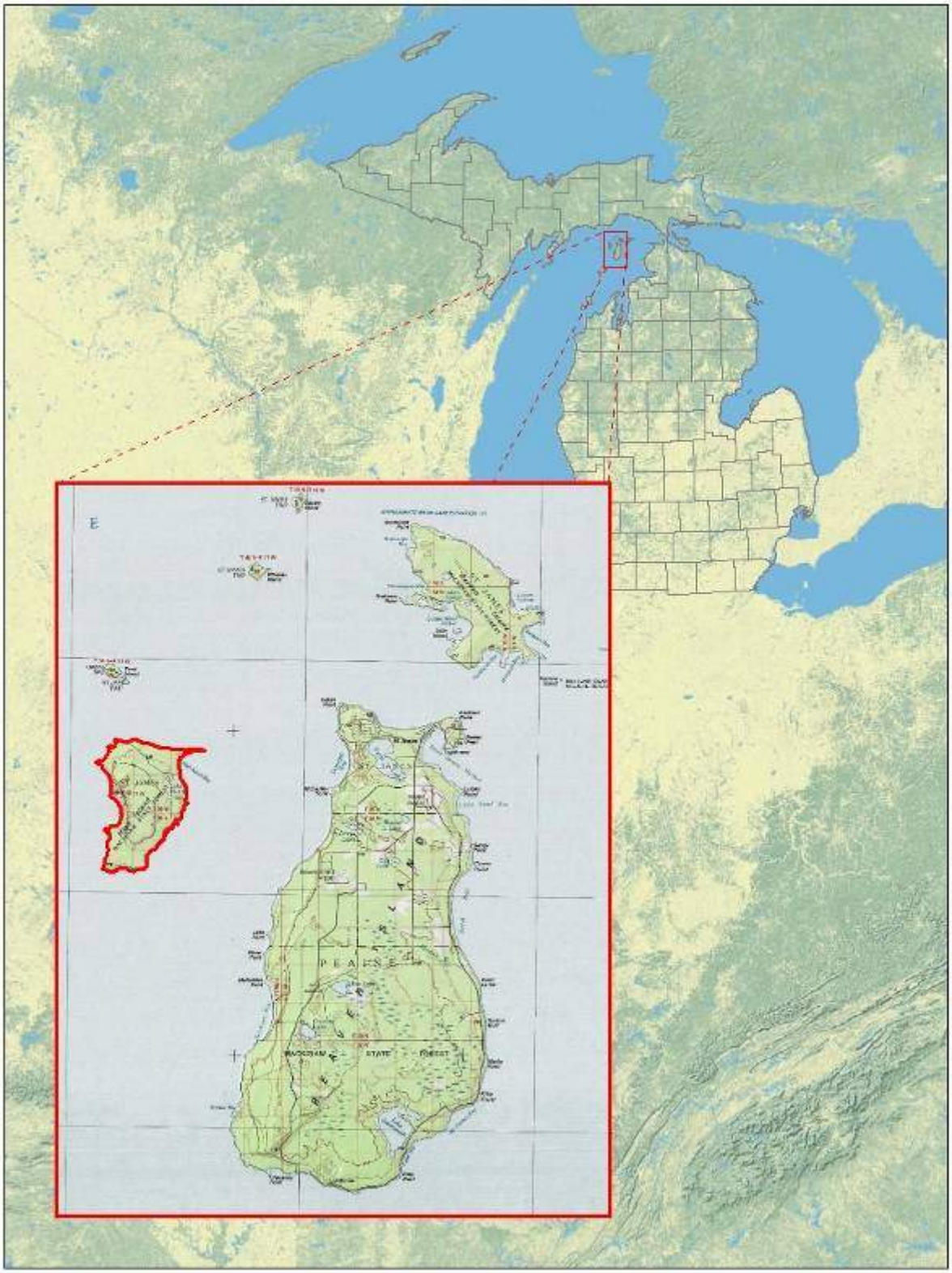

Figure 1. The study area, High Island, lies within the Beaver Island Archipelago in northern Lake Michigan.

prevented access to High Island during the planned early season survey period, thus site visits were limited to late season surveys on August 1 and 4.

Using the LTBB aerial imagery and GIS maps, both in digital form using handheld devices and hard copies, surveyors hiked to delineated areas from several access points, including the west side of the island adjacent to the open dunes, the northwest shore, the extreme southern shore, and the northeastern shore near Lake Maria. The east-west interior trail system was also used to hike from the eastern shore to the large dune complex on the western side of the island. MNFI and LTBB staff conducted surveys together, learning from one another in the process.

Aerial Photo Interpretation

Prior to the field season, color aerial imagery collected April 11, 2010 by LTBB was obtained to conduct a methodical interpretation of High Island for natural features. The imagery consisted of digital orthophotos with a one-foot GSD (Ground Sample Distance) or 0.3048 meters. The imagery was interpreted in conjunction with data from the MNFI Biotics Database. These data included information and associated shapefiles for all known element occurrences (EOs) of high quality natural communities, rare animals, rare plants, and other tracked features, such as exemplary geological formations or lichens. MDNR aerial imagery was also consulted for comparison, particularly the 1998 CIR (color infrared) photos and additional color imagery from 2005 and 2009.

Interpretation focused on the identification of natural communities, with special attention to those occurring along or in close proximity to the shoreline and most likely to support high priority rare taxa. Priority natural communities included such types as coastal fen, rich conifer swamp, boreal forest, mesic northern forest, open dunes, interdunal wetland, wooded dune and swale, and limestone cobble shore and the related sand and gravel beach. These types guided the selection of priority survey sites for each component of the project.

Figure 2 shows the principle areas highlighted for field survey. They consisted primarily of: 1) the large open dunes complex in the middle of the western shore of the island, 2) the coastal area along the northwest shore of the islands, 3) the northeast interior lake (known in some maps as Lake Maria), 4) the steep bluff forming a contiguous, V-shaped rim in the southern interior of the island, 5) the extreme southern shore of the island with adjacent wetland/interdunal depressions, 6) the southeastern shoreline of the island, and 7) the sand spit at the northeast corner of the island.

Selection of Survey Targets

Target species for survey were identified for rare plants, rare animals, and invasive plants prior to the field season to help direct inventories. Species selection was based upon the known, historical or reported occurrence within the Beaver Island Archipelago, other islands within northern Lake Michigan, the Straits region, or the coastal zone of adjacent mainland areas (Penskar et al. 2002a, Penskar et al. 2002b, Penskar et al. 2001, Penskar et al. 2000, Penskar et al. 1999, Penskar et al. 1997, Penskar and Leibfreid 1993).

Figure 2. Principle areas highlighted for field survey on High Island in 2011.

Additional species were included for which suitable habitat appeared to be present on the island as determined by the aerial photo interpretation and experience of the surveyors. Surveys were guided by but not limited to seeking targeted species. With extensive experience in habitats throughout Michigan, all surveyors were prepared to gather data on any other significant species unknown or unusual for the region.

Rare Plant Inventories
Methods

Target Species

Nineteen rare plant species were targeted for survey including three species previously documented on the island (Table 1). The latter included records for *Cirsium pitcheri* (Pitcher's thistle, state and federal threatened), *Tanacetum huronense* (Lake Huron tansy, state threatened), and *Orobanche fasciculata* (fascicled broomrape), state threatened).

Field Surveys

Sites were systematically surveyed by conducting methodical meander-searches. Efforts were made to identify previously known rare plant records to determine whether they were extant or not and to update extant occurrences with current, detailed, spatial and population data. When potential habitat for new rare plant taxa was encountered, sites were carefully surveyed to detect any of these species. Plant species lists were compiled for significant natural communities during the dedicated site surveys and foot travel throughout the island. These lists were compiled using the statewide assessment system provided by Herman et al. (2001), to characterize floristic quality. They were also compiled so that known, high quality natural community occurrences could be subsequently updated by MNFI ecology staff. Species not previously known from the island were noted.

Special plant field forms, plant species lists, and representative photographs were compiled as necessary when rare plant populations were identified. Waypoints were recorded via a Garmin 12XL GPS unit to obtain accurate location data for occurrences, in addition to depicting survey areas and routes throughout the island. Where appropriate, voucher specimens were collected and pressed to provide documentation for new plant records, including both rare and more common species. In some cases, voucher specimens were sought to better document known records previously based solely on field observations, or to obtain higher quality, contemporary collections more representative of the population of a site. Specimens were also obtained for the subsequent identification of plants that could not be determined in the field and/or that required determination by a specialist.

Data Processing

Following field surveys, voucher specimens collected during inventories were examined and identified. Data from field forms, notes, and plant lists were compiled and in conjunction with downloaded GPS data and photographs, element occurrence records were evaluated, transcribed, and processed. Where appropriate, new records were mapped and recorded, and known records were updated and remapped as necessary to more accurately reflect their recently observed spatial distributions.

Table 1. Target species identified for rare plant surveys on High Island in 2011.

Species	Common Name	Global, State Rank[1]	State[2], US[3] Status	Associated Natural Community types/habitats
Amerorchis rotundifolia	roundleaf orchid	G5, S1	E	Rich conifer swamp
Asplenium trichomanes-ramosum	green spleenwort	G4, S3	SC	Limestone outcrops
Botrychium campestre	dunewort	G3G4, S2	T	Open dunes, old fields
Bromus pumpellianus	Pumpelly's brome grass	G5T4, S2	T	Open dunes
Calypso bulbosa	Calypso orchid	G5, S2	T	Boreal forest, rich conifer swamp
Carex richardsonii	Richardson's sedge	G4, S3S4	SC	Alvar, limestone bedrock lakeshore, northern fen
Carex scirpoidea	bulrush sedge	G5, S2	T	Coastal fen, limestone bedrock lakeshore, northern fen, alvar
Cirsium pitcheri	Pitcher's thistle	G3, S3	T, LT	Open dunes
Cypripedium arietinum	ram's head orchid	G3, S3	SC	Boreal forest, rich conifer swamp
Drosera anglica	English sundew	G5, S3	SC	Coastal fen, northern fen
Iris lacustris	dwarf lake iris	G3, S3	T, LT	Boreal forest, alvar, limestone bedrock lakeshore
Mimulus michiganensis	Michigan monkey-flower	G5T1, S1	E, LE	Rich conifer swamp
Orobanche fasciculata	fascicled broomrape	G4, S2	T	Open dunes
Panax quinquefolius	ginseng	G3G4, S2S3	T	Mesic northern forest
Pinguicula vulgaris	butterwort	G5, S3	SC	Coastal fen, interdunal wetland, limestone bedrock lakeshore
Pterospora andromedea	pinedrops	G5, S2	T	Boreal forest, dry-mesic northern forest, dry northern forest, wooded dune and swale
Solidago houghtonii	Houghton's goldenrod	G3, S3	T, LT	Alvar, interdunal wetland, limestone cobble shore, coastal fen, northern fen, open dunes
Stellaria longipes	stitchwort	G5, S2	SC	Open dunes
Tanacetum huronense	Lake Huron tansy	G5T4T5, S3	T	Open dunes, limestone cobble shore, wooded dune and swale

[1]NatureServe Global and State Ranks: G1, S1-most imperiled; G5, S5-least imperiled.
[2]State status abbreviation: E, state endangered; T, state threatened; SC, state species of special concern.
[3]US/Federal status abbreviation: LE, legally endangered, LT, legally threatened.

Rare Plant Inventories
Results

Field Surveys

Figure 3 depicts the areas covered during field inventories and the locations of rare plants observed to date. From the west shore access point, large portions of the open dunes complex were traversed, including portions of the large blowout areas. Throughout the dunes and along the shoreline, Pitcher's thistle (Figure 4) was observed in abundance. Localized patches of fascicled broomrape, comprised of occasional, widely spaced stems, were found within the northernmost isolated blowout and also along lower slopes. Although the withered fascicled broomrape stems observed were long since past anthesis (flowering) and seed dispersal, this distinctive species was recognizable (Figure 5). The shoreline was systematically surveyed from the dune complex through the northwestern coastal area, where a small, obscure patch of Lake Huron tansy was observed (Figure 6). A plant species list was compiled to characterize the flora of the dunes, as presented in

Figure 3. Rare plants documented on High Island to date. Occurrences in red were observed during 2011 field surveys; occurrences in yellow were not relocated in 2011. The Pitcher's thistle represented by three points, is considered a single element occurrence.

Figure 4. State and federal threatened Pitcher's thistle. Photo by S. Crispin.

Figure 5. State threatened fascicled broomrape. Photo by M. R. Penskar.

Figure 6. State threatened Lake Huron tansy. Photo by M. R. Penskar.

Appendix A. The southern shore was accessed and surveyed primarily to assess the potential for coastal fen species, but no such habitat was identified. During the survey of the sandy-cobbly shoreline areas, a single flowering plant of Pitcher's thistle was observed. No rare species were found during surveys of the Lake Maria shoreline. Numerous scattered patches of Pitcher's thistle were observed along the eastern coastal zone, north and south of the landing area. Owing to the limited time for surveys, the interior bluff slope and the southern third of the eastern shoreline were not accessed during the August 2011 site visits. All rare species occurrences documented on the island to date are summarized in Table 2 including their first and last observed dates.

Table 2. Previously documented and updated rare plant element occurrences for High Island, based on the MNFI Natural Heritage Database, 2011.

Scientific Name	Common Name	State, Federal Status	EO Number	Year First Observed	Year Last Observed
Cirsium pitcheri	Pitcher's thistle	T, LT	68	1981	2011
Stellaria longipes	stitchwort	SC	11	1986	1986
Orobanche fasciculata	fascicled broomrape	T	19	1986	2011
Tanacetum huronense	Lake Huron tansy	T	9	1958	2011

Rare Plant Inventories
Discussion

Weather conditions limited surveys on High Island in 2011, but it is clear that similar to Garden, it is one of the most significant islands within the Beaver Island archipelago, sometimes referred to as the Grand Traverse Islands (Judziewicz 2001). Key natural features include the extensive acreage of boreal forest, which dominates much of the island, an exemplary, pristine dune complex with well developed dune fields and blowouts, and long stretches of limestone cobble shore, as well as narrow but high quality foredune areas that collectively support large numbers of the island's extensive Pitcher's thistle population. Given that much of the interior of the island was not inventoried during surveys, this is a conservative assessment of natural features in terms of natural community or habitat types.

Although relatively few rare plant species were identified during inventories, and all were observations of previously documented occurrences, these surveys resulted in the acquisition of important data. All three of the plant occurrences identified resulted in significant updates. The island occurrence of Pitcher's thistle, one of the largest and highest quality populations in the state as indicated by its "AB rank", had not been surveyed and updated since its original documentation in 1981. The island Lake Huron tansy occurrence had not been updated since 1958, when it was first observed on High Island. The occurrence of fascicled broomrape was similarly the first update since its original discovery in 1986. For these species, which had not been observed in 30, 53, and 25 years, respectively, more detailed data on population size, habitat, and spatial extent were compiled to significantly enhance these records for the comprehensive, statewide database.

Pitcher's thistle is a Great Lakes endemic known from 171 sites in Michigan, with the majority of large, high quality populations found in the northern Lake Michigan basin, typically growing in open dunes but also occasionally on gravelly-sandy shores

(Higman and Penskar 1999, Appendix B). On High Island, this species was abundant in the open dunes complex, but was also found to occur in good numbers along the east and northeast shores, the northwest shore, and then sparsely elsewhere.

Lake Huron tansy, while not an endemic, is restricted to Great Lakes shores in the Midwest. It is known from 128 occurrences in Michigan, where it typically inhabits foredunes. It may also be found on sand and gravelly beaches (Choberka et al. 2001, Appendix B). Fascicled broomrape is a western disjunct that reaches the eastern edge of its distribution in the Great Lakes region in Indiana and Michigan. It is known from 20 occurrences in Michigan where it is restricted to coastal dunes and requires its obligate host plant, *Artemisia campestris* (wormwood) (Higman and Penskar 1996, Appendix B).

Owing to its size and rugged nature, High Island has considerable merit for further survey, warranted in part by the delineated areas that could not be accessed in 2011 due to weather. Of particular interest is the marked V-shaped bluff (Figure 2) that forms a distinct topographic feature in the southern region of the island. Due to the relatively steep slope, this bluff may be somewhat more mesic in nature and contain seeps that are of potential habitat for both rare plant and animal species, such as ferns and fern allies (e.g. clubmosses), snails, and other taxa.

All remaining shoreline areas not thoroughly explored for rare plant species should be methodically inventoried to catalogue Pitcher's thistle and Lake Huron tansy colonies and to identify any other associated habitats for additional rarities. These areas consist of the northern shoreline, and the southern portions of the eastern and western shoreline. The dense areas of boreal forest at the southern end of the island merit spring surveys for such species as calypso orchid and ram's head orchid. Efforts should be made to relocate stitchwort which was last observed in the western dune complex in 1986. Lastly, a principal target species to be sought in the open dunes is *Botrychium campestre* (dunewort), which is known to occur in perched dunes in the northern Great Lakes basin (such as Sleeping Bear dunes) and also on islands (North Manitou, South Manitou, and South Fox) in the region. This diminutive fern can only be found during early season surveys, which must be conducted from about early to mid-June.

Rare Animal Inventories
Methods

Target Species

Animal inventories focused on surveys for eight rare avian and three rare invertebrates (Table 3). Avian targets included rare birds that typically nest along Great Lakes shorelines or on islands, such as the piping plover (*Charadrius melodus,* state and federal endangered), Caspian tern (*Sterna caspia,* state threatened), and common tern (*Sterna hirundo,* state threatened); and rare raptor species that require suitable forest nest trees. These include the bald eagle (*Haliaeetus leucocephalus,* state special concern*),* northern goshawk (*Accipiter gentilis,* state threatened*),* osprey (*Pandion haliaetus,* state special concern) and merlin (*Falco columbarius,* state threatened).

Table 3. Target species identified for rare bird and invertebrate surveys on High Island.

Scientific Name	Common Name	Global Rank[1]	State Rank[1]	State Status[2]	US Status[3]	Habitats
Charadrius melodus	Piping Plover[4]	G3	S1	E	LE	Open, sandy beach, dunes
Haliaeetus leucocephalus	Bald Eagle[4]	G5	S4	SC		Forests near open water
Falco columbarius	Merlin	G5	S1S2	T		Boreal forest near open water/wetlands
Pandion haliaetus	Osprey	G5	S4	SC		Swamp forests , floodplain forest, and open wetlands along open water
Sterna caspia	Caspian Tern[4]	G5	S2	T		Sand and gravel beach
Sterna hirundo	Common Tern[4]	G5	S2	T		Sand and gravel beach
Accipiter gentilis	Northern Goshawk	G5	S3	SC		Northern forests, swamp forests, floodplain forest, and boreal forest
Euxoa aurulenta	Dune cutworm	G5	S1S2	SC		Dunes
Trimerotropis huroniana	Lake Huron locust	G2G3	S2S3	T		Dunes
Somatochlora hineana	Hine's emerald dragonfly	G2G3	S1	E	LE	Calcareous wetlands, northern fens

[1]NatureServe Global and State Ranks: G1, S1-most imperiled; G5, S5-least imperiled.
[2]State status abbreviation: E, state endangered; T, state threatened; SC, state species of special concern.
[3]US/Federal status abbreviation: LE, legally endangered, LT, legally threatened.
[4]Previously recorded breeding on High Island.

Invertebrate targets included the Lake Huron locust (*Trimerotropis huroniana*, state threatened) and the dune cutworm (*Euxoa aurulenta*, state special concern), both of which inhabit open dunes, and the Hine's emerald dragonfly (*Somatochlora hineana*, state and federal endangered), known from calcareous wetlands.

Inventories were conducted where previous occurrences were known and at additional suitable sites, during periods when the targeted animals were most active or when adults would be expected to occur. Surveys emphasized both the identification of new occurrences and the review of known or historical occurrences of rare species. Brief descriptions of these species, their habitats, and survey methods are provided below.

Avian Surveys

Shore Birds

The piping plover is a small, robin-sized shorebird with sand-colored plumage on top and a white underside with a single, narrow, black band across the upper chest. It also has a small black band across its forehead, a very short, stout, orange bill with a black tip, and orange-yellow legs. The Michigan population of piping plovers is part of the Great Lakes population, one of three remaining breeding populations of this species in the world. In Michigan, piping plovers prefer fairly wide, sandy, open beaches along the Great Lakes with sparse vegetation and scattered cobble for nesting (Lambert and Ratcliffe 1981, Powell and Cuthbert 1992). Piping plovers were last documented on High Island in 2006 along the sand and gravel beaches near the middle of the

western shoreline. Nesting was also documented in 2001 near the far end of the northeast sand spit along High Island Bay (MNFI 2011). Foot surveys using a high-powered spotting scope to search for nesting plovers, were planned for the week of June 5-11. The two areas in which it had been documented previously were targeted, especially the sand and gravel beach extending along the northwest shoreline (Figure 7).

The Caspian tern is the largest of the terns, with a wing span averaging 1.4 meters (4.5 feet; Hyde 1996). It has a black cap and red bill similar to other white terns in the state but its large size and lack of a deeply forked tail distinguishes it from these other terns (Hyde 1996). The common tern also has a black head and nape and a red bill, but is smaller than the Caspian tern, with an average wingspan of 0.8 meter (2.6 feet). It has a slender body, long pointed wings, and a deeply forked tail (Hyde 1997). Terns typically nest on islands and sand and gravel beaches and jetties to avoid terrestrial predators (MNFI 2007). The last documented breeding records for both Caspian and common terns on High Island were near the far end of the northeast sand spit along High Island Bay. Caspian terns were last documented in 1985 when some 900 nests were observed. The last Common Tern colony, comprised of 65 nests, was documented in 1982, and was heavily preyed upon by great horned owls (*Bubo virginianus*) (MNFI 2011). Casual foot surveys using a high-powered spotting scope to locate nesting terns were planned for the northeast sand spit and other areas of suitable habitat on the island in June 2011.

Raptors

The only documented raptor nesting record from High Island in the MNFI database is a 2002 Bald Eagle nest along the northwest shore of the island (MNFI 2011). Bald eagles will nest in a variety of forested habitats that provide suitable nest sites close to open water (Gehring 2006, MNFI 2007). Osprey also nest in a variety of forested habitats with suitable nest sites, such as trees, snags or cliffs, near open water with an adequate fish supply or prey base (Gibson 2007, MNFI 2007). Foot and boat surveys were planned along the shoreline for bald eagles and osprey during the June survey period.

Call playback surveys in the extensive boreal forest in the southern part of the island, were planned for the merlin and northern goshawk. The merlin is a medium-sized falcon, about the size of a blue jay, characterized by long, pointed wings that beat rapidly, a vertically streaked underside, and a long, heavily-barred tail (MNFI 2007, Cuthrell 2002). Merlins typically nest in boreal forests, preferring spruce forests near bogs or open water, in Michigan (Johnson and Coble 1967, Jordan and Shelton 1982). They do not build their own nests but use those of other birds, most commonly those of corvids (crows, ravens) (Cuthrell 2002). The northern goshawk is a large, gray bird with long, broad wings and a long tail which is rounded on the end. The head has a black cap with a pronounced white eyeline. Northern goshawks prefer large tracts of forest with an intermediate amount of canopy closure, small forest openings for foraging, and an open understory (Cooper 1999). This species can be found in a variety of forest types including coniferous stands, deciduous stands, riverine forests, and cultivated conifer stands (Cooper 1999).

Invertebrate Surveys

Dune cutworm

The dune cutworm is reported occurring in disjunct populations in sandy areas throughout North America. No other information on specific habitat requirements is in the literature. The Michigan locations are all

Figure 7. Survey sites and documented occurrences of rare animals on High Island. The point for dune cutworm is a historic, general record from 1935, lacking specific location data.

sparsely vegetated, high quality coastal dune habitats with both marram grass (*Ammophila breviligulata*) and sand reed grass (*Calamovilfa longifolia*). All Michigan specimens have been collected in close proximity to these grasses and it is speculated that the dune cutworm feeds on them.

Blacklight trapping was conducted at one site in a large open dune on the west side of High Island (Figure 7). Sampling occurred during the nights of June 29 and 30. A bucket-type trap was placed in the dune with a 15 watt UV light powered by a 12 volt marine battery. Attracted moths hit a baffle that directs them down a funnel and into the bucket for collection during trap checks. The traps were placed in a central location with the larval host plants (dune grasses) on all sides to maximize the likelihood of collecting adults. The trap location was recorded using a hand-held GPS unit.

Lake Huron locust

The Lake Huron locust is a small ash-gray grasshopper with darker brown and white markings, and wings with a prominent dark band. The pronutum (saddle-like structure behind the head) is cut by two narrow grooves (sulci), and a broad (not narrow) black band covers half the inner surface of the hind femora near the body. This species occurs only in sparsely vegetated, high quality Great Lakes sand dunes along northern Lake Michigan, northern Lake Huron, and eastern Lake Superior. Ideal habitat includes at least a mile of shoreline with two or more sets of dunes with blowouts. It primarily feeds on sand reed grass, marram grass, and wormwood, but will eat other forbs also, including the federal threatened pitcher's thistle (*Cirsium pitcheri*). The Lake Huron locust is most active in late morning, after 9:30 or 10 am. Males crepitate in flight, making a cracking noise.

Surveys were conducted by walking through appropriate habitat and flushing individuals, and counting and recording points with a handheld GPS unit. Close-focusing binoculars and an aerial net were used to confirm identification. Surveys occurred on High Island on August 1 and 4 in four areas with suitable habitat (Figure 7).

Hine's emerald dragonfly

Hine's emerald dragonfly adults, like other members of its family, have brilliant green eyes. *Somatochlora hineana* can be distinguished from all other species of *Somatochlora* by a combination of its dark metallic green thorax with two distinct creamy-yellow lateral lines and its distinctively shaped terminal appendages or genitalia. Adults have a body length of 2.3-2.5 inches (60-65 mm) and a wingspan of 3.5-3.7 inches (90- 95 mm). Important habitat characteristics of Hine's emerald sites include graminoid-dominated wetlands which contain seeps, or slow moving rivulets; cool, shallow water slowly flowing through vegetation; and open areas in close proximity to forest edge. The shallow, flowing, cool water provides important larval habitat and the open areas with adjacent woodland edge provide adult hunting and roosting habitat. Hine's emerald dragonfly sites in Michigan are classified as calcareous wetlands or northern fens with an underlying layer of shallow dolomite.

Adult Hine's emeralds feed over meadows or at forest edges by 7 am on hot days, but are most active from 9:30 am to 1:30 pm, occasionally hanging from twigs. Sometimes they feed in swarms during the day or near sunset. Males patrol territories 1-3 m over rivulets, darting between hovering points where they pivot in different directions. The rear half of the abdomen on females looks muddy and two-toned, and their flickering brown wings are visible at

some distance. Meander surveys through potential habitat were planned for the August field trip. Surveyors use close-focusing binoculars and aerial nets during surveys, as netting individuals to examine and photograph them before release provides the most definitive method for identification.

Data Processing

Following field surveys, data from field forms, notes, and species lists were compiled and examined, and GPS locations and photographs were downloaded. Voucher specimens collected during inventories were examined and identified. Element occurrence records were evaluated, transcribed, and processed. New element occurrence records were mapped and entered into the MNFI Natural Heritage Database, and known element occurrence records were updated and remapped as necessary to more accurately represent their spatial distribution in the database.

Rare Animal Inventories
Results

Avian Surveys

Weather and lake conditions prevented safe passage to High Island when early season surveys were scheduled. Thus, rare bird surveys were not conducted during the appropriate survey window in 2011. However, a pair of bald eagles was observed near Lake Maria, during a reconnaissance trip in September 2010 with LTBB staff, and a pair of merlins was observed flying south of the eastern landing point in August 2011.

Invertebrate Surveys

Dune Cutworm

Only one potential dune cutworm specimen was collected during the blacklight surveys, however the determination was negative.

Hine's emerald dragonfly

Suitable habitat for the Hine's emerald dragonfly was not found during field evaluation on August 1 and no official surveys were conducted for this species.

Lake Huron locust

The Lake Huron locust was found in all four areas surveyed on High Island in 2011 (Figure 8). Large numbers of Lake Huron locusts were observed in the extensive, high quality open dunes on the west side of the island and the northeast end of the island (Figures 7, 9). These areas contain well-developed foredunes and backdunes with blowouts. Over 400 individual locusts were observed throughout the dunes in each of these two areas. Fewer Lake Huron locusts were observed in areas with small sand dunes on the northwest end and south side of the island (Figure 7). The more common Carolina locust (*Dissosteira carolina*) was also found in some of the same areas as the Lake Huron locust. These two species often occur together.

Observations of the Lake Huron locust on the island resulted in an update of a known occurrence, previously documented in 1996 (Table 4). Twenty-five to 30 locusts had been observed along a 600-m transect in the extensive dunes on the west side of the island (MNFI 2011). Based on the NatureServe (2011) element occurrence specifications, these observations represent one element occurrence record with multiple locations on the island. Based on the 2011 survey results and the NatureServe element occurrence rank specifications (Schweitzer and Whittaker (2007), the Lake Huron locust occurrence on High Island was ranked as having good to fair viability (Appendix C).

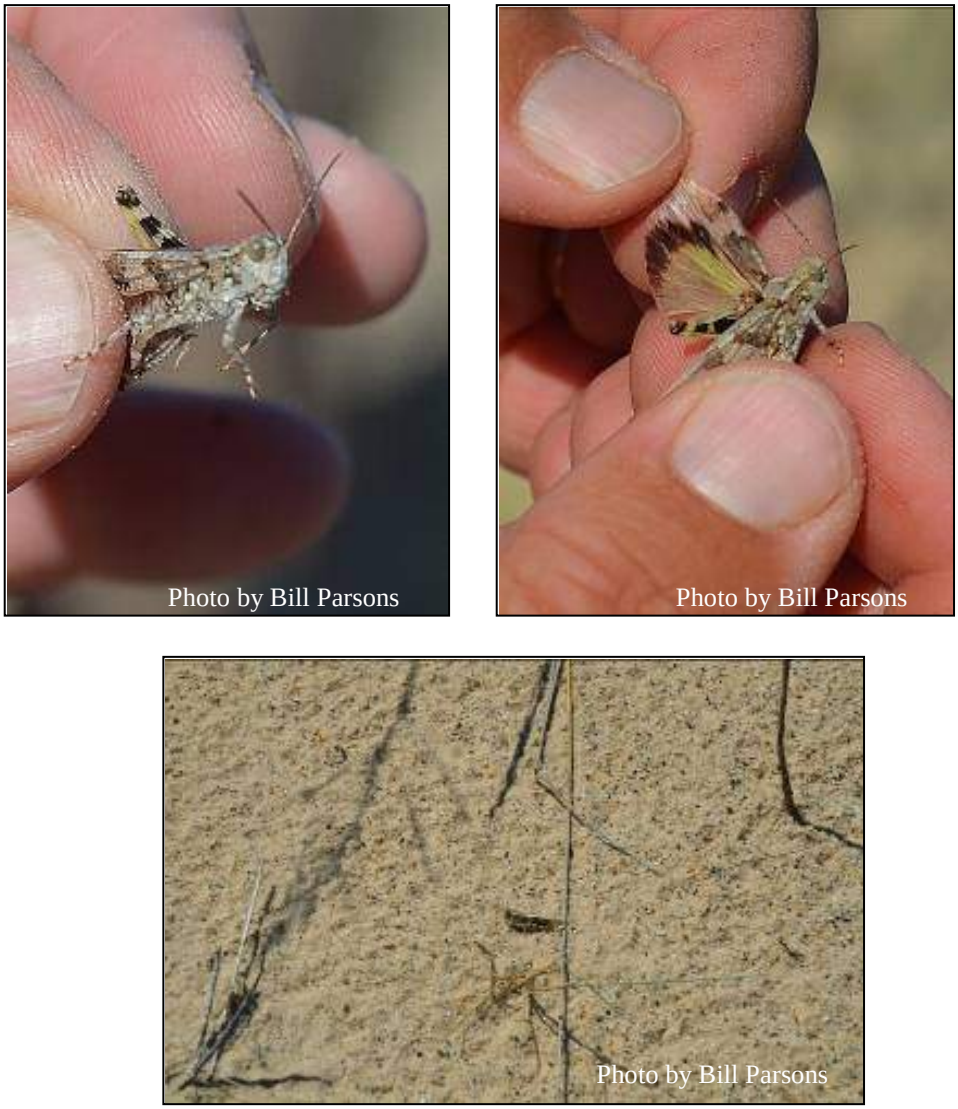

Figure 8. Photos of Lake Huron locusts found on High Island in 2011.

Rare Animal Inventories
Discussion

Avian Species

Due to the historical occurrence of many of the targeted birds on or near the island and casual observation of eagles and merlins, additional surveys for all target bird species are recommended. Neotropical migrants could also be targeted since suitable habitat occurs on the island. Surveys for marsh-dependent species may also reveal suitable wetlands along the eastern coastal zone.

Invertebrates

Dune Cutworm

Efforts to expand surveys for the dune cutworm, last documented on High island in 1935, are warranted. Documenting an extant population would be significant at both state and global levels. The dune cutworm is known only from disjunct populations in a small number of states or provinces in the U.S. and Canada (Cuthrell 1999, Nature-

Figure 9. Photos of suitable habitat where Lake Huron locusts were found on High Island in 2011. (Photos taken by Bill Parsons.)

Table 4. Previously documented and updated rare animal element occurrences for High Island, based on MNFI Natural Heritage Database, 2011.

Scientific Name	Common Name	State, Federal Status	EO Number	Year First Observed	Year Last Observed
Birds					
Charadrius melodus	Piping Plover	E, LE	29	1979	2006
Charadrius melodus	Piping Plover	E, LE	31	1979	2001
Haliaeetus leucocephalus	Bald Eagle	SC	592	2002	2005
Sterna caspia	Caspian Tern	T	3	196?	1985
Sterna hirundo	Common Tern	T	36	1960	1985
Invertebrates					
Euxoa aurulenta	Dune Cutworm	SC	4	1935	1935
Trimerotropis huroniana	Lake Huron Locust	T	49	1996	2011

Serve 2011). It has been documented from only nine locations in six counties in Michigan, including the 1935 High Island occurrence. Additionally, most of the known occurrences in the state are historical; last observed over 20 years ago (MNFI 2011). Documentation of the dune cutworm on High Island would be the most recently

confirmed site and one of only two recent known occurrences of this species in Michigan.

Additional information is needed to manage and conserve the dune cutworm since very little is known about its status, distribution, and ecology in Michigan or throughout its range. Additional surveys should be conducted in the western dune complex sampled in 2011 as well as smaller dunes, such as those along the northeast end of the island, to determine if the population persists and its extent. Surveys of other previously documented sites in Michigan as well as new sites with suitable habitat are needed to establish its current distribution and status statewide. Research is also needed at known sites to obtain information on the species' life history and ecology, particularly identification of the larval food plant and other habitat requirements (Cuthrell 1999). Because this species has been documented from such a small number of sites in the state, all known sites should be protected and high quality dune habitat at these sites should be maintained.

Lake Huron locust

Surveys for the Lake Huron locust revealed that this species is more prevalent on High Island than previously documented. It was known from only one dune area on the island prior to 2011. It was reconfirmed at its original site and documented in three additional areas. It is very likely that the species is more widespread on the island in open sandy habitats. Additional surveys for the species should be conducted to determine the full extent and size of the island population and to monitor its status and viability.

The Lake Huron locust population on High Island is significant from global and state perspectives. It is a Great Lakes endemic known only from sand dunes in Michigan, Wisconsin, and Ontario (Otte 1984, Ballard 1989, Rabe 1999, NatureServe 2011). However, the species may be extirpated from Ontario and restricted to only a small number of sites in Wisconsin (NatureServe 2011). Thus, Michigan contains the majority of the global population and range of this species. The population on High Island is ranked as having good to fair viability and is among about 51 (57%) of the 89 known sites in Michigan that have been ranked as having excellent (A), good (B) or fair (C) viability (MNFI 2011; Appendix C). The remaining sites have been ranked as having fair to poor (CD) or poor (D) viability or are considered historical sites (MNFI 2011, Appendix C). Scholtens (1996, 1997) also identified the Lake Michigan islands as one of six major shoreline areas in the state with significant populations of the locust.

Because of the rarity and endemic status of Lake Huron locust and the extent and condition of the population and habitat on High Island, it is important to sustain this island population. Throughout its range, significant portions of the species' dune habitat have been degraded or destroyed by residential and/or recreational development (Rabe 1999). Protection of any remaining habitat is critical from state and global perspectives. Shorelines that are one mile or more in length with extensive, wide dunes that contain at least two sets of dunes and blow-out areas appear to be ideal habitat for this species (Scholtens 1997, Rabe 1999). These large areas typically sustain the natural processes that maintain and create habitat, particularly areas of bare sand where the locust likely lays its eggs and overwinters. The dunes on the west side of the island and along the northeast end of the island where large numbers of Lake Huron locusts were observed in 2011, represent good examples of optimal or high quality habitat for the species. The Lake Huron locust can also

persist in areas with smaller dunes and with low to moderate levels of natural and/or anthropogenic disturbance (Scholtens 1997, Rabe 1999). However, the species generally occurs in large numbers in high quality sites, and quickly diminishes or disappears when dunes become heavily vegetated or disturbed (Ballard pers. comm.).

In addition to surveys and monitoring, research is needed to obtain additional information on the life history and ecology of the Lake Huron locust to provide a stronger basis for management and conservation of this species. Additional information about the species' microhabitat requirements, particularly for different stages of its life history, is needed. Information about the species' movement and dispersal patterns and capabilities would also be useful (Rabe 1999).

Invasive Plant Inventories
Methods

Target Species

Species targeted for survey were selected from the list of invasive species with potential to impact Michigan's native biodiversity, presented in *Meeting the Challenge of Invasive Plants: A Framework for Action* (Higman and Campbell 2009). Species that were already known from, or near the Beaver Archipelago, that spread quickly and pose significant threats to the vulnerable natural features of the island were prioritized. Currently known distributions, anticipated threat, and rates of spread were based on data from the Midwest Invasive Species Information Network (MISIN), the University of Michigan Herbarium, local networks of conservation organization staff, the extensive review conducted for developing the *Framework,* and personal experience of the project team.

Table 5 lists the invasive species targeted, the natural communities they are most likely to colonize, and the rare species they are most likely to impact. While these species were the primary focus for survey, observations of any species listed in the *Framework* or any other species known to be invasive elsewhere, but not yet documented from the region were also noted.

Field Surveys

Since comprehensive surveys throughout the entire island were beyond the scope of this project, the primary focus was to conduct invasive plant surveys where rare species were known or likely to occur, thereby identifying threats to the most vulnerable species and their habitats first. The secondary focus was to target disturbed areas, which are often key entry points for invasive species. Surveys were conducted on August 1 and 4, while en route to rare species survey sites and at the survey sites themselves. Additional surveys were conducted along the coastal zone, trails, and clearings where feasible and as time allowed. Surveyors meandered along the route and through survey sites, covering as much ground as possible, while deliberately targeting the heterogeneity of the habitat (Goff et al. 1982). Occurrences of invasive plants were documented by marking their location with a GPS point and indicating their extent and abundance using standardized drop-down menus. The area and density categories are shown in Table 6 and are based on protocols established by the Michigan DNR Parks and Stewardship Program (Clancy pers. comm. 2011). Separate occurrences were marked for infestations that were separated by 100 feet or more of un-infested area.

Table 5. Priority invasive species targeted on High Island, the natural communities they are likely to colonize and the vulnerable features they are likely to impact.

Invasive Species	Natural Communities	Vulnerable Plants	Vulnerable Animals
hybrid cat-tail non-native phragmites narrow-leaved cat-tail reed canary grass	coastal fen northern fen Great Lakes marsh limestone cobble shore	bulrush sedge (T) butterwort (SC) English sundew (SC) stitchwort (SC) Houghton's goldenrod (LT, T) Lake huron tansy (LT, T) Pumpelly's brome grass (T) Richardson's sedge (SC)	American bittern (SC) Caspian tern (T) common loon (T) common tern (T) Hine's emerald dragonfly (LE, E) least bittern (T)
spotted knapweed lyme grass baby's-breath	open dune	dunewort (T) dwarf lake iris (LT, T) fascicled broomrape (T) Lake Huron tansy (T) pitcher's thistle (LT, T)	dune cutworm Lake Huron locust (T)
autumn olive common buckhorn Eurasian honeysuckles garlic mustard glossy buckthorn multiflora rose	boreal forest dry-mesic northern forest dry northern forest mesic northern forest rich conifer swamp wooded dune and swale	calypso orchid (T) dwarf-lake iris (LT, T) ginseng (T) green spleenwort (SC) pine drops (T) ram's-head orchid (SC) roundleaf orchid (E) Michigan monkey-flower (LE, E)	Lake Huron locust (T) Merlin (T) Northern Goshawk (T) Osprey (SC) Red-shouldered Hawk (T)

Table 6. Size and density codes for invasive species occurrences

Area Code	Area Description	Density Code	Density Description
1	Individual/few/several	1	Sparse (scattered individual stems or very small stands)
2	less than 1,000 square feet	2	Patchy (a mix of sparse and dense areas)
3	1,000 ft^2 to 0.5 acre	3	Dense (greater than 40% of the area)
4	0.5 acre to 1 acre	4	Monoculture (nearly 100% of area)
5	greater than 1 acre		

Data Processing

The invasive species GPS data points were downloaded to a GIS project file and maps depicting the species, location and size of each mapped infestation were created. A scaled map of a portion of the island was also produced where individual occurrences can be more easily discerned. The density of an occurrence was not depicted on these maps, but can be determined using the identify feature in ArcMap, by clicking on a mapped point in the project shapefile.

Invasive Plant Inventories

Results

Five of the priority invasive plants targeted were documented on High Island, including non-native phragmites, reed canary grass, narrow-leaved cat-tail, hybrid cat-tail, and spotted knapweed (Table 7). Numerous large and small patches of the grasses and cat-tails were found along the northwest coastal zone and south of the eastern landing where surveys were conducted in 2011 (Figures 10, 11). Spotted knapweed was abundant along the eastern shore in the narrow foredunes and cobble shore south of the

landing and north throughout the sand spit. It was also found along the surveyed areas in the northwestern and southern shore. A possible occurrence of Oriental bittersweet (*Celastrus orbiculata*) was documented at high elevation in a major blowout within the western dune complex. Confirmation was not possible since it wasn't flowering and the leaves were fully emerged. Because this species is a rapid proliferator and poses a significant threat to forests and dunes, it is included with the other priority invasive species in Table 7. No other priority invasive species were documented in the western dune complex. Notably absent in the surveyed areas were garlic mustard, Eurasian honeysuckles, autumn olive, common buckthorn, glossy buckthorn, and multiflora rose. None of these species were noted during 2010 reconnaissance surveys along the trails of the northeastern forest either. Figure 12 shows the noted occurrences of these species as well as identified patches of native phragmites, which were also encountered. Figure 13 shows a close-up view of priority species infestations documented in the northwest corner of the island. Species are distinguished by color with the size of the icon corresponding to the area description code for each occurrence. Shapefiles with both area and density data for each occurrence are provided with this report.

Table 7. Priority invasive species documented on High Island during 2011 surveys.

Common Name	Scientific Name	Common Name	Scientific Name
hybrid cat-tail	*Typha Xglauca*	reed canary grass	*Phalaris arundinacea*
narrow-leaved cat-tail	*Typha angustifolia*	spotted knapweed	*Centaurea stoebe*
non-native phragmites	*Phragmites australis*	Oriental bittersweet*	*Celastrus orbiculata*

* Requires confirmation.

Figure 10. Large patch of invasive phragmites on the east side of High Island with Lake Michigan in the background.

Figure 11. Sparse patch of invasive phragmites spreading along the east side of High Island.

Occurrences of ten additional species, noted as invasive in the *Framework*, were also documented (Table 8). Bouncing bet and common St. John's-wort were fairly abundant along with spotted knapweed in the eastern foredunes and in several clearings just inland on the bluff. The other species were found scattered in the surveyed areas outside of the western dune complex. The locations of these lower threat species are shown in Figure 14.

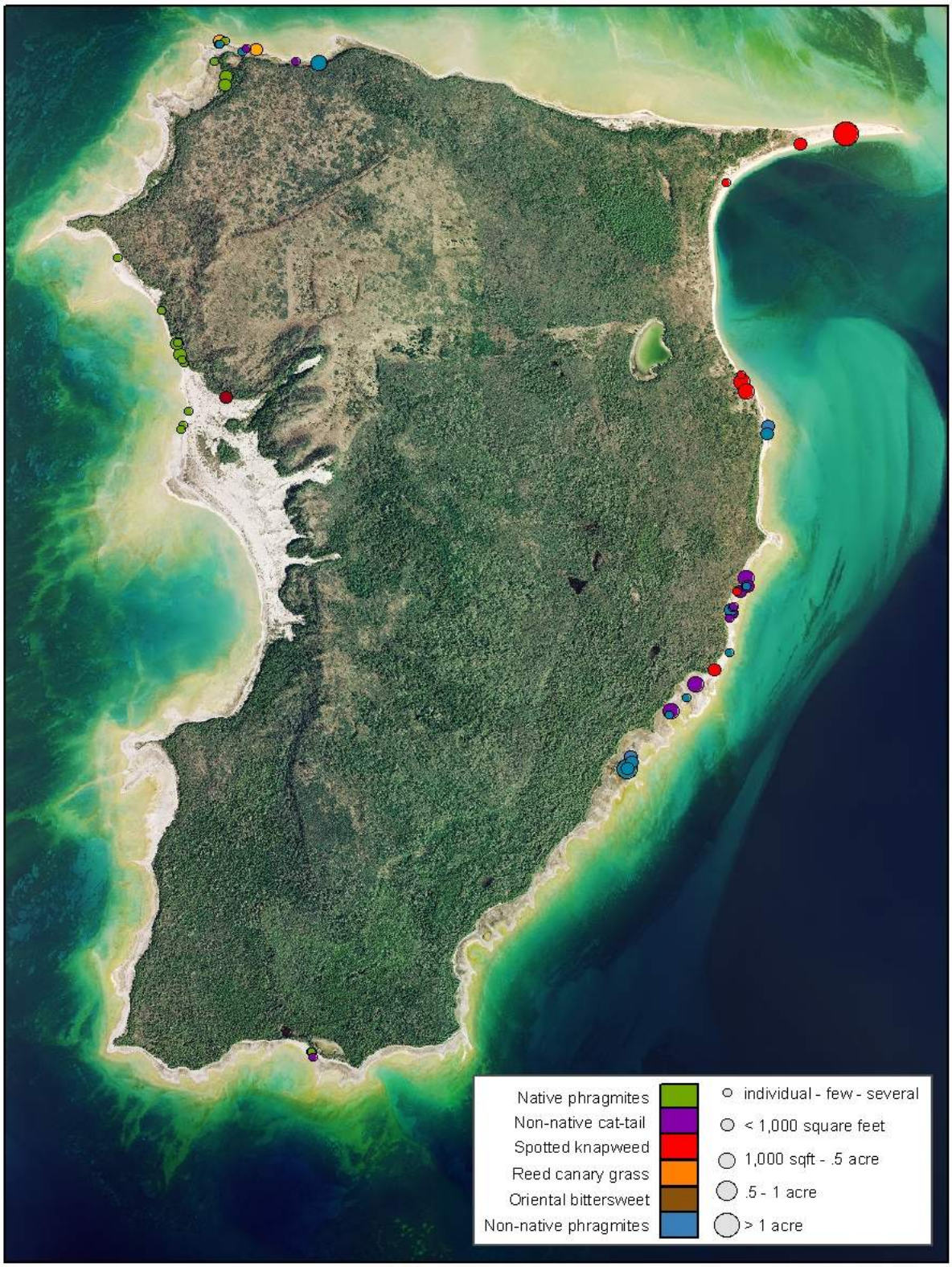

Figure 12. Priority invasive species and native phragmites mapped on High Island during 2011 surveys.

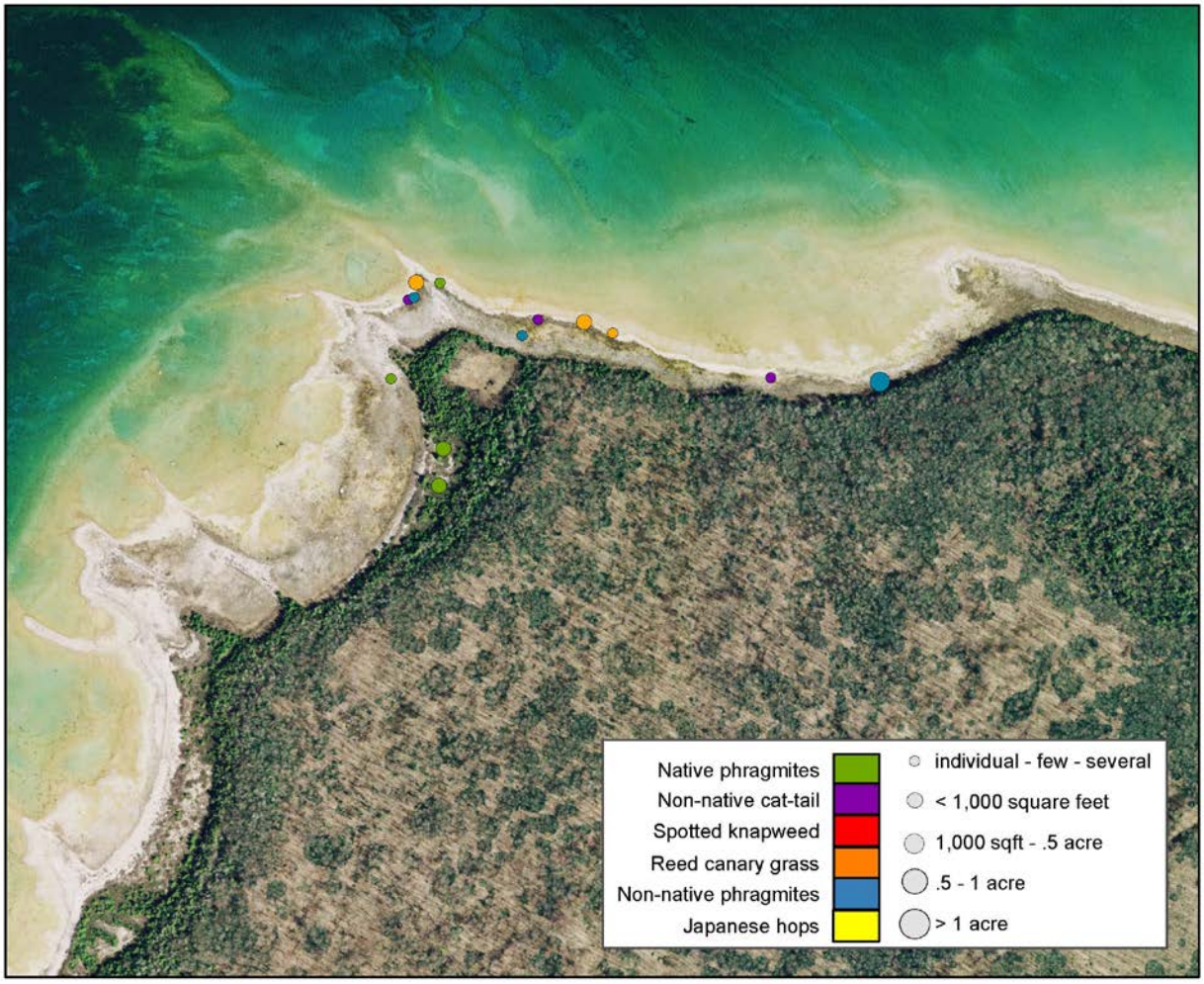

Figure 13. View of northwest High Island showing priority invasive species infestations and native phragmites occurrences by size.

Table 8. Lower threat invasive species documented on High Island during 2011 surveys.

Common Name	Scientific Name	Scientific Name	Common Name
bittersweet nightshade	*Solanum dulcamara*	common mullein	*Verbascum thapsis*
bladder campion	*Silene vulgaris*	common St. John's-wort	*Hypericum perforatum*
bouncing bet	*Saponaria officinalis*	European marsh thistle	*Cirsium palustre*
bull thistle	*Cirsium vulgare*	white sweet clover	*Melilotis alba*
Canada thistle	*Cirsium arvense*	yellow sweet clover	*Melilotis officinale*

Invasive Plant Inventories
Discussion

The absence of invasive species from the high quality western dune complex is highly significant, as few dunes in Northern Michigan have not been impacted by species such as spotted knapweed, lyme grass, baby's-breath, bouncing bet, or bladder campion. The eastern foredunes and cleared areas are more typical of Lower Peninsula dunes, with relatively high abundance of spotted knapweed and bouncing bet. The patches of

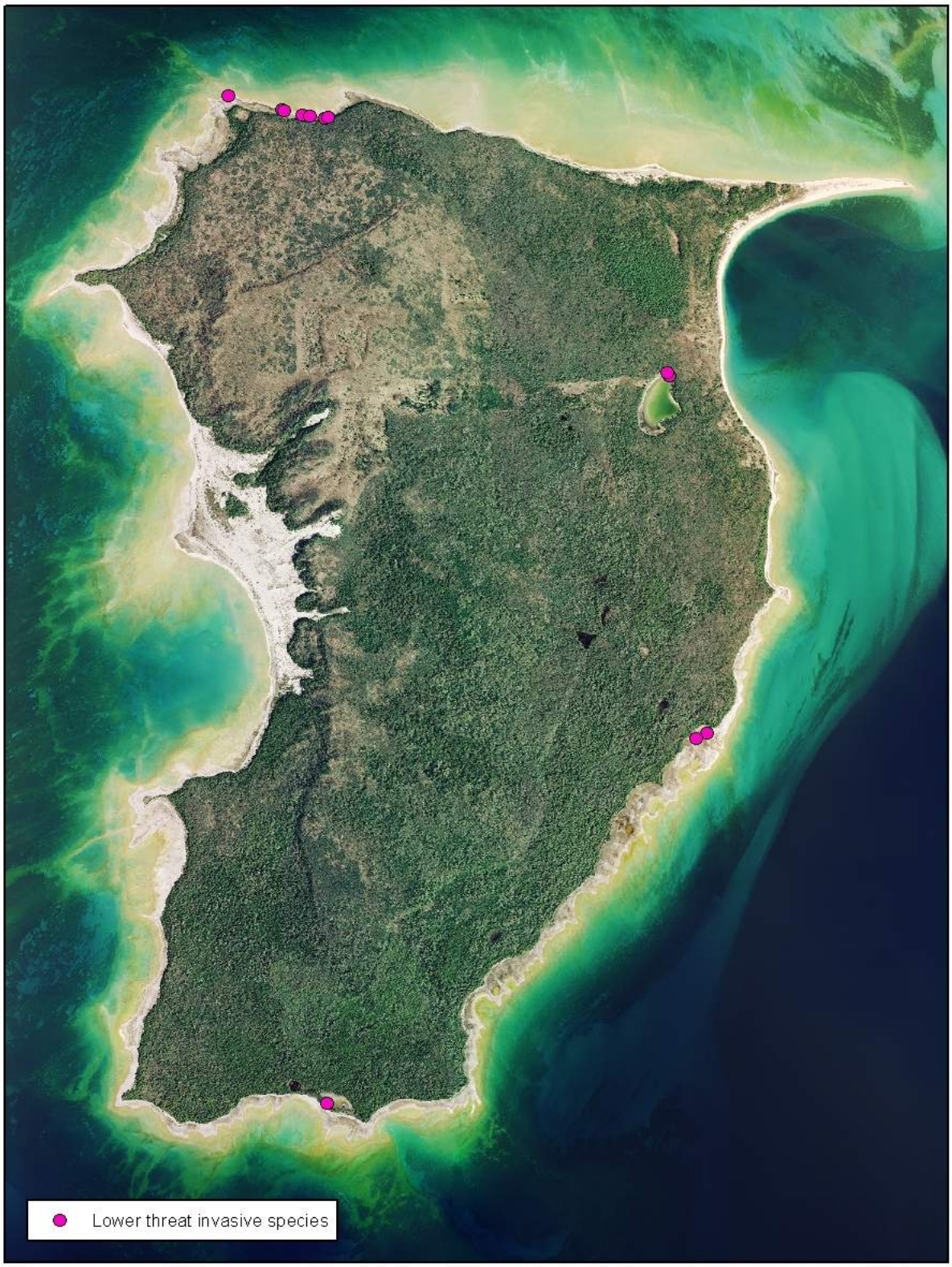

Figure 14. Lower threat invasive species mapped on High Island during 2011 surveys.

invasive phragmites and cat-tails are typical of early infestations of northern Lake Michigan coastal marshes, cobble shores, coastal fens, and sand and gravel beaches. Treatment of such patches, with regular maintenance, has proven highly effective in northern Michigan and have already been initiated on the island.

These findings, coupled with the noted absence, thus far, of garlic mustard, Eurasian honeysuckles, autumn olive, common buckthorn, glossy buckthorn, multiflora rose and lyme grass, present a window of opportunity for mounting a highly successful, prioritized rapid response effort. Figure 15 demonstrates how costs increase and level of success declines the longer aggressive invasive species remain unchecked. Due to the relatively low levels of infestation, implementation of an intensive, focused control effort *now*, could significantly reduce priority and medium-threat invasive species populations to acceptable maintenance levels and keep the long-term cost of control low.

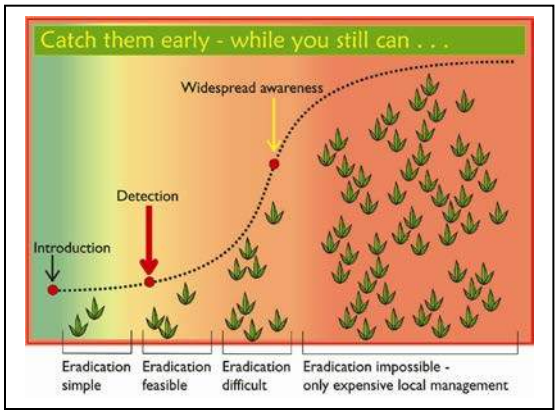

Figure 15. Cost effectiveness of early detection and rapid response.

In general, it is most effective to treat small isolated infestations first and work backwards towards larger source infestations, ultimately eradicating or containing them. Otherwise, the small, isolated occurrences will grow into larger infestations. If resources are limited, prioritizing high value sites and species of highest threat can be effective. Based on current data for High Island, several immediate priorities are recommended:

- Confirm the identity of the bittersweet; in the western dune complex; this is best undertaken in early spring when the leaves are unfurling (USGS 2007). If it is Oriental bittersweet, carefully survey the surrounding area and map, treat, and monitor all occurrences.
- Continue surveying and treating invasive phragmites around the perimeter of the island and expand this effort to include reed canary grass and invasive cat-tails.
- Regularly monitor the western dune complex working outward from the center to control spotted knapweed and any other invasive species that may become established.
- Treat isolated patches of priority and lower threat species (Tables 7, 8; Figures 12-14).
- Complete surveys and mapping of high value sites, trails, and other disturbed areas and use these findings prioritize treatment efforts.

Since treatment rarely completely eradicates an infestation and new propagules will con-

tinue to arrive, rapid response efforts are most cost-effective when complemented by strategic, long-term monitoring. This entails periodic monitoring for new infestations near high value sites to keep them out, and in disturbed areas where invasive species are likely to establish first. It is further recommended that routine monitoring of the entire coastal zone and all high value sites be conducted annually, to keep established species at low levels and to detect and eradicate any newly colonizing invasive species.

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Appendix A. Plant Species List for High Island Dunes Using the Floristic Quality Assessment

Floristic Quality Data
August 1, 2011 by Mike Penskar

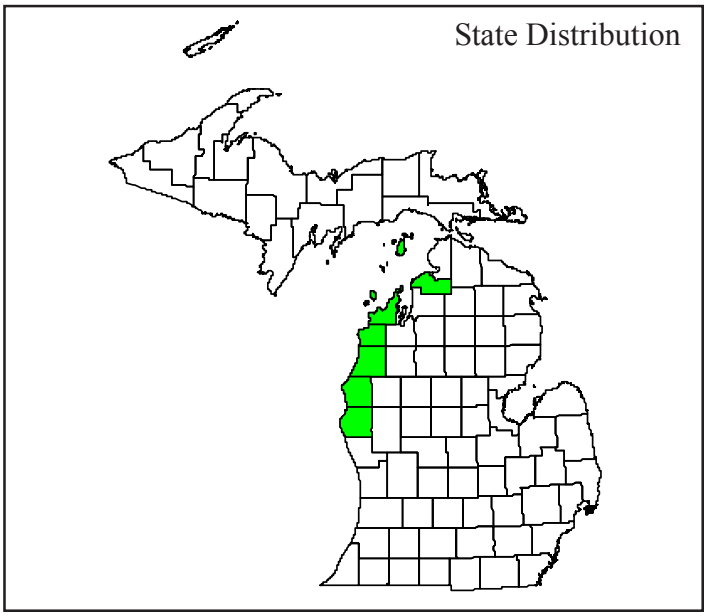
NATIVE SPECIES	37	Native	37	88.10%	Adventive	5	11.90%
Total Species	42	Tree	5	11.90%	Tree	1	2.40%
NATIVE MEAN C	6.2	Shrub	10	23.80%	Shrub	0	0.00%
W/Adventives	5.4	W-Vine	0	0.00%	W-Vine	0	0.00%
NATIVE FQI	38	H-Vine	0	0.00%	H-Vine	0	0.00%
W/Adventives	35	P-Forb	9	21.40%	P-Forb	3	7.10%
NATIVE MEAN W	1	B-Forb	3	7.10%	B-Forb	0	0.00%
W/Adventives	1.4	A-Forb	2	4.80%	A-Forb	0	0.00%
Facultative (-)		P-Grass	7	16.70%	P-Grass	1	2.40%
		A-Grass	0	0.00%	A-Grass	0	0.00%
		P-Sedge	0	0.00%	P-Sedge	0	0.00%
		A-Sedge	0	0.00%	A-Sedge	0	0.00%
		Fern	1	2.40%			

Scientific Name	Common Name	C	W	Wetness	Physiognomy
Agropyron dasystachyum	wheat grass	10	4	FACU-	Nt P-Grass
Ammophila breviligulata	marram grass	10	5	UPL	Nt P-Grass
Andropogon scoparius	little bluestem grass	5	3	FACU	Nt P-Grass
Arabis lyrata	sand cress	7	4	FACU-	Nt B-Forb
Arctostaphylos uva-ursi	bearberry	8	5	UPL	Nt Shrub
Artemisia campestris	wormwood	5	0	FAC	Nt B-Forb
Asclepias syriaca	common milkweed	1	5	UPL	Nt P-Forb
Betula papyrifera	paper birch	2	2	FACU+	Nt Tree
Cakile edentula	sea rocket	5	3	FACU	Nt A-Forb
Calamovilfa longifolia	sand reed grass	10	5	UPL	Nt P-Grass
Campanula aparinoides	marsh bellflower	7	-5	OBL	Nt P-Forb
Cirsium pitcheri	Pitcher's thistle	10	5	UPL	Nt B-Forb
Cornus stolonifera	red osier dogwood	2	-3	FACW	Nt Shrub
Elymus canadensis	Canada wild rye	7	1	FAC-	Nt P-Grass
Epipactis Helleborine	helleborine	0	5	UPL	Ad P-Forb
Equisetum variegatum	variegated scouring rush	8	-3	FACW	Nt Fern Ally
Euthamia graminifolia	grass leaved goldenrod	3	-2	FACW-	Nt P-Forb
Festuca saximontana	fescue	6	5	UPL	Nt P-Grass
Hieracium Piloselloides	glaucous king devil	0	5	UPL	Ad P-Forb
Juncus balticus	rush	4	-5	OBL	Nt P-Forb
Juniperus communis	common or ground juniper	4	3	FACU	Nt Shrub
Juniperus horizontalis	creeping juniper	10	1	FAC-	Nt Shrub
Lathyrus japonicus	beach pea	10	4	FACU-	Nt P-Forb
Lithospermum caroliniense	plains puccoon	10	5	UPL	Nt P-Forb
Malus pumila	apple	0	5	UPL	Ad Tree
Picea glauca	white spruce	3	3	FACU	Nt Tree
Pinus resinosa	red pine	6	3	FACU	Nt Tree

Scientific Name	Common Name	C	W	Wetness	Physiognomy
Poa compressa	canada bluegrass	0	2	FACU+	Ad P-Grass
Polygonum ramosissimum	bushy knotweed	7	1	FAC-	Nt A-Forb
Populus balsamifera	BALSAM POPLAR	2	-3	FACW	Nt Tree
Potentilla anserina	silverweed	5	-4	FACW+	Nt P-Forb
Potentilla fruticosa	shrubby cinquefoil	10	-3	FACW	Nt Shrub
Prunus pumila	sand cherry	8	5	UPL	Nt Shrub
Salix exigua	sandbar willow	1	-5	OBL	Nt Shrub
Salix lucida	shining willow	3	-4	FACW+	Nt Shrub
Salix myricoides	blueleaf willow	9	-3	FACW	Nt Shrub
Sedum acre	mossy stonecrop	0	5	UPL	Ad P-Forb
Shepherdia canadensis	soapberry	7	5	UPL	Nt Shrub
Smilacina stellata	starry false solomon seal	5	1	FAC-	Nt P-Forb
Solidago simplex	Gillman's goldenrod	10	3	FACU	Nt P-Forb
Sphenopholis intermedia	slender wedgegrass	4	0	FAC	Nt P-Grass
Thuja occidentalis	arbor vitae	4	-3	FACW	Nt Tree

Appendix B. Rare Species Abstracts

Orobanche fasciculata Nutt. — fascicled broom-rape



Best Survey Period

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Status: State threatened

Global and state rank: G4/S2

Family: Orobanchaceae (broom-rape)

Other common names: broom rape, clustered or yellow cancer-root, sand cancer-root

Synonyms: *Thalesia fasciculata* (Nutt.) Britton, *Anoplanthus fasciculata*

Total range: This species reaches its easternmost distribution in the Great Lakes region, extending into Michigan and Indiana. In western North America it ranges to the Yukon and British Columbia, extending south to Arizona, California, and northern Mexico. It is considered rare in Illinois, Indiana, Wisconsin, Kansas, Minnesota, Ontario, and the Yukon.

State distribution: Fascicled broom-rape is restricted to the Lake Michigan shore from Charlevoix to Oceana Counties—including Beaver, South Fox and South Manitou Islands—with barely more than a dozen localities recorded. Most and the largest of these lie in Leelanau and Benzie Counties. One Oceana County population appears to be no longer extant. No inland localities are known. The species is relatively scarce at all sites except one occurrence in Sleeping Bear Dunes National Lakeshore.

Recognition: *Orobanche fasciculata* is a parasitic plant that **completely lacks chlorophyll**, the stem and scale-like leaves appearing a **pale yellow-brown in color**. The **fleshy, somewhat succulent stem** is primarily subterranean, with the aerial portion, including the inflorescence, reaching 5-15 cm in height. The reduced **scale-leaves are hairy** and widest toward the stem base, becoming more narrow and pointed upward. A cluster of **3-10, tubular, bilaterally symmetrical flowers** terminates the stem, each flower on a stalk 2-6 cm long. The flowers are rose-purple when in bud, becoming **pinkish to creamy white upon maturity**. **Bright yellow splotches**, which serve as nectar guides for pollinators, are visible within the throat of the floral tube. After flowering, this plant becomes dark brown and **forms erect fruiting capsules**. It is easiest to see at this time, when in contrast with the buff-colored open dune sands of its habitat.

Orobanche uniflora (one-flowered broom-rape), a similarly obscure species but not considered particularly rare within the state, is easily distinguished by its shorter stature (1-5 cm), hairless scale-leaves, fewer flowers (1-3) on longer stalks (6-20 cm), and violet-tinged flowers. This species occurs in association with juniper, its host species, whereas the host of *O. fasciculata* is wormwood (*Artemisia campestre*; shown in lefthand corner of photo).

Best survey time/phenology: Due to its small size and inconspicuous coloring, fascicled broom-rape is best sought when in flower, or better yet, in fruit when the dark brown color of the fruiting capsules poses a better contrast to the dune sands than the sandy buff colored flowers. Most of the occurrences in Michigan are noted to flower in late June and fruit in the latter part of July and August. Since wormwood is it's only known host plant in Michigan, surveys should focus on sites where this species is present.

Habitat: In Michigan, fascicled broom-rape inhabits

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dunes along the northern Lake Michigan shoreline and usually grows on the leeward slope of the first or second dune ridge inland from the lake. It favors zones of sand deposition where *Calamovilfa longifolia* (sand reed grass) often dominates and its host *Artemesia campestre* (wormwood) is common. Other common dune associates of this species include *Ammophila breviligulata* (beach grass), *Andropogon scoparius* (little bluestem*), Arabis lyrata* (lyre-leaved rock cress), *Monarda punctata* (horse-mint), *Asclepias syriaca* (milkweed), *Salix myricoides* and *S. cordata* (dune willows), and the Great Lakes endemic *Cirsium pitcheri* (Pitcher's thistle). Farther west where it is more common, it is primarily a plant of dry plains and prairies, and parasitizes a variety of other plant species, including several western species of *Artemisia*.

Biology: This annual plant is a parasite on other species, and is dependent on *Artemisia campestre* (wormwood) as its host plant in Michigan and Wisconsin. It is believed that germination of its seed is triggered by root secretions from the host plant (Kuijt 1969), after which a haustorium, or root connection, establishes between the seedling's primary root and the host root. Fleshy, tuberous structures then emerge around the apical meristem and develop into flowering stalks in June and July. The flowers of fascicled broom-rape are well adapted to cross-pollination by bees and bumblebees (Kuijt 1969), but are capable of setting seed without fertilization (Reuter 1986). The copious seeds produced are dispersed by wind and rainwater via their minute size and the numerous air-retaining cavities (testa) on their surfaces (Kuijt1969).

Conservation/management: Dunes supporting fascicled broom-rape should be protected from heavy disturbance (e.g., from pedestrians or vehicles) and from development. However, light disturbance may tend to increase the frequency of this species' host-plant and thus enhance conditions for germination. Fortunately, six colonies of *Orobanche* have been found within Sleeping Bear National Lakeshore, two others on State Park property, and one on Nordhouse Dunes Research Natural Area/Wilderness Area in Manistee National Forest. Recent surveys of a known fascicled broom-rape site discovered several years previously did not result in observations of any plants; within this site there were many signs of artificial disturbances, including ORV traffic, increased recreational use of the site by pedestrians, and evidence of exotic plant invasion. Protection of shoreline habitat may thus be essential to maintaining viable populations of this rare species within the state.

Comments: An extract from one member of this genus has been used to treat kidney stones (Thieret, 1971).

Research needs: An important need for *O. fasciculata* is to assess genetic variability within and between known populations and the relative rates of outcrossing and self fertilization. This will ultimately be important for determining which and how many populations are necessary for successful conservation of the species. Long term demographic studies are also suggested in order to better predict the long-term viability of individual populations.

Key words: open dune, American dune wild-rye, Lake Huron tansy, Pitcher's thistle, Pumpell's brome grass, Lake Huron locust, piping plover

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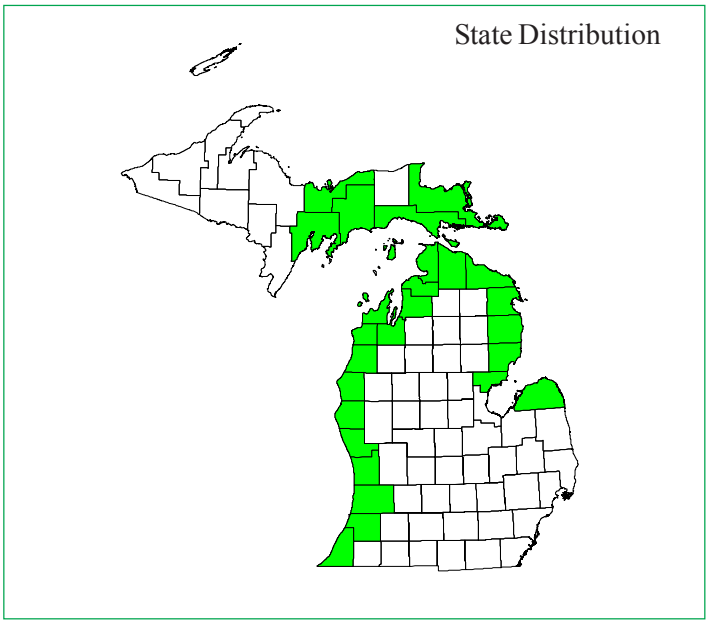
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552

Cirsium pitcheri (Torrey and Gray) Pitcher's thistle

Photos by Sue Crispin



Status: State threatened, Federal threatened

Global and state rank: G3/S3

Other common names: Dune thistle

Family: Asteraceae (aster family)

Total range: The range of this Great Lakes endemic falls primarily within Michigan's borders, occuring along the entire shoreline of Lake Michigan, with localities along the more limited dunes of Lake Huron and a few sites along the extensive Grand Sable dunes of the Lake Superior shore. In Canada this species occurs in northern Lake Huron and at least one site on the north shore of Lake Superior. Several scattered sites occur along Lake Michigan in Wisconsin, and populations remain extant in Indiana within Indiana Dunes National Lakeshore. Historically, Pitcher's thistle was known from several localities in Illinois, where it was subsequently extirpated, but is now being reintroduced as part of the Federal Recovery Plan for the species.

State distribution: *Cirsium pitcheri* is most common in Michigan along the extensive dune systems on the northern and northeastern shores of Lake Michigan. It is scattered along the perimeters of southeastern Lake Michigan and northern Lake Huron. One major population and several relatively small occurrences are known along the southeastern shore of Lake Superior. The bulk of the occurrences, and those with the largest populations, are concentrated in the major dune landscapes in the northern Lake Michigan basin, especially in the Lower Peninsula counties of Emmet, Charlevoix, Leelanau, Benzie, Manistee, Mason, and Oceana.

Recognition: This stout, prickly, dune species may grow to ca. 1 m or more in height, though stunted individuals as small as 10 cm may flower. **The leaves and entire plant are blue-green in color and densely covered with white-woolly hairs.** The mature leaves are deeply divided into narrow, spine-tipped segments. **The prickly, spine-tipped flower heads are relatively large and strikingly cream-colored, though they may occasionally have a slightly pinkish tint,** yielding seeds with feathery bristles. Pitcher's thistle is unlikely to be easily confused with any other thistle species in Michigan, including both native and non-native species, all of which can be distinguished by their deep pink flower heads (with the rare exception of occasional albino flowers in other species). Although other thistles, particularly non-native ones, may inhabitat disturbed areas in dunes, they are unlikely to co-occur with Pitcher's thistle or persist in good quality, open dunes habitat. Vegetatively, all other thistles in Michigan lack the deep blue-green color of Pitcher's thistle and its usually dense covering of white woolly hairs.

Best survey time/phenology: *Cirsium pitcheri* is fairly easy to recognize as a seedling, but becomes more easily recognizable as it matures. Until one becomes familiar with the plant at all stages, it is best to survey for it during the principal flowering and fruiting period from late-June to early September.

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Habitat: Pitcher's thistle typically grows on open sand dunes and occasionally on lag gravel associated with shoreline dunes. All of its habitats are along the Great Lakes shores, or in very close proximity. Associated plants include such common dune species as *Ammophila breviligulata* (beach grass), *Andropogon scoparius* (little bluestem), *Elymus canadensis* (wild rye)*, Arabis lyrata* (lyre-leaved sand cress), *Arctostaphylos uva-ursi* (bearberry), *Calamovilfa longifolia* (sand reed grass), *Agropyron dasystachyum* (dune wheat grass), *Asclepias syriaca* (common milkweed), *Salix cordata* and *S. myricoides* (dune willows), *Hudsonia tomentosa* (beach heath; false heather), *Lithospermum caroliniense* (hairy puccoon), and many other characteristic species of the open dunes, including other rare taxa such as *Stellaria longipes* (stitchwort), *Orobanche fasciculata* (fascicled broomrape), and *Botrychium campestre* (prairie moonwort). Pitcher's thistle often occurs in association with the Great Lakes endemic *Solidago houghtonii* (Houghton's goldenrod) when interdunal wetlands are present within the dunes landscape.

Biology: This monocarpic (once-flowering) plant produces a vigorous rosette that may mature for ca. 5-8 years or more before it flowers. Pitcher's thistle blooms from approximately late June to early September and is protandrous (the pollen maturing before stigmas are receptive on individual flowers), and at least partially self-compatible. Insect pollinators are relatively diverse, including halictid bees, bumblebees, megachilid bees, anthophorid bees, and skippers and butterflies (*Vanessa cardui, Daneus peleyippus*). Moths may well be nocturnal pollinators (Loveless 1984). Microlepidopteran larvae, especially the artichoke plume moth (*Platyptilia carduidactyla*), are responsible for varying amounts of seed predation by eating developing ovules. Loveless (1984) found that seed set declines throughout the flowering season. Seeds are dispersed individually by wind or as entire flower heads blown across the sand, or possibly transported by water.

American goldfinches were observed by Loveless (1984) to consume as much as 50% of the seeds in a flower head. Thirteen-lined ground squirrels also prey upon undispersed seed, and other birds, especially sparrows, forage on unburied dispersed seeds. The fundamental dispersal unit is often the entire head of mature achenes, which remains attached to the withered stem of the mother plant. Seeds germinate in June, and most seedlings appear within 1-3 meters of parent plants (Loveless 1984; Keddy & Keddy 1984). Spittlebugs contribute to mortality of adult plants by ovipositing on the apical meristem and deforming embryonic leaves. The taproot of this thistle, which can reach up to 2 m in length, enhances its ability to survive the dessicating conditions of the dune habitat (Loveless 1984; Johnson and Iltis 1963). High rates of sand movement probably stresses plants through erosion and burial of growing stems, though sand movement is absolutely essential for maintaining the open dune habitat of this species. Extreme drought can also be a major stress, especially for seedlings and juvenile plants with poorly developed, shallow tap roots.

Conservation/management: Though Pitcher's thistle can be locally extirpated by destruction or major disturbance of its habitat (e.g. by shoreline development or intensive recreation), it is somewhat tolerant of disturbance from pedestrians and limited ORV traffic. This is especially true in the heart of its range where it is more abundant and seed sources are present to assist in replenishment. However, vehicular traffic and regular foot traffic tend to unduly destabilize dune sands by mechanically destroying vegetation; this increases erosion and stresses Pitcher's thistle plants, which also are often severely affected by direct impacts. An indirect effect of artificial disturbance is that it enables non-native species such as the invasive spotted knapweed (*Centaurea maculosa*) to invade dune habitats and displace native vegetation, resulting in further habitat degradation.

Because of the extreme development pressure along the Great Lakes shoreline, the potential cumulative impacts to Pitcher's thistle populations is high. Efforts should be made to create active dune zones where development is limited.

Two of the world's largest populations of *Cirsium pitcheri* lie within Sleeping Bear National Lakeshore and Ludington State Park/Manistee National Forest (Nordhouse Dunes). The species also occurs in at least two Michigan Nature Association Sanctuaries, several Nature Conservancy preserves, five state natural areas, and in Pictured Rocks National Lakeshore, as well as in severally informally protected public and private tracts.

Comments: Loveless (1984) found *Cirsium pitcheri* to be very low in genetic diversity. She also discovered that populations around the Straits of Mackinac differed genetically from more northern and southern populations, suggesting that the former may have been genetically isolated at some point and have had gene flow primarily among themselves. Due to the genetic similarity between *C. pitcheri* and the Great Plains species *C. canescens*, Loveless postulates that they descended from a common parent in the west, which migrated east to the Great Lakes shores during the abrupt warming occurring during the hypsithermal period (ca. 11,000-8000 years B.P.) by colonizing local, transient dune systems created by glacial outwash and proglacial lakes. The genetically depleted and homogeneous founder population which reached and colonized the dunes along the Great Lakes was then isolated from its western counterpart by climatic changes, resulting in postglacial reforestation and the extinction of possible linking populations.

Research needs: The response of this species to disturbance would provide useful management information, as Pitcher's thistle occurs in many areas heavily used by recreationists.

Related abstracts: Open duens, dune cutworm, Lake Huron locust, piping plover, dunewort, fascicled broomrape, Houghton's goldenrod, Lake Huron tansy.

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Abstract citation:

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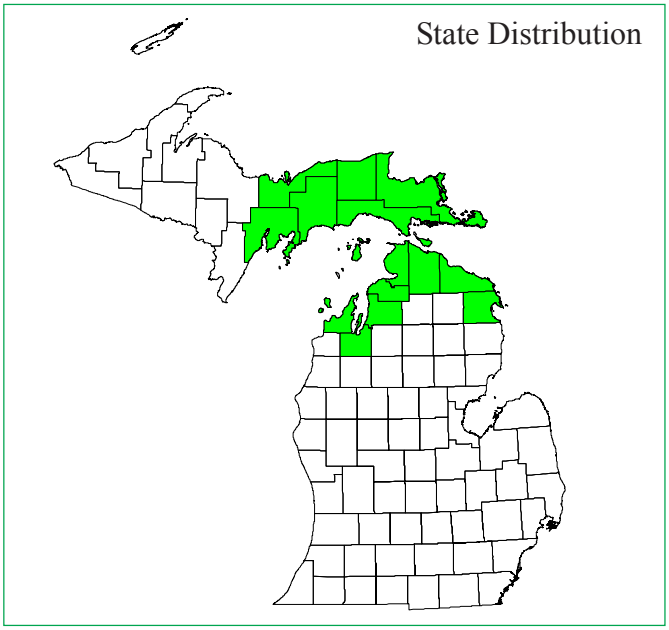
Tanacetum huronense Nutt. — Lake Huron Tansy

Photo by Michael R. Penskar



Best Survey Period

Legal status: State threatened

Global and state rank: G4Q/S3

Family: Asteraceae (aster family)

Other common names: Huron tansy

Taxonomy: The taxonomy of *Tanacetum huronense* is very complex. Kartesz and Kartesz (1980) treated *Tancetum huronense* as a distinct species. Other authors have treated *T. huronense* as a subspecies of the closely related Siberian and Alaskan *T. bipinnatum* L. (Gleason and Cronquist 1991), whereas Hultén (1971) includes *Tanacetum* within the genus *Chrysanthemum* and treats Great Lakes plants as a subspecies of *C. bipinnatum* L. As noted by Voss (1996), whatever the most appropriate treatment of this group may be, *Tanacetum huronense* at least includes the plants of the Great Lakes, from which the original taxon was described.

Total range: Lake Huron Tansy is a wide-ranging species distributed in North America from Alaska to British Columbia, Hudson Bay, and Newfoundland. Lake Huron tansy has a restricted distribution throughout the Great Lakes. It is found on the northern shores of Michigan, the Door Peninsula in Wisconsin, and adjacent Ontario shores of Lake Superior (Voss 1996, Guire and Voss 1963). This species seems to prefer alkaline (i.e. calcium-rich) substrates throughout its range.

State distribution: Lake Huron Tansy is found in the calcareous dune and beach systems along the north coasts of Lake Michigan and Lake Huron, the southeast shores of Lake Superior, and the islands in northern Lake Michigan. Of the more than 100 known Michigan occurrences for this species, just over 60 have been discovered or confirmed extant since 1980.

Recognition: Lake Huron tansy is a strongly **rhizomatous** plant with 1-3 main stems that may range up to about 8 dm in height. Its leaves are **hairy, inconspicuously glandular-dotted**, and **deeply twice or more divided** (pinnatisect). The ultimate, finely divided segments of each leaf have a short, dull point (a mucro). The basal rosette leaves are persistent, and they are larger (23-36 cm long, 3-9 cm wide) than the successively smaller stem leaves (10-23 cm long, 3-8 cm wide). Lake Huron tansy produces a "daisy type" of flower head, which is composed of **numerous separate small flowers or florets**. There are two flower types that can be found on a head: **disk flowers**, the tubular flowers that form the majority of the flower head, and **ray flowers**, which form a small fringe of tiny

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petals along the outer rim of the head. Each **yellow "petal"** on the outside of the head is a modified individual ray flower (2.5-4mm long). The yellow disk florets are tightly arranged in the center, forming a flower head that is about 13-19 mm in diameter. Each major stem produces about 3-12 heads, but a plant may produce up to 22 heads or more.

Lake Huron tansy is most likely to be confused with Michigan's only other *Tanacetum* species, the common and widespread garden tansy, *T. vulgare*, a non-native species that invades a wide variety of habitats including coastal dunes. Garden tansy, however, is readily distinguished by its **smooth, non-hairy (i.e. glabrous) foliage that is less finely divided** and the **distinctly smaller flower heads (5-10 mm in width)** that are often more numerous than those found in Lake Huron tansy. Despite the ubiquitous nature of garden tansy and its proximity to some Lake Huron tansy populations, no hybrids have been reported to date.

Best survey time/phenology: This species blooms from approximately late June through August, although the peak blooming period is generally within July. Those experienced with this species can reliably identify it by its foliage over a broader period, from leaf emergence through senescence.

Habitat: Lake Huron tansy inhabits active dunes, old, stabilized dunes, and sandy or even substantially cobbly beaches. At times of high water periods, it can withstand wave action. Along foredunes and in other active dune areas, it commonly grows with such characteristic associates as *Ammophila breviligulata* (marram grass), *Calamovilfa longifolia* (sand reed grass), *Agropyron dasystachyum* (wheat grass), *Salix cordata* and *S. myricoides* (dune willows), *Prunus pumila* (sand cherry), *Juniperus horizontalis* (creeping juniper), *Lathyrus japonicus* (beach pea), *Elymus canadensis* (Canada wild rye), *Arabis lyrata* (lyre-leaved rockcress), and *Artemisia campestris* (wormwood). Rare associates that may occur with Lake Huron tansy include *Cirsium pitcheri* (Pitcher's thistle), *Bromus pumpellianus* (Pumpelly's brome grass), *Stellaria longipes* (stitchwort), *Orobanche fasciculata* (fascicled broom-rape), *Botrychium campestre* (dunewort), and *Solidago houghtonii* (Houghton's goldenrod).

Biology: Lake Huron tansy is a perennial that forms colonies through rhizomatous growth. It blooms primarily from late June through July, fruiting from late July through September. In the fluctuating conditions of active dunes and shifting beaches, Lake Huron tansy uses two strategies for reproduction; abundant seed production and the asexual propagation of plants through its rhizomatous growth habit.

Conservation/management: Destruction or disturbance of natural habitat is the primary threat to Lake Huron tansy populations. Although Lake Huron tansy is well adapted to the natural disturbances that characterize and sustain its coastal habitats, it is vulnerable to a variety of threats such as erosion and direct impacts via excessive foot traffic and recreation, and especially the use of all-terrain vehicles. Landscape fragmentation and the direct destruction of the dunes through development activities also comprise ongoing threats. Lake Huron tansy and other coastal dune species are particularly vulnerable to much less obvious threats that may have a high impact on the function of coastal dune systems. This includes the use of a wide variety of shoreline stabilizing structures such as retaining walls, piers, and revetments, as well as the placement of beach armoring materials (e.g. rip-rap) to prevent erosion. These structures and practices, while understandably devised to protect property, also collectively impede natural sand movement and nourishment processes that maintain the integrity of coastal dune systems.

Lastly, owing to many forms of artificial disturbance, coastal dunes have been invaded by a number of highly invasive non-native plant species, including well known invaders such as *Centaurea maculosa* (spotted knapweed), *Gypsophila paniculata* (baby's breath), *Saponaria officinalis* (soapwort), and *Populus nigra* var. *italica* (Lombardy poplar). Control measures for these species will become ever more important as a component of conservation and management.

Research needs: The life history of this species is relatively poorly known, and thus most investigations of the biology of this species would be highly useful, including studies of seed dispersal and ecology, pollination, and the response of this species to natural disturbance features of the dunes. It would be especially useful to study the ecology of this species in

relation to landscape fragmentation and the effects of human activities that affect the movement of sand along coastal regions.

Related abstracts: Open dunes, wooded dune and swale complex, dunewort, fascicled broom-rape, Houghton's goldenrod, Pitcher's thistle, Lake Huron locust, prairie warbler, dune cutworm, caspian tern, common tern, piping plover.

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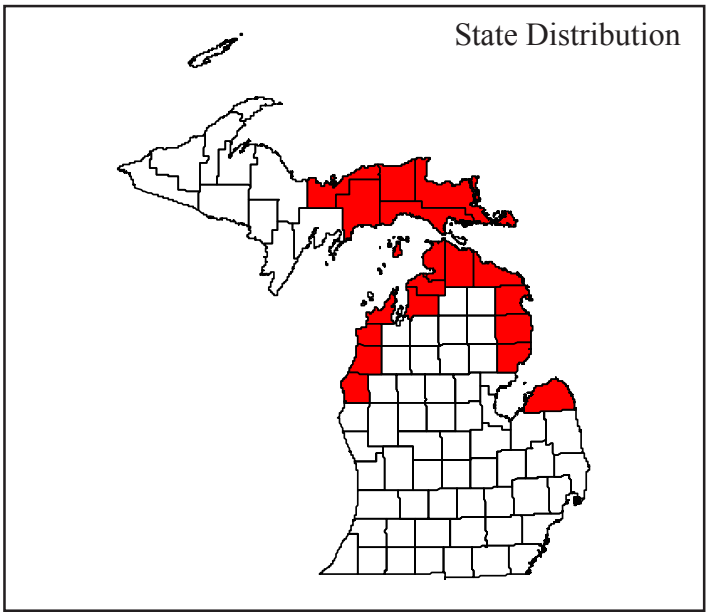
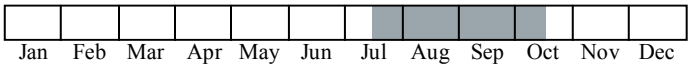
Trimerotropis huroniana (Walker) Lake Huron locust



Best Survey Period



Status: State threatened

Global and state rank: G2G3/S2S3

Family: Acrididae (short-horned grasshopper)

Range: The Lake Huron locust is restricted to Great Lakes sand dunes in northeastern Wisconsin (Ballard 1989), the eastern Upper Peninsula and northern Lower Peninsula of Michigan, and the central Lake Huron shoreline of Ontario (Otte 1984).

State distribution: The Lake Huron locust occurs along the Lake Michigan shoreline, including the offshore islands, from Mason to Emmet and Mackinac to Schoolcraft counties; the Lake Huron shoreline from Iosco to Cheyboygan and Mackinac to Chippewa counties; and the Lake Superior shoreline from Chippewa to Alger County. Altogether, it is known from 18 counties, although it has not been observed in Huron County since the 1960s.

Recognition: The Lake Huron locust is a **small** band-winged grasshopper. The length to end of its folded forewings for males is 1-1.24 inches (24-30 mm), and for females is 1.1-1.6 inches (29-40 mm). The **body** is usually **silvery to ash gray, with darker brown and white markings**. Brick red, burnt orange, and ocher color morphs occur occasionally, especially among females. The tegmina (toughened **forewings)** of the adults **have darker bands that may be weakly or strongly expressed**. The **hindwings** are **light yellow near the body with a smoky patch near the tip**. Sexes can be easily distinguished by the males' stronger mottling, their noisy (crepitating) flight, and, as in other Orthoptera, their significantly smaller size. The Lake Huron locust is one of four species in the Great Lakes Region with the pronotum (**the saddlelike structure behind the head) cut across by two well-defined grooves** called sulci. The other three species occur predominately along shorelines farther south than the Lake Huron locust. The range of one of these, the similar-looking seaside locust (*Trimerotropis maritima*), overlaps with the Lake Huron locust along the Lake Michigan shoreline. It can be distinguished from the Lake Huron locust by the two narrow, blackish bands on the inner surface of the hind femora near the distal end. The Lake Huron locust has a **broad band covering half of the inner surface of the hind femora near the body and a narrow band near the distal end**. Other grasshoppers that occur with the Lake Huron locust have one or no sulcus cutting across the pronotum.

Best survey time: Nymphs can be found before mid-July. Adults are present from early to mid-July into October until the time of frequent heavy frosts and snow. Individuals become active between 9:30 and 10:00 a.m., after the sun had risen far enough to warm the foredune shoreline.

Habitat: In Michigan, the Lake Huron locust is restricted to sparsely vegetated, high-quality coastal sand dunes. A similar habitat affinity has been reported from Wisconsin (Ballard 1989). In these areas, it typically occurs in high numbers and is usually the dominant species. Where the open dunes grade into heavily vegetated or disturbed areas, their numbers quickly decline.

Biology: The seaside locust, *Trimerotropis maritima*, apparently replaces the Lake Huron locust as an ecological equivalent along the southern shores of Lake Huron and

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Lake Michigan (Hubbell 1929). On the west side of the state the northward range of the seaside locust, extends at least as far as Manistee, Manistee County, while the southward range of the Lake Huron locust extends at least as far as Ludington State Park, Mason County (Scholtens 1996). Currently, it is not known whether a similar overlap occurs along the Lake Huron shoreline. Scholtens (1996) also documented a third very similar sand-colored, yellow-banded Oedipodinae grasshopper, *Spharagemon collare*, as far north as Presque Isle County along the Lake Huron shoreline. Although it occurred in habitats that are typical for *T. huroniana*, only one of the sites he surveyed contained both species. *Spharagemon collare* was not found on any shoreline sites in good to excellent condition. All localities where it occurred were heavily disturbed with high numbers of invasive weeds.

Little on the life history of the Lake Huron locust has been published. Its courtship behaviors are thought to be similar to that of the pallid-winged locust, *T. pallidipennis* (Otte 1970). Egg masses for the single generation per year are laid in the soft soil where they overwinter. Nymphs hatch in late spring and mature by mid-July. Adults may be found in large numbers through the fall, most likely succumbing to the first hard frosts.

Adults communicate through visual and auditory signals (Otte 1970). Only males crepitate in flight by flashing and snapping their wings, making a cracking noise with each snap. Crepitation occurs during a hovering courtship flight in which the males snap their wings two or three times while hovering; this display typically occurs on sunny days when temperatures reach 80^{o}F. Crepitation also occurs during flight elicited by a disturbance. On the ground, courting males stridulate by rubbing the femora against the forewings, producing a trill in busts of two to three pulses (Otte 1970). Females are cryptically colored against the light sand of the back dunes, whereas the males are virtually invisible on the gravel-dominated upper beaches of the foredunes.

The Lake Huron locust is strictly ground dwelling, essentially never climbing on foliage or other supports (Ballard 1989). On sunny, windless days, locusts are most common on sparsely vegetated sands, where they are evenly distributed with territories of several feet in diameter. In windy, overcast weather, individuals are densely distributed within the heavy dune grass cover, apparently seeking shelter.

Host plant use in the Lake Huron locust is not restricted to grasses, although these probably make up a large portion of the diet. Scholtens (1996) reports that abundant dune grasses are among the most preferred species, but several dune forbs apparently are included in the diet. Three plant species were common to all sites with Lake Huron locusts, dune grass (*Calamovilfa longifolia*), beach grass (*Ammophila breviligulata*) and wild wormwood (*Artemisia campestris*). Other plant species may be important to the locust if it employs diet mixing as a nutritional strategy as do many other locusts (Mulkern et al. 1969). Scholtens (1997) analyzed frass (fecal) pellets to confirm that Lake Huron locust nymphs were feeding on four vascular plant species, including beach grass, wild wormwood, dune grass, and wheatgrass (*Agropyron dasystachyum*). Significant among the acceptable forbs is Pitcher's thistle (*Cirsium pitcheri*), a federally protected species restricted to the dunes. Unacceptable species were generally woody species, but also included the state-threatened Lake Huron tansy (*Tanacetum huronense*). Limited observations in the field indicate that locusts feed by clipping off vegetation near the base of plants. Parts of insect exoskeletons were found in 28% and 44% of pellet samples from two sites (Scholtens 1997). It is thought that locust nymphs scavenge dead insects to supplement the nitrogen intake in their diet. Nitrogen is widely recognized as the most common limiting nutrient for herbivorous insects (Mattson 1980). Scholtens (1997) concluded that the locust appear to be fairly randomly distributed in dune habitat with respect to plant species and seemed to eat most acceptable host plants, virtually at random, although some preference was shown for beach grass. Host plant specialization is not thought to be a factor limiting this species to shoreline dune habitats at this time.

Lake Huron locusts do show significant preference for dry, loose sand substrates characteristic of shoreline dune habitats and not stabilized, wooded dunes or most inland habitats (Scholtens 1997). The biological reason for this preference is not known. The largest, apparently most stable populations of the locust are associated with areas of extensive, wide dunes. Shorelines that are one mile or more in length with at least two sets of dunes containing blowout areas are ideal.

Explaining the presence or absence of the locust from particular dune systems requires evaluation of a variety of factors including geological processes, biological interactions, and human influence. Interactions between changes in lake levels, availability of suitable habitat, and the locust' ability to colonize and recolonize could have significant influence on the species' distribution patterns at any one point in time.

Conservation/management: Unfortunately, significant parts of the locust's high-quality dune habitat have been degraded or destroyed by shoreline home and recreational development throughout the Great Lakes Region. Protection of the remaining habitat is the most significant action that could be taken for the conservation of this species in Michigan. Although a dune-obligate species, the Lake Huron locust apparently can persist with low to medium levels of human-related disturbance. The extent of the dunes protected at a site should be large enough to allow natural processes to locally change the character of the dunes through blowouts, which create more habitat, or stabilization by plants, which reduces habitat. When disturbance changes the character of the habitat away from a typical dune system to one with a large number of invasive weeds, or lack of sand movement, the Lake Huron

locust seems to drop significantly in numbers. Healthy locust populations have been maintained on private lands in several places on Lake Michigan and Lake Huron, as long as the basic dune system is kept intact. The housing developments most destructive to the locust seem to be those older developments along Lake Huron, where the dune system was quite narrow and construction of houses and swimming beaches has essentially removed the dune and its vegetation. Severe destruction of dunes on public lands has had the same effect where the dunes have been essentially denuded of native vegetation and mechanically flattened to create swimming and volleyball areas.

Scholtens (1996, 1997) identified several major shoreline areas with significant populations of the locust:

1. the northwestern segment of Emmet County along Lake Michigan at Sturgeon Bay, an area of at least 10 miles;
2. the Sleeping Bear Dunes National Lakeshore in Benzie and Leelanau counties;
3. the Ludington State Park area in Mason County which includes at least six miles of good beach front;
4. the Pt. Aux Chenes dunes in Mackinac County with at least two to three miles of dunes;
5. much of the Lake Superior shoreline, where long stretches of high dunes exist from Whitefish Point to the Grand Marais area in Chippewa County; and
6. the Lake Michigan islands.

Research needs: Additional surveys should be conducted to verify the current ranges of the Lake Huron locust, the seaside locust and *S. collare*. Examination of the ecological relationships between these species would be helpful. Additional information on the ecology and life history of the Lake Huron locust also is needed to provide a stronger basis for management planning and conservation activities. The exact microhabitat requirements of the locust over the course of its lifespan should be determined. Long-term monitoring of populations spanning a geographic range of disturbance types and levels would provide crucial information necessary to make recommendations about best management practices for this species. Information about normal movement and dispersal patterns, as well as about the locusts' recolonization capabilities, also would be useful.

Related abstracts: open dunes, Pitcher's thistle, Houghton's goldenrod, Lake Huron tansy, piping plover, prairie warbler, dune cutworm

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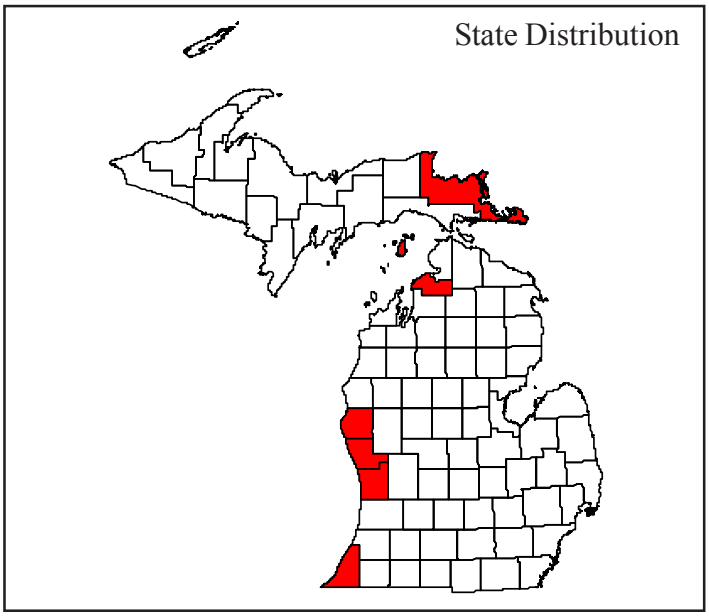
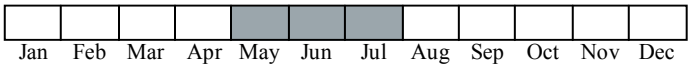
11-99/mlr

Euxoa aurulenta (Smith) dune cutworm



Best Survey Period



Status: State special concern

Global and state rank: G5/S2S3

Family: Noctuidae (owlet moth family)

Range: The dune cutworm moth occurs as a series of disjunct populations throughout a large area of North America having been recorded from the following states: Arizona, Colorado, Idaho, Illinois, Michigan, Montana, Nebraska, North Dakota, Oregon, Utah, and Washington. It has also been recorded from the Canadian provinces of Alberta, Manitoba, Ontario, and Saskatchewan (Hardwick 1970).

State distribution: The dune cutworm is known from a total of nine Lake Michigan shoreline locations. It has been collected from six counties in Michigan including Berrien, Charlevoix (High Island), Chippewa, Muskegon, Oceana, and Ottawa counties.

Recognition: The following descriptive notes follow Hardwick (1970). This moth, in the family Noctuidae, has a wingspan from 1.4-1.6 inches (35.3-39.3 mm). The **forewing of most individuals is light fawn**, often heavily irrorate with white or pale grey. There is a chocolate-brown color phase as well. **Hind wing varying from pure creamy-white to uniform medium smoky-brown; hind wing most frequently white suffused with brown and often with a brown outer-marginal band with a white fringe**. **Underside of forewing white, often suffused with brown**. Underside of hind wing usually paler than forewing. Because there are many similar looking moths within the genus *Euxoa* and *Agrotis*, a voucher specimen(s) need to be collected for this species for positive identification.

Best survey time: The dune cutworm is reported to be an early flier within the *Euxoa* with dates ranging from 6 May to 23 July. The Michigan records range from 26 May to 12 July. The best way to survey for this species is by blacklighting, a technique where a sheet is stretched across two trees or poles and an ultraviolet light is used to attract moths to the sheet. Moths can be collected directly from the sheet.

Habitat: The dune cutworm is reported occuring in disjunct populations in sandy areas throughout North America (Hardwick 1970). No other information on specific habitat requirements is in the literature. The Michigan locations are all sparsely vegetated, high quality coastal dune habitats such as those found at Grand Mere dunes and Warren Dunes State Park in Berrien County; Muskegon State Park, Muskegon County; and Whitefish Point, Chippewa County.

Biology: The dune cutworm moth is univoltine (one generation per year) and likely overwinters as a pupae. The immature stages have not been described for this cutworm. No other information is known on the life history or biology of this species although it is speculated to feed on some species of dune grass. In Michigan specimens have been collected in close proximity to the beach grasses (*Ammophila breviligulata* and *Calmovilfa longifolia*).

Conservation/management: Unfortunately, significant parts of the high-quality dunes habitat have been degraded or destroyed by shoreline home and recreational develop-

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ment. The known remaining sites need to be protected as well as high-quality sand dune habitats. Further survey and resurvey of the nine known Michigan sites along with blacklighting in nearby sandy areas is urgently needed to assess the status and to learn more about this species. Several open sand dunes along the Lake Michigan, Huron, and Lake Superior shorelines should be surveyed. Until we know more about its habitat affinities and more on the species biology, life history, and ecology, we cannot make any specific management recommendations.

Research needs: The species is found in many disjunct localities throughout North America in sandy areas. Nothing else about its life history or biology is known. Research designed to study the life history and ecology of the moth is urgently needed including identification of the larval food plant. In addition to surveys for new sites, known sites should be studied to determine the micro-habitat requirements the moth needs to persist.

Related abstracts: open dunes, Lake Huron locust, fascicled broomrape, Houghton's goldenrod, Lake Huron tansy, Pitcher's thistle

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Appendix C. NatureServe Element Occurrence Rank Specifications

Lake Huron Locust

Population or element occurrence (EO) viability rank specifications for the Lake Huron locust, as defined by NatureServe (Schweitzer and Whittaker 2007)

A- Rank: If the B-criteria are accepted as reasonable, then perhaps 1000 adults estimated in 3000 acres would be a reasonable basis for an A. An A ranked occurrence should be among the best all time and should contain substantially more than the minimum required for persistence in present or better condition--including maintaining genetic diversity.

B- Rank: A persistent population estimated after a survey of 1 hour to be greater than 300 individuals in greater than 1000 acres (approx. 405 ha) of suitable habitat. Threats are manageable.

C- Rank: A persistent population estimated after a survey of 1 hour to be between 10 and 50 individuals in less than 100 acres (approx. 40.5 ha) of required habitat. Threats are typically more serious.

D- Rank: A non-persistent population, or an apparently persistent estimated after a survey of 1 hour to be less than 10 individuals in a habitat strip less than 10 m wide, even if it is a long (> 1 km) stretch of habitat. Threats are greater and more difficult to control.

EO Rank Specs Justifications:
The present B-criteria are modified (e.g. 150 estimated changed to 300) from 1994 A-criteria which presumably would define a very good occurrence but are too low to be reasonable as an A for an insect or other animal with a one year or less generation time. Since this would be a good occurrence in the opinion of Whittaker, such is accepted as a reasonable basis for a B. The A-criteria are derived from inflating the B, and it is not certain and current A quality occurrences exist. All criteria are lower than usual for an insect.

Natural Community Surveys of Beaver Island

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For:
Little Traverse Bay Bands of Odawa Indians
Natural Resources Department

December 31, 2016
Report Number 2016-25

MICHIGAN STATE UNIVERSITY | Extension

LITTLE TRAVERSE BAY BANDS OF ODAWA INDIANS
ODAWA NATURAL RESOURCE DEPARTMENT

Michigan Natural Features Inventory

Fox Lake Bog. Photo by Joshua G. Cohen.

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Cover Photo: Southwest Old Growth mesic northern forest. Photo by Joshua G. Cohen.

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Funding for this project was generously provided by the Little Traverse Bay Bands of Odawa Indians. We express our sincere gratitude to the numerous Natural Resources Department (NRD) staff that helped administer and guide this project including Bill Parsons and Archie Kiogima. In addition, the following NRD staff assisted with field surveys: Noah Jansen (pictured above), Bill Parsons (pictured above), and Archie Kiogima. Bill Parsons also shared hundreds of excellent photos from the surveys, many of which are featured in this report. For their support and assistance throughout this project, we thank our MNFI colleagues, especially Helen Enander, Rebecca Rogers, Kraig Korroch, Nancy Toben, and Brian Klatt.

INTRODUCTION

The Michigan Natural Features Inventory (MNFI) database of high-quality occurrences of natural communities is a critical source of information on Michigan's terrestrial ecosystems (MNFI 2016). Natural communities are defined as assemblages of interacting plants, animals, and other organisms that repeatedly occur under similar environmental conditions across the landscape and are predominantly structured by natural processes rather than modern anthropogenic disturbances (Kost et al. 2007). Protecting and managing representative natural communities is critical to biodiversity conservation, since native organisms are best adapted to environmental and biotic forces with which they have survived and evolved over the millennia (Kost et al. 2007). Prior to the implementation of this project, 16 high-quality occurrences of natural communities had been documented on Beaver Island with ten of those occurrences occurring on state lands (Table 1). These natural community occurrences represent eight of the 77 natural community types described for Michigan by Cohen et al. (2014).

Prior to this project, the majority of the natural community occurrences on Beaver Island had not been surveyed in over a decade, including two sites that had not been visited since 1981 and two sites that had not been visited since 1998 (Table 1). Many of the natural community element occurrences that were previously documented on the islands were in need of more thorough on-the-ground surveys informed by better aerial imagery to refine, and in many cases expand, their mapped boundaries. In addition, air photo interpretation of high-resolution imagery and historical imagery from the 1930s identified the potential for new occurrences of natural communities in several locations on state land. A critical goal of this project was to collect updated and new data for natural communities to provide natural resource managers with accurate, detailed information on the current status of ecosystems on this island that can help guide biodiversity management and restoration and ongoing planning efforts. Our project objectives were to assist resource agencies with land use planning and resource management on Beaver Island by (1) updating known high-quality occurrences of natural communities occurring on state land, (2) conducting surveys for new occurrences of natural communities on state land, (3) synthesizing survey results and information in MNFI's conservation database, and (4) proposing biodiversity stewardship and monitoring priorities.

Surveys were conducted during the 2016 field season. MNFI conducted surveys of ten previously known element occurrences on state land and documented five new natural community element occurrences on state land. Nine different natural community types are represented in the 15 element occurrences surveyed (Table 1). Surveys assessed the element occurrence ranking, classification, and delineation of these occurrences and detailed the vegetative structure and composition, ecological boundaries, landscape and abiotic context, threats, management needs, and restoration opportunities associated with each site. The primary goal of this survey effort is to provide resource managers and planners with standardized, baseline information on each natural community element occurrence. This baseline information is critical for facilitating site-level decisions about biodiversity stewardship, prioritizing protection, management and restoration, monitoring the success of management and restoration, and informing landscape-level biodiversity planning efforts. This report summarizes the findings of MNFI's ecological surveys and also presents a prioritization of stewardship and monitoring of the natural community element occurrences found on Beaver Island.

Interdunal wetland, Little Sand Bay. Photo by Joshua G. Cohen.

Table 1. Natural community element occurrences (EOs) on Beaver Island. The * indicates the EOs that were surveyed in 2016. The ^ indicates the EOs that occur on state land.

Community Type	EO ID	Survey Site	EO RANK	Prior EO RANK	Year Surveyed Prior to Project	Year Last Observed
Bog*^	12097	Fox Lake Bog	AB	AB	2006	2016
Bog^	20442	Greene's Lake	AB	AB	2015	2015
Boreal Forest*^	6311	French Bay	B	C	2006	2016
Boreal Forest*	2437	Little Sand Bay	C	BC	1981	2016
Dry-Mesic Northern Forest*^	9259	Pointe La Par	B	AB	2006	2016
Interdunal Wetland*^	6089	Little Sand Bay	BC	C	1981	2016
Mesic Northern Forest	9328	Font Lake Old Growth	CD	CD	1999	1999
Mesic Northern Forest	4742	Lake Genesereth Old Growth	CD	CD	1998	1998
Mesic Northern Forest*^	626	Martin's Bluff	BC	B	2006	2016
Mesic Northern Forest*^	10493	Southwest Old Growth	BC	B	1998	2016
Open Dunes*^	530	Cable Bay	C	C	1998	2016
Open Dunes	9292	Iron Ore Bay	C	C	1998	1998
Open Dunes	6701	Lookout Point	CD	CD	2015	2015
Open Dunes*^	20737	McCauley Point	C	NA	2016	2016
Open Dunes*^	10808	McFadden Point	C	C	2006	2016
Open Dunes	5002	Sand Bay	C	C	1998	1998
Poor Conifer Swamp*^	20688	Greene's Lake Swamp	AB	NA	2016	2016
Poor Fen*^	2988	Egg Lake	B	B	2006	2016
Rich Conifer Swamp*^	20690	Doty's Swamp	C	NA	2016	2016
Rich Conifer Swamp*^	20689	Greene's Lake Swamp	BC	NA	2016	2016
Rich Conifer Swamp*^	20692	Little Sand Bay	C	NA	2016	2016

Boreal forest, French Bay. Photo by Joshua G. Cohen.

METHODS

Field Survey Prioritization

Natural community surveys were targeted on state lands. Sites for survey were further prioritized by evaluating their date since last survey (with higher priority for older records). Targets for de novo survey were identified using aerial photographic interpretation focusing on rare ecosystems and based on past MNFI survey effort on Beaver Island in 2006, and through site leads and recommendations from scientists with the Little Traverse Bay Bands of Odawa Indians Natural Resources Department.

Field Survey

A total of 15 high-quality natural communities were surveyed in 2016 on Beaver Island (Table 1). Each natural community was evaluated employing Natural Heritage and MNFI methodology, which considers three factors to assess a natural community's ecological integrity or quality: size, landscape context, and condition (Faber-Langendoen et al. 2008). If a site meets defined requirements for these three criteria (MNFI 1988) it is categorized as a high-quality example of that specific natural community type, entered into MNFI's database as an element occurrence, and given a rank based on the consideration of its size, landscape context, and condition. Ecological field surveys were conducted during the 2016 growing season from August 22 through August 26 to evaluate the condition and classification of the sites. To assess natural community size and landscape context, a combination of field surveys, aerial photographic interpretation, and Geographic Information System (GIS) analysis was employed. Typically, a minimum of a half day was dedicated to each site, depending on the size and complexity of the site.

The ecological field surveys involved:

a) compiling comprehensive plant species lists and noting dominant and representative species
b) describing site-specific structural attributes and ecological processes
c) measuring tree diameter at breast height (DBH) of representative canopy trees and aging canopy dominants (where appropriate)
d) analyzing soils and hydrology
e) noting current and historical anthropogenic disturbances
f) evaluating potential threats
g) ground-truthing aerial photographic interpretation using GPS (A Garmin unit was utilized)
h) taking digital photos and GPS points at significant locations
i) surveying adjacent lands when possible to assess landscape context
j) evaluating the natural community classification and mapped ecological boundaries
k) assigning or updating element occurrence ranks
l) noting management needs and restoration opportunities

Boreal forest, Little Sand Bay. An increment borer was used to age canopy dominants. Photo by Joshua G. Cohen.

Soil reaction kits were used to estimate the soil pH for each natural community. Photo by Bill Parsons.

Where feasible, oblique photos were captured from tree tops. Photo by Bill Parsons.

Following completion of the field surveys, the collected data were analyzed and transcribed to update or create element occurrence records in MNFI's statewide biodiversity conservation database (MNFI 2016). Natural community boundaries were mapped or re-mapped. Information from these surveys and prior surveys, if available, was used to produce site descriptions, threat assessments, and management recommendations for each natural community occurrence, which appear within the following **Survey Results** section.

Natural Community Stewardship Prioritization

MNFI developed a scoring matrix for natural community element occurrences to provide a framework for the prioritization of stewardship. For this scoring matrix, we developed the following three indices: an ecological integrity index, a rarity index, and a threat severity index. We used the element occurrence rank to develop the ecological integrity rank, with higher scores for higher-ranked EOs. The rarity index was developed by assigning a score for each natural community type's state rank and global rank and averaging the two scores. For both state and global ranks, higher scores were assigned to rarer types. The threat severity index was developed using knowledge of general threats to natural community types and information gained during surveys on specific regional threats to natural community types (Cohen and Slaughter 2015). For each natural community element occurrence on Beaver Island, the sum of the scores for the ecological integrity index, rarity index, and threat severity index was calculated to sort the natural community element occurrences by their stewardship prioritization score. The stewardship prioritization for the natural community element occurrences found on Beaver Island is presented in the **Stewardship Prioritization Results** section.

Rich conifer swamp, Greene's Lake Swamp. Photo by Joshua G. Cohen.

SURVEY RESULTS

Fifteen occurrences of high-quality natural communities were surveyed during the 2016 field season. A total of nine different natural community types were visited including: bog (1 element occurrence or EO), boreal forest (2 EOs), dry-mesic northern forest (1 EO), interdunal wetland (1 EO), mesic northern forest (2 EOs), open dunes (3 EOs), poor conifer swamp (1 EO), poor fen (1 EO), and rich conifer swamp (3 EOs). Table 1 lists the visited sites, their element occurrence ranks, and their previous element occurrence ranks if applicable. One previously documented site on state land, Greene's Lake bog (EO ID 20442) was not visited in 2016 since it had been recently surveyed by MNFI in 2015.

The following site summaries provide detailed site descriptions and discuss threats and management recommendations for each of the 14 natural community EOs visited in 2016. These site summaries are organized alphabetically by community type and then by element occurrence. Each grouping of communities begins with an overview of the natural community type, which was adapted from MNFI's natural community classification (Kost et al. 2007, Cohen et al. 2014). In addition, an ecoregional distribution map is provided for each natural community type (Albert et al. 2008). For each site summary, we indicate if the site is an update of a previously identified EO or a new EO and provide the following information:

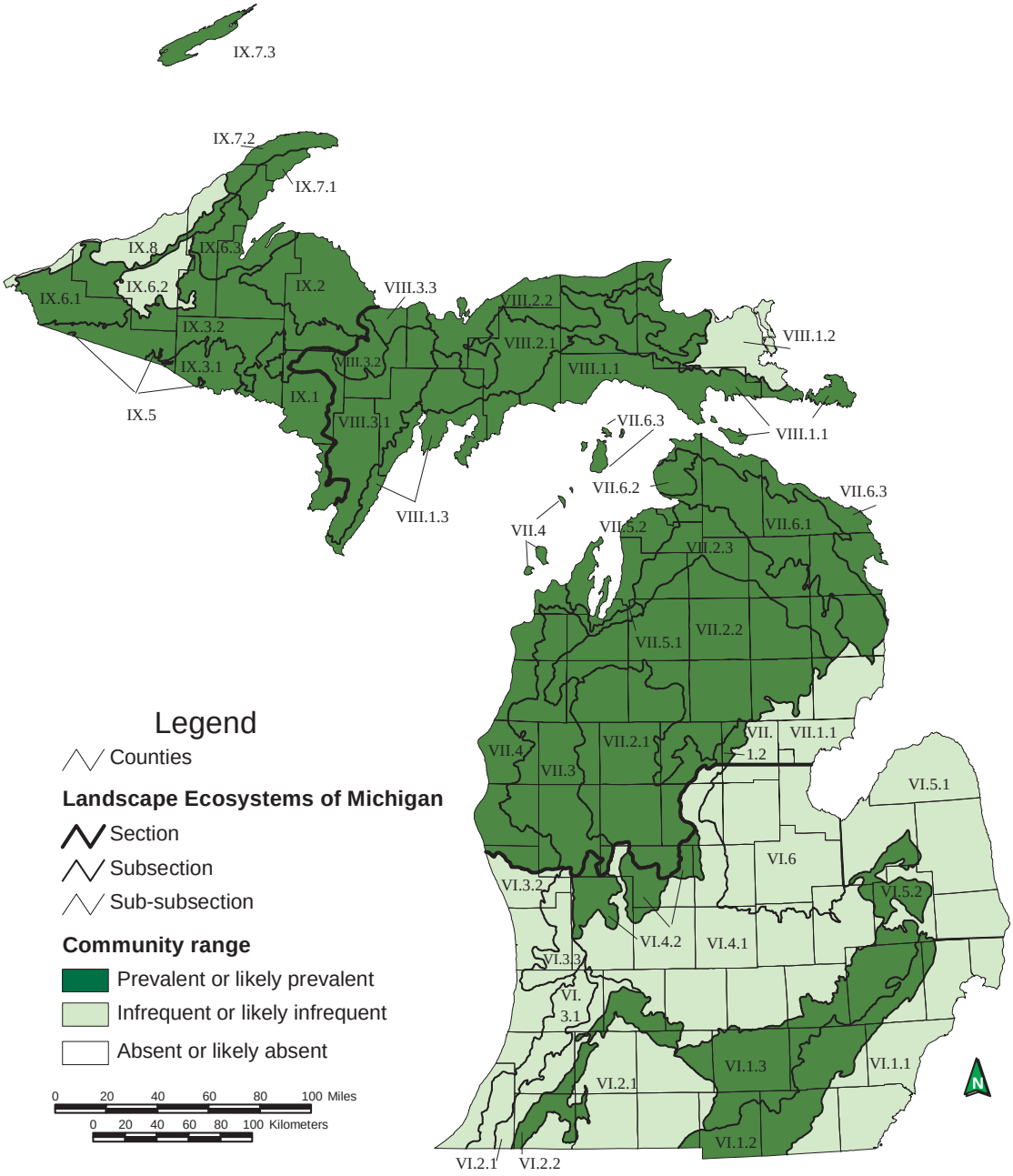
a) site name
b) natural community type
c) global and state rank (see Appendix 1 for ranking criteria)
d) current element occurrence rank
e) size
f) digital photograph(s)
g) site description
h) threat assessment
i) management recommendations

Bog, Fox Lake Bog. Photo by Joshua G. Cohen.

SITE SUMMARIES

BOG

Overview: Bog is a nutrient-poor peatland characterized by acidic, saturated peat and the prevalence of sphagnum mosses and ericaceous shrubs. Located in depressions in glacial outwash and sandy glacial lakeplains and in kettles on pitted outwash and moraines, bogs frequently occur as a floating mat on the margins of lakes and ponds. Fire occurs naturally during drought periods and can alter the hydrology, mat surface, and flora. Beaver-induced flooding also influences bogs (Kost et al. 2007, Cohen et al. 2014).



Map 1. Distribution of bog in Michigan (Albert et al. 2008).

1. Fox Lake Bog
Natural Community Type: Bog
Rank: G3G5 S4, vulnerable to secure globally and secure within the state
Element Occurrence Rank: AB
Size: 155 acres
Element Occurrence Identification Number: 12097 (EO Update)

Site Description: This large ombrotrophic bog occurs on poorly drained lakeplain with deep sphagnum peats overlying sands. The sphagnum peats are strongly acidic and saturated with inundated peats occurring along the margins of Fox Lake. The lakeplain is level but diverse microtopography occurs due to sphagnum hummock and hollow development. Slightly less acidic conditions occur along the bog margin and along the floating bog mat adjacent to Fox Lake.

The bog is characterized by a scattered canopy of stunted conifers with tamarack (*Larix laricina*), black spruce (*Picea mariana*), white pine (*Pinus strobus*), and red pine (*P. resinosa*), which occurs locally. The canopy becomes denser, taller and more closed along the bog margin where the bog mat is grounded or where paludification has occurred. The noted tree species also occur in the tall shrub and sapling layer. Along the bog margin where there is some groundwater influence, mountain holly (*Ilex mucronata*) and winterberry (*Ilex verticillata*) are locally dominant. Leatherleaf (*Chamaedaphne calyculata*) dominates the continuous and closed low shrub layer. Other prevalent ericaceous shrubs include bog laurel (*Kalmia polifolia*), Labrador tea (*Rhododendron groenlandicum*), and bog rosemary (*Andromeda glaucophylla*). Low sweet blueberry (*Vaccinium angustifolium*) and Canada blueberry (*V. myrtilloides*) are locally dominant where the bog mat is grounded. The herbaceous layer is dominated by few-seed sedge (*Carex oligosperma*) along with sheathed cotton-grass (*Eriophorum spissum*). Wintergreen (*Gaultheria procumbens*) and small cranberry (*Vaccinium oxycoccos*) are common throughout. The floating bog mat adjacent to Fox Lake in the northwestern corner of the peatland supports higher biodiversity, characterized by the aforementioned species along with white beak-rush (*Rhynchospora alba*), twig-rush (*Dulichium arundinaceum*), pitcher-plant (*Sarracenia purpurea*), and round-leaved sundew (*Drosera rotundifolia*).

Threats: Uplands adjacent to and within the bog could be harvested, which would moderately influence the peat chemistry along the bog margin. The pine and aspen sand dune island within the bog could be harvested. Logging traffic could compact the peat and cause rutting. Reed canary grass (*Phalaris arundinacea*) could spread where the anthropogenic disturbances impact the hydrology and soil chemistry.

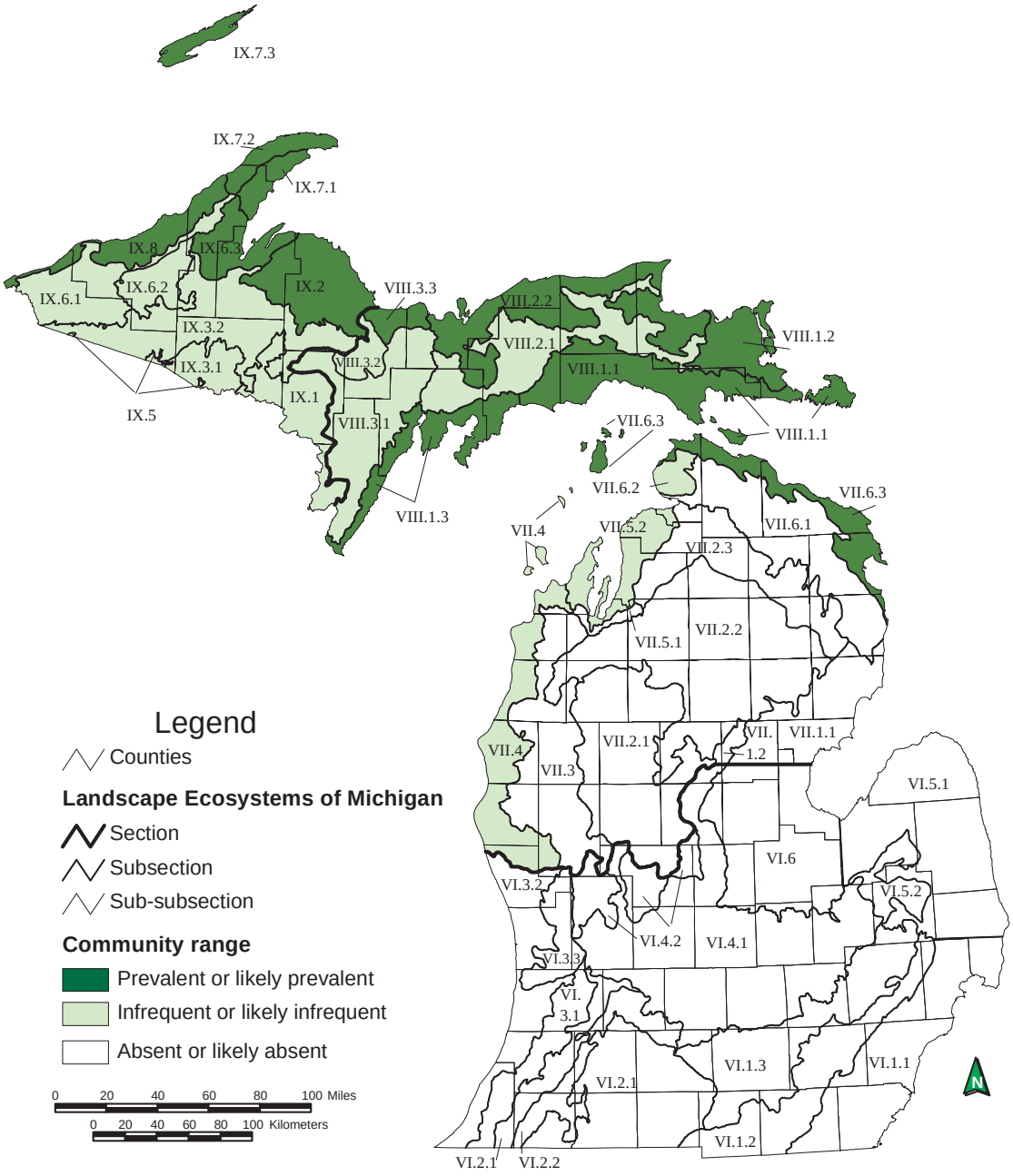
Management Recommendations: The main management recommendation is to allow natural processes to operate unhindered. Wildfires should be allowed to burn the bog as well as the surrounding uplands. Maintaining a forested buffer surrounding the bog will help ensure the stability of the bog's hydrologic regime. Portions of the bog and surrounding landscape that occur on private lands could be protected through acquisition or the establishment of conservation easements.

Fox Lake Bog. Photos by Joshua G. Cohen.

2014 aerial photograph of Fox Lake Bog

BOREAL FOREST

Overview: Boreal forest is a conifer or conifer-hardwood forest type occurring on moist to dry sites characterized by species dominant in the Canadian boreal forest. It typically occupies upland sites along shores of the Great Lakes, on islands in the Great Lakes, and locally inland. The community occurs north of the climatic tension zone primarily on sand dunes, glacial lakeplains, and thin soil over bedrock or cobble. Soils of sand and sandy loam are typically moderately acid to neutral, but heavier soils and more acid conditions are common. Proximity to the Great Lakes results in high levels of windthrow and climatic conditions characterized by low summer temperatures and high levels of humidity, snowfall, and summer fog and mist. Additional important forms of natural disturbance include fire and insect epidemics (Kost et al. 2007, Cohen et al. 2014).



Map 2. Distribution of boreal forest in Michigan (Albert et al. 2008).

2. French Bay
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: B
Size: 197 acres
Element Occurrence Identification Number: 6311 (EO update)

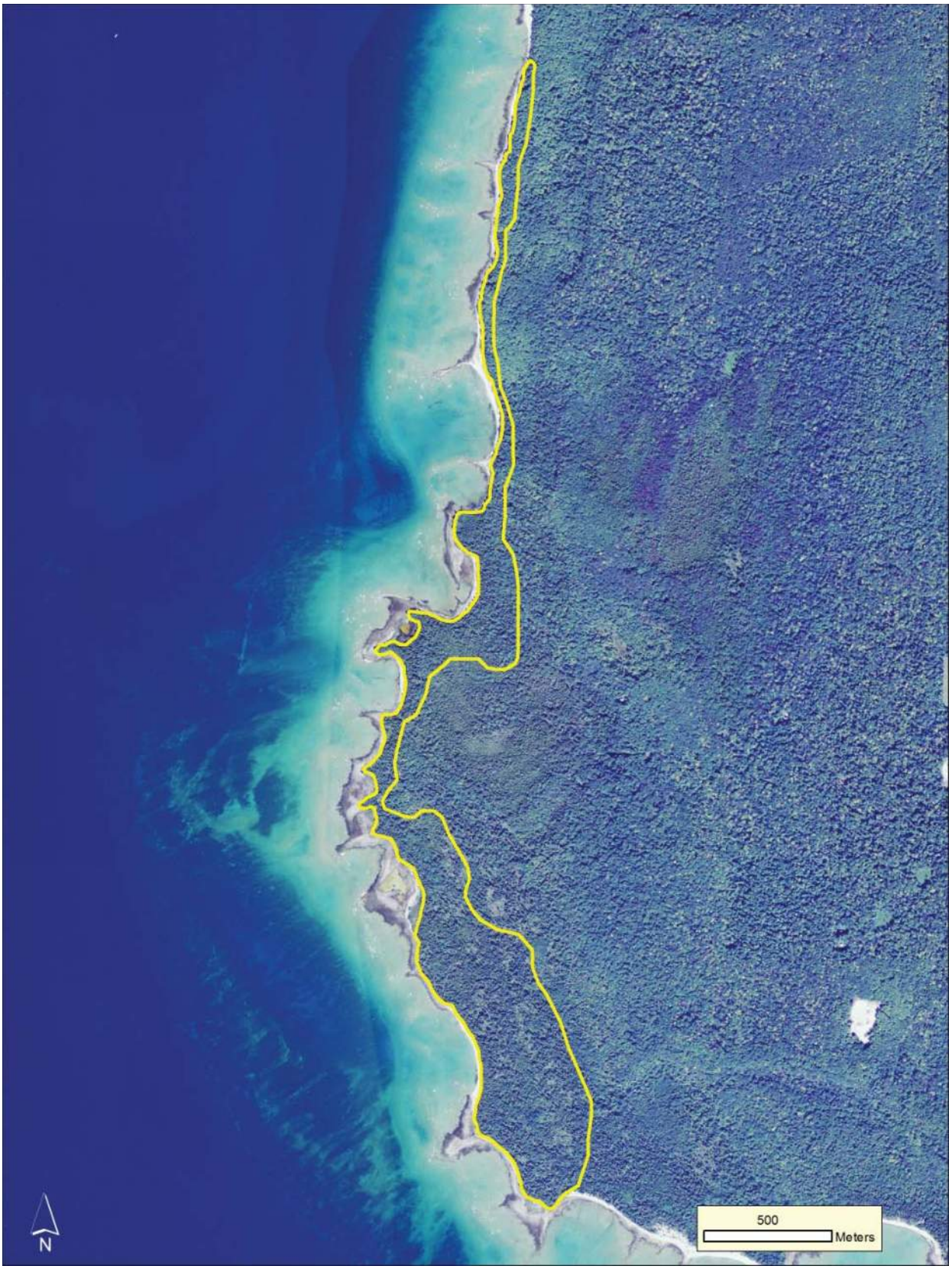
Site Description: Boreal forest occurs along the southwestern shoreline of Beaver Island. Adjacent shoreline communities include limestone cobble shore, sand and gravel beach, open dunes, and to a lesser extent Great Lakes marsh. Boreal forest is bordered along the inland side by hardwood-conifer swamp, rich conifer swamp, dry-mesic northern forest, mature mesic northern forest, and early-successional forest. Much of the surrounding northern hardwoods have been logged. The mapped area of boreal forest contains inclusions of rich conifer swamp, mesic northern forest, and dry-mesic northern forest. Fine-scale gradients in hydrology and soils makes mapping this boreal forest precisely very difficult. The topography is rolling in areas where the boreal forest occurs on former cobble shore and sand shore. Windthrow is prevalent throughout and as a result, the boreal forest is characterized by high levels of coarse woody debris and uneven-aged stand patterning at multiple scales. Large areas of blowdown occur throughout as do small-scale windthrow gaps. A 50.2 cm red pine (*Pinus resinosa*) was cored and estimated to be over 140 years old (with excellent growth for the first 63 years). A 31.5 cm northern white-cedar (*Thuja occidentalis*) was cored and estimated to be over 100 years old and a 51.5 cm northern white-cedar was cored and estimated to be over 120 years old. Deer trails occur throughout the boreal forest, which is likely used as a deer yard in the winter. The soils of the boreal forest are characterized by a shallow (5-10 cm), acidic (pH 4.5-5.0) A horizon over acidic (pH 5.0-6.0), medium-textured sands. The sands occur locally over cobble (50 cm of sand over cobble observed in one sample).

The boreal forest is dominated by northern white-cedar with canopy associates including white spruce (*Picea glauca*), paper birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), red maple (*Acer rubrum*), white pine (*Pinus strobus*), red pine, and red oak (*Quercus rubra*). Canopy trees typically range in DBH from 20-50 cm with some scattered larger DBH white pine and red oak (50-70 cm). Canopy closure ranges widely from 50 to 90% with areas of more open canopy (50-70%) occurring following large windthrow events. Where the boreal forest occurs on former sand shoreline features, pines are most prevalent in the canopy. Where the boreal forest occurs on former limestone cobble shore, northern white-cedar is dominant. The understory is typically sparse (5-15%) with some areas with more open canopy having higher densities (20-40%). Characteristic understory species include balsam fir (*Abies balsamea*), white spruce, trembling aspen, and beaked hazelnut (*Corylus cornuta*). Yew (*Taxus canadensis*) is noticeably absent from the understory and low shrub layer (yew is an overwhelming dominant on nearby High Island). The absence of yew is a likely indication that deer browse pressure has impacted the species composition and structure of this boreal forest. Prevalent species in the low shrub layer include wild red raspberry (*Rubus strigosus*), balsam fir, and Canada blueberry (*Vaccinium myrtilloides*) with soapberry (*Shepherdia canadensis*), Canadian fly honeysuckle (*Lonicera canadensis*), and snowberry (*Symphoricarpos albus*) occurring locally. Characteristic ground cover species include starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), wild sarsaparilla (*Aralia nudicaulis*), sedges (*Carex pedunculata* and *C. eburnea*), oak fern (*Gymnocarpium dryopteris*), big-leaved aster (*Aster maculata*), gay-wings (*Polygala paucifolia*), bunchberry (*Cornus canadensis*), naked miterwort (*Mitela nuda*), goldthread (*Coptis trifolia*), bracken fern (*Pteridium aquilinum*), dwarf raspberry (*Rubus pubescens*), stiff clubmoss (*Spinulum annotinum*), and dwarf lake iris (*Iris lacustris*, state and federally threatened), which is a local dominant.

Threats: Species composition and vegetative structure are patterned by natural processes but have been influenced by past logging and deer herbivory. Deer trails and deer browse were noted throughout. Scattered cut stumps occur near the shoreline and near two-tracks.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the boreal forest. Reducing deer densities on the island could be accomplished through culling and/or increasing late-successional habitat by allowing early-successional stands to senesce and succeed to more mature, shade-tolerant systems. In addition, establishment of deer exclosures within the site will foster conifer seedling and sapling regeneration. Placement of exclosures should be located around concentrations of coarse woody debris or nurse logs since these microsites provide important establishment sites for plants. The impacts of deer herbivory should be monitored, especially if exclosures are erected.

French Bay boreal forest. Photo by Joshua G. Cohen.



2014 aerial photograph of French Bay boreal forest.

3. Little Sand Bay
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: C
Size: 37 acres
Element Occurrence Identification Number: 2437 (EO update)

Site Description: Boreal forest occurs along the northeastern shoreline of Beaver Island. The boreal forest occurs adjacent to a sandy bay that supports interdunal wetland and a low foredune with open dunes vegetation. To the south of the boreal forest is a small pocket of rich conifer swamp. Immediately adjacent to the boreal forest to the east is a narrow forested swale that has been flooded by beaver and as a result, the canopy of northern white-cedars (*Thuja occidentalis*) is flood-killed. Inland from the boreal forest is managed northern hardwoods. The mapped area of boreal forest contains inclusions of rich conifer swamp and mesic northern forest. Fine-scale gradients in hydrology and soils makes mapping this boreal forest precisely very difficult. The topography of the boreal forest is rolling, occurring on former sandy shoreline. Windthrow is prevalent throughout and as a result, the boreal forest is characterized by high levels of coarse woody debris and uneven-aged stand patterning at multiple scales. Large areas of blowdown occur throughout as do small-scale windthrow gaps. A 31 cm northern white-cedar was cored and estimated to be 145 years old. A 61 cm red oak (*Quercus rubra*) was cored and estimated to be 180 years old. Beaver sign and deer browse occur throughout the boreal forest. The soils of the boreal forest are characterized by a shallow (5 cm), acidic (pH 4.5) A horizon over slightly acidic to circumneutral (pH 6.5-7.0) medium-textured sands.

The boreal forest is dominated by northern white-cedar with canopy associates including paper birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), trembling aspen (*P. tremuloides*), red maple (*Acer rubrum*), hemlock (*Tsuga canadensis*), and red oak. Canopy trees typically range in DBH from 20 to 40 cm with some scattered larger DBH trembling aspen, red oak, and hemlock (60-80 cm). Canopy closure ranges widely from 65 to 90% with areas of more open canopy (50-70%) occurring following large windthrow events. The understory ranges from 15 to 35% and characteristic understory species include balsam fir (*Abies balsamea*), mountain maple (*Acer spicatum*), striped maple (*A. pensylvanicum*), trembling aspen, and northern white-cedar, which occurs locally in areas of heavy blowdown. Yew (*Taxus canadensis*) is noticeably absent from the understory and low shrub layer (yew is an overwhelming dominant on nearby High Island). The absence of yew is a likely indication that deer browse pressure has impacted the species composition and structure of this boreal forest. Prevalent species in the low shrub layer include balsam fir, Canadian fly honeysuckle (*Lonicera canadensis*), white ash (*Fraxinus americana*), and striped maple. Characteristic ground cover species include starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), wild sarsaparilla (*Aralia nudicaulis*), sedge (*Carex pedunculata*), goldthread (*Coptis trifolia*), bracken fern (*Pteridium aquilinum*), and stiff clubmoss (*Spinulum annotinum*).

Threats: Species composition and vegetative structure are patterned by natural processes but have been influenced by past logging, deer herbivory, and beaver flooding. Deer browse was noted throughout.

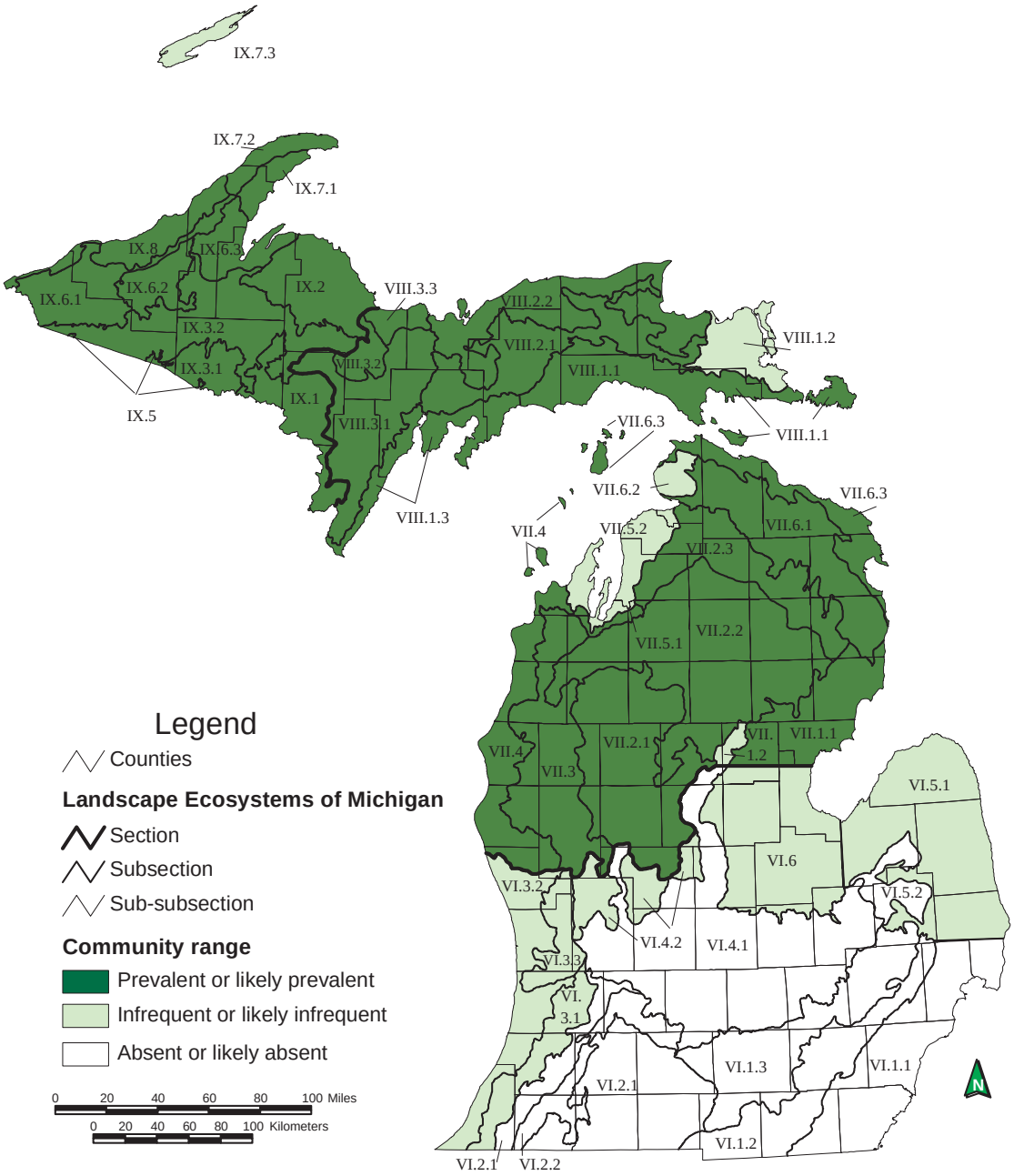
Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the boreal forest. Monitor for invasive species and deer browse pressure.

Little Sand Bay boreal forest. Photos by Joshua G. Cohen.

2014 aerial photograph of Little Sand Bay boreal forest.

DRY-MESIC NORTHERN FOREST

Overview: Dry-mesic northern forest is a pine or pine-hardwood forest type of generally dry-mesic sites located mostly north of the transition zone. Dry-mesic northern forest is characterized by acidic, coarse- to medium-textured sand or loamy sand and occurs principally on sandy glacial outwash, sandy glacial lakeplains, and less often on inland dune ridges, coarse-textured moraines, and thin glacial drift over bedrock. The community historically originated in the wake of catastrophic fire and was maintained by frequent, low-intensity ground fires (Kost et al. 2007, Cohen et al. 2014).



Map 3. Distribution of dry-mesic northern forest in Michigan (Albert et al. 2008).

4. Pointe La Par
Natural Community Type: Dry-mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: B
Size: 387 acres
Element Occurrence Identification Number: 9259 (EO Update)

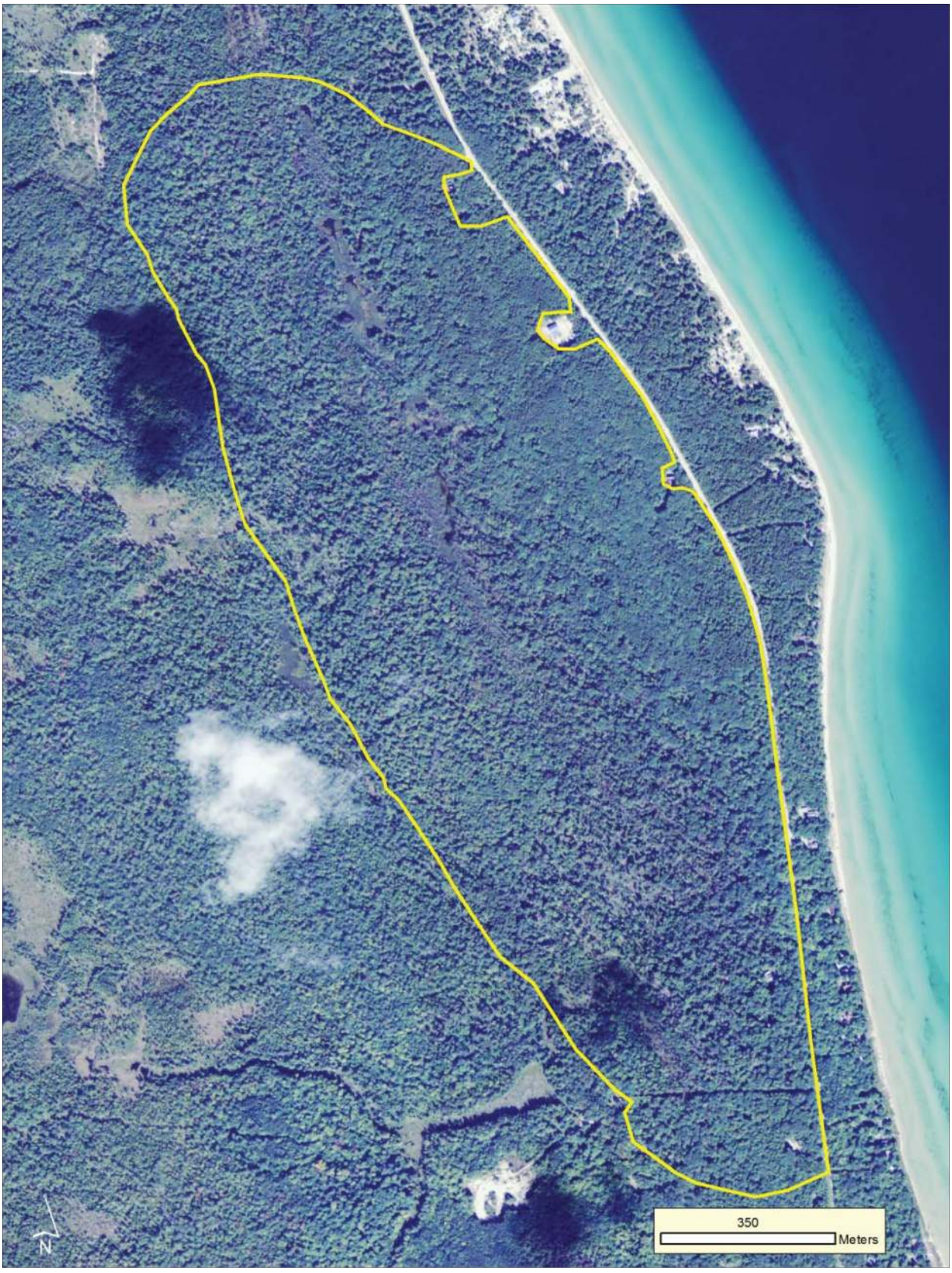
Site Description: This uneven-aged, dry-mesic northern forest occurs on dune and swale topography oriented from northwest to southeast with numerous wooded swales. The soils are fine-textured dune sands that are acidic on the dune ridges with a thick needle duff. A soil sample from the dune ridge was characterized by a 5 cm, acidic (pH 4.5) A horizon over medium- to fine-textured, acidic (pH 5.5-6.0) dune sands. The sand in the swales is coarse-textured, wet and alkaline with a high water table (40 cm). The site was likely historically burned by Native Americans. The forest is characterized by a moderate level of coarse woody debris due to senescence and blowdown. A 52 cm red oak (*Quercus rubra*) was cored and estimated to be over 100 years old in the southwestern portion of the complex.

The canopy is dominated by red pine (*Pinus resinosa*) and red oak with supercanopy white pine (*Pinus strobus*), aspen (*Populus* spp.) clones, and patches of hemlock (*Tsuga canadensis*), which occur in the southern extent of the occurrence. Additional canopy associates include paper birch (*Betula papyrifera*) and red maple (*Acer rubrum*). In addition, northern white-cedar (*Thuja occidentalis*) occurs locally along the sand ridges, especially adjacent to rich conifer swamp inclusions in the western portion of the forest. Red maple and balsam fir (*Abies balsamea*) are prevalent in the subcanopy and understory, indicating many decades of fire suppression (50-70 years). White pine dominates the understory with balsam fir locally dominant, red maple common, and red pine occasional. The scarcity of red oak in the understory layer is likely indicative of high levels of deer herbivory. The low shrub layer is dominated by blueberries (*Vaccinium* spp.) and huckleberry (*Gaylussacia baccata*) with occasional common blackberry (*Rubus allegheniensis*), striped maple (*Acer pensylvanicum*), and Canadian fly honeysuckle (*Lonicera canadensis*). The ground layer is dominated by bracken fern (*Pteridium aquilinum*) with wintergreen (*Gaultheria procumbens*), starflower (*Trientalis borealis*), wild sarsaparilla (*Aralia nudicaulis*), and red oak and white pine seedlings. Additional common ground layer species include Canada mayflower (*Maianthemum canadense*) and bunchberry (*Cornus canadensis*). The numerous swales, which occur between the dune ridges, are typically forested with an open canopy of small-diameter green ash (*Fraxinus pennsylvanica*) and northern white-cedar. The low shrub layer is dominated by alder-leaved buckthorn (*Rhamnus alnifolia*). Occasional tall shrubs include beaked hazelnut (*Corylus cornuta*), dogwoods (*Cornus* spp.), and buttonbush (*Cephalanthus occidentalis*). Characteristic ground cover species include tussock sedge (*Carex stricta*), fowl manna grass (*Glyceria striata*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), and northern bugleweed (*Lycopus uniflorus*).

Threats: Continued fire suppression and deer herbivory could negatively impact species composition, structure, and the site's future successional trajectory. Private portions of the site could be logged or developed. Prevalence of balsam fir and red maple in the subcanopy and understory indicate fire suppression has affected the site for the past 50 to 70 years. Logging stumps occur in portions of the forest. A trail passes through the northwestern portion of the forest.

Management Recommendations: Prescribed fire should be employed to mimic ground fires in order to set back mesophytic species, such as red maple and balsam fir, and establish conditions favorable for pine and oak regeneration. The site should be monitored for invasive species encroachment and deer herbivory. Increasing the amount of late-successional habitat in the adjacent landscape will help reduce deer browse pressure. Reducing deer densities on the island is recommended. High-quality dry-mesic northern forest on private lands could be protected through acquisition or the establishment of conservation easements.

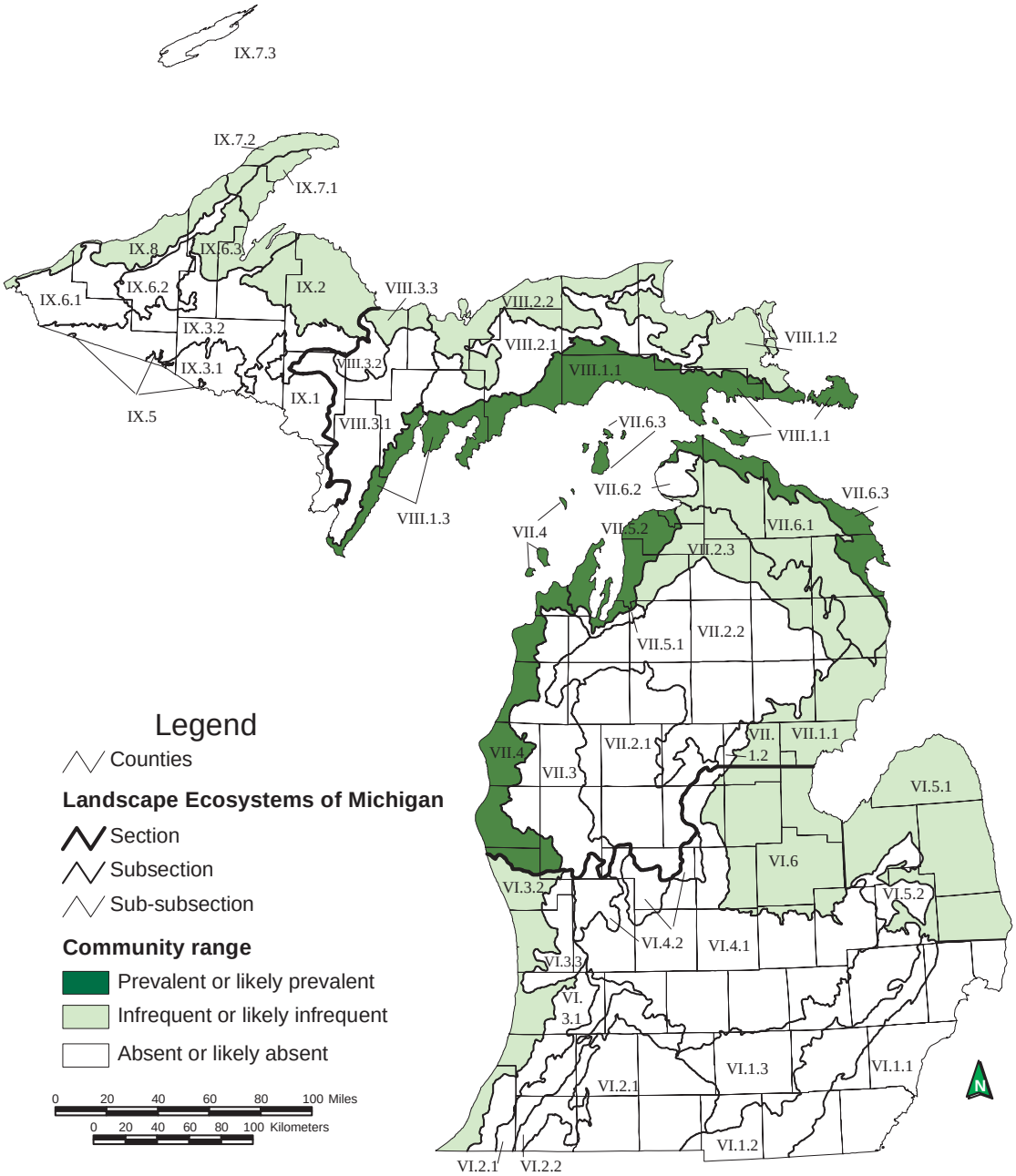
Pointe La Par dry-mesic northern forest. Photos by Joshua G. Cohen.



2014 aerial photograph of Pointe La Par dry-mesic northern forest.

INTERDUNAL WETLAND

Overview: Interdunal wetland is a rush-, sedge-, and shrub-dominated wetland situated in depressions within open dunes or between beach ridges along the Great Lakes. This system is patterned by a dynamic water table that fluctuates seasonally and yearly in synchrony with lake level changes (Kost et al. 2007, Cohen et al. 2014).



Map 4. Distribution of interdunal wetland in Michigan (Albert et al. 2008).

5. Little Sand Bay
Natural Community Type: Interdunal Wetland
Rank: G2? S2, imperiled throughout range
Element Occurrence Rank: BC
Size: 17 acres
Element Occurrence Identification Number: 6089 (EO Update)

Site Description: This interdunal wetland occurs along the Lake Michigan shoreline and is found along the northeastern shore of Beaver Island along Little Sand Bay. In addition to interdunal wetland, the sandy bay supports a low foredune with open dunes vegetation. Rich conifer swamp and boreal forest occur inland from the interdunal wetland. Interdunal wetlands are dynamic systems that change seasonally and annually depending on the fluctuations of the adjacent Great Lake. Interdunal wetlands are formed when water levels of the Great Lakes drop, creating a swale or linear depression between the inland foredune and the newly formed foredune along the water's edge. When Great Lakes water levels rise or during storm events, the interdunal wetland closest to the shoreline can be partially or completely buried by sand. Summer heating and evaporation can result in warm, shallow water or even complete drying within the swale. Numerous swales occur along this half-mile stretch of shoreline. More recently formed swales occur along the sand and gravel beach, and based on air photo interpretation, appear to have formed within the last ten years. Swales also occur between the low dune ridges. Vegetative cover is greater in these swales set back from the active lakeshore and water depth and coverage are greater in the swales adjacent to the active lakeshore. The swales within this complex tend to be narrow (2-5 feet wide). Water depth within the nearshore swales was observed to be 10 to 20 cm. Soils of the interdunal wetlands are wet, alkaline (pH 8.0) sands.

This interdunal wetland is graminoid dominated. Common graminoids include threesquare (*Schoenoplectus pungens*), Baltic rush (*Juncus balticus*), beak-rush (*Rhynchospora capillacea*), and twig-rush (*Cladium mariscoides*). Ground cover associates include Kalm's lobelia (*Lobelia kalmii*), grass-of-Parnassus (*Parnassia glauca*), Ohio goldenrod (*Solidago ohioensis*), grass-leaved goldenrod (*Euthamia graminifolia*), silverweed (*Potentilla anserina*), false asphodel (*Triantha glutinosa*), slender bog arrow-grass (*Triglochin palustris*), and butterwort (*Pinguicula vulgaris*, state special concern). Scattered shrubs include Kalm's St. John's-wort (*Hypericum kalmianum*), shrubby cinquefoil (*Dasiphora fruticosa*), and willows (*Salix* spp.). Stunted northern white-cedar (*Thuja occidentalis*), paper birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), tamarack (*Larix laricina*), and white pine (*Pinus strobus*) occur sporadically along the margins of the wetlands. Shrub and tree cover is more prevalent in the swales that are further from the active shoreline. The low foredunes adjacent to the interdunal wetland are characterized by open dunes vegetation with dominant ground cover species including marram grass (*Ammophila breviligulata*) and sand reed grass (*Calamovilfa longifolia*) and common herbaceous species including wormwood (*Artemisia campestris*), white camas (*Anticlea elegans*), Pitcher's thistle (*Cirsium pitcheri*, state and federally threatened), and Lake Huron tansy (*Tanacetum bipinnatum*, state special concern). Low shrubs common along the low dune ridges include bearberry (*Arctostaphylos uva-ursi*), creeping juniper (*Juniperus horizontalis*), and Kalm's St. John's-wort, and common tree saplings include balsam poplar, tamarack, northern white-cedar, and white spruce (*Picea glauca*).

Threats: The interdunal wetlands are impacted by hikers along the shore. In addition, dead zebra mussel shells are accumulating in some of the newly formed swales and may be limiting vegetation establishment. No invasive species were documented during the course of this survey but non-native species could potentially impact this dynamic system.

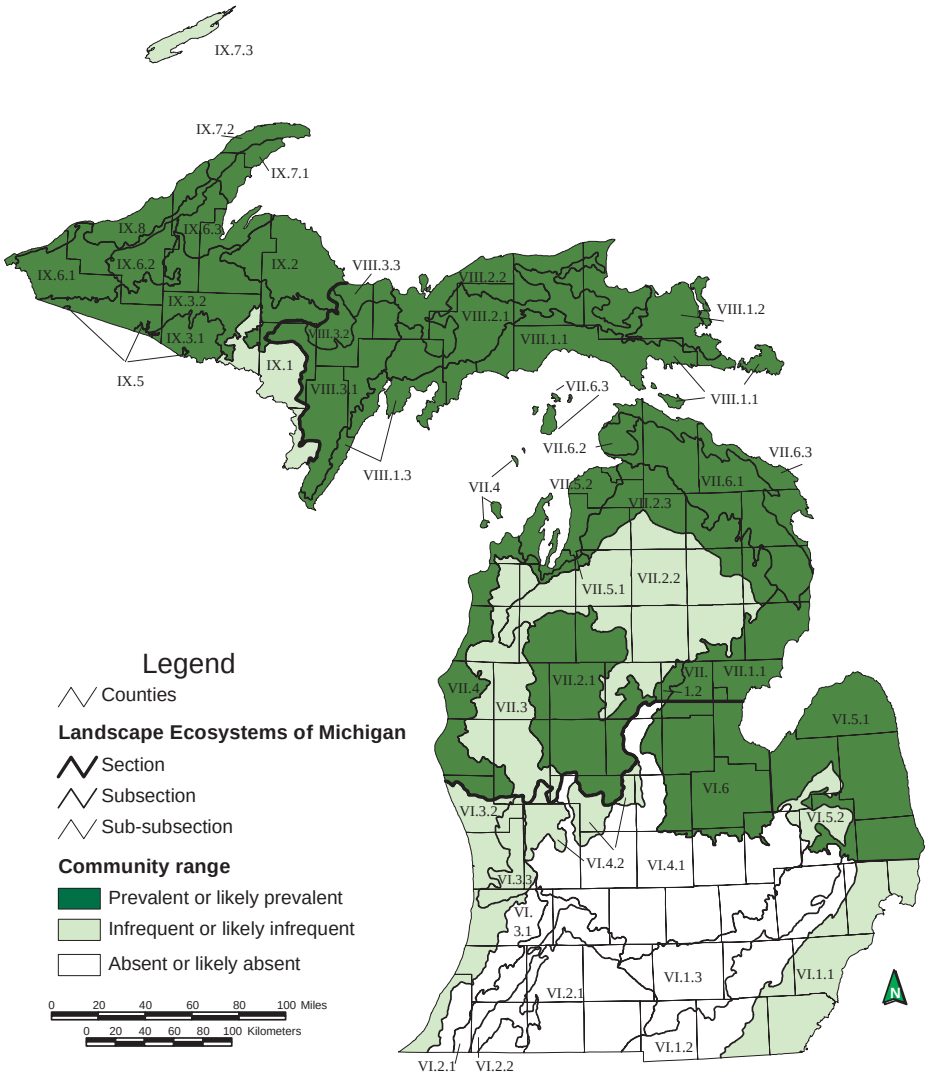
Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to monitor for invasive plants along the shoreline.

Little Sand Bay interdunal wetland. Photos by Joshua G. Cohen (above) and Bill Parsons (below).

2014 aerial photograph of Little Sand Bay interdunal wetland.

MESIC NORTHERN FOREST

Overview: Mesic northern forest is a forest type of moist to dry-mesic sites lying mostly north of the climatic tension zone, characterized by the dominance of northern hardwoods, particularly sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*). Conifers such as hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) are frequently important canopy associates. This community type breaks into two broad classes: northern hardwood forest and hemlock-hardwood forest. It is primarily found on coarse-textured ground and end moraines, and soils are typically loamy sand to sandy loam. The natural disturbance regime is characterized by gap-phase dynamics; frequent, small windthrow gaps allow for the regeneration of the shade-tolerant canopy species. Catastrophic windthrow occurs infrequently with several generations of trees passing between large-scale, severe disturbance events. Historically, mesic northern forest occurred as a matrix system, dominating vast areas of mesic uplands in the Great Lakes region. These forests were multi-generational, with old-growth conditions lasting many centuries (Kost et al. 2007, Cohen et al. 2014).



Map 5. Distribution of mesic northern forest in Michigan (Albert et al. 2008).

6. Martin's Bluff
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 42 acres
Element Occurrence Identification Number: 626 (EO Update)

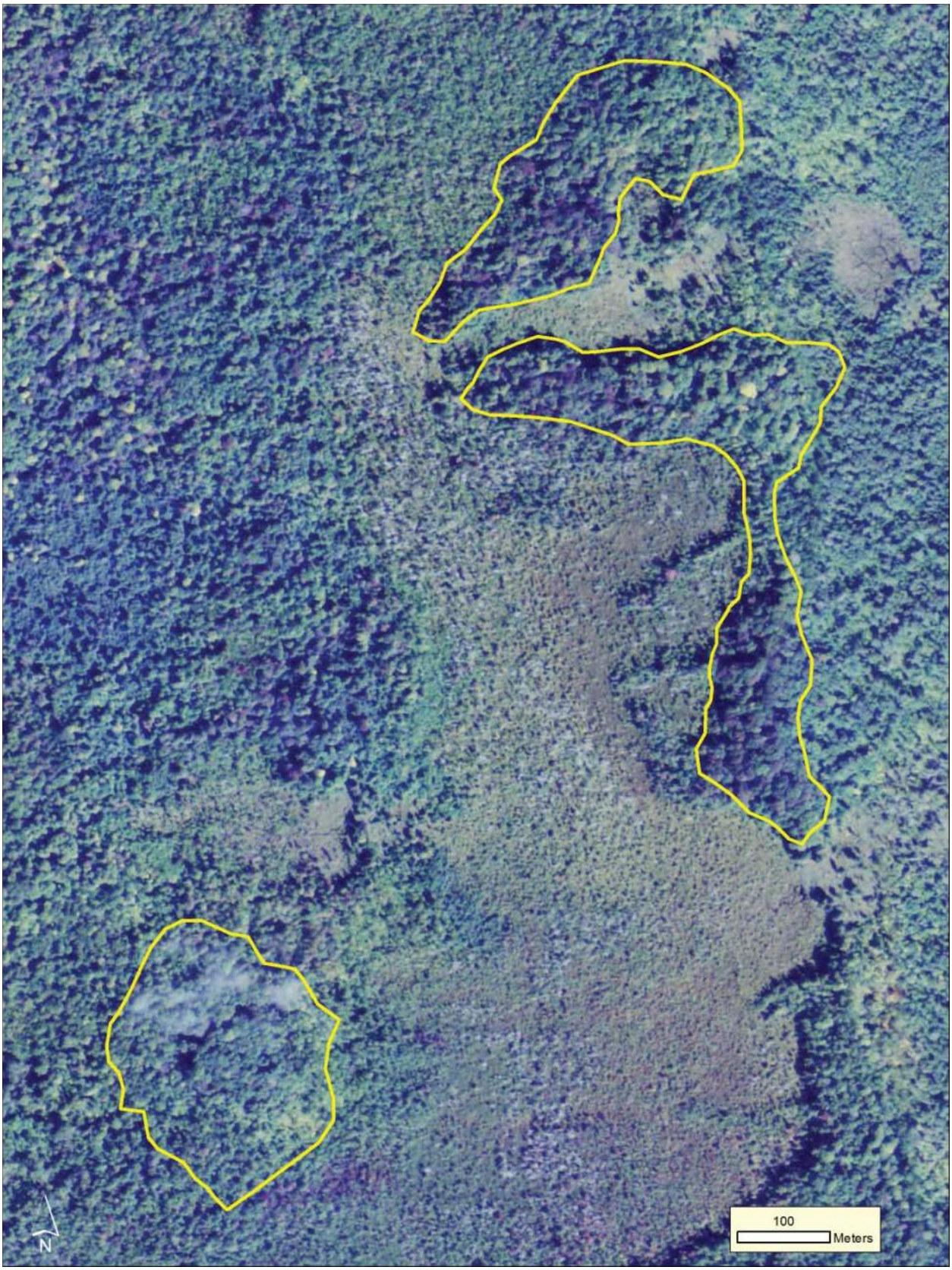
Site Description: Three small islands of uneven-aged, old-growth mesic northern forest occur on rolling ground moraine with fine- to medium-textured loamy sands that range from acidic to alkaline. The site is characterized by well-developed pit and mound topography but only moderate levels of coarse woody debris and snags were observed. The forest is surrounded by beaver-influenced wetlands, conifer swamp, and paper birch (*Betula papyrifera*) and aspen (*Populus* spp.) forest that likely established following turn-of-the-century logging. Soils vary with canopy dominance. In areas dominated by sugar maple, the soils have a mull humus over acidic (pH 5.0-6.0) sandy clay loams and sandy loams. In hemlock-dominated areas, the soils are characterized by an acidic mor humus over leeched sands (pH 4.5) over loamy sands (pH 4.5-5.0).

The canopy is dominated by large-diameter (> 60 cm), old-growth (250+ years old) sugar maple (*Acer saccharum*), hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), and yellow birch (*Betula alleghaniensis*). Mature beech trees within this forest are beginning to die from beech bark disease. Canopy dominance varies locally with hemlock dominant in the northern island and sugar maple dominant in the southern two polygons. The forest is characterized by uneven-aged structure with sugar maple, hemlock, yellow birch, balsam fir (*Abies balsamea*), and red maple (*Acer rubrum*) in the subcanopy. Canopy associates include pockets of mid-tolerant species, such as green ash (*Fraxinus pennsylvanica*) and shade-intolerant species, such as paper birch and quaking aspen (*Populus tremuloides*), which occur along the edges of the forest and in larger light gaps. Numerous canopy gaps of diverse age, size, and shape are found throughout the site. The tall shrub layer is dominated by sugar maple with balsam fir as a local dominant and striped maple (*Acer pensylvanicum*), beaked hazelnut (*Corylus cornuta*), beech, and red maple characteristic. American fly honeysuckle (*Lonicera canadensis*) is prevalent in the low shrub layer with seedlings of sugar maple, white ash (*Fraxinus americana*), and balsam fir common. The ground cover is dominated by sugar maple seedlings with characteristic species including starflower (*Trientalis borealis*), wild sarsaparilla (*Aralia nudicaulis*), violets (*Viola* spp.), spinulose woodfern (*Dryopteris carthusiana*), Indian cucumber root (*Medeola virginiana*), Canada mayflower (*Maianthemum canadense*), sedge (*Carex pedunculata*), goldthread (*Coptis trifolia*), gay-wings (*Polygala paucifolia*), bunchberry (*Cornus canadensis*), partridge berry (*Mitchella repens*), blue-bead lily (*Clintonia borealis*), and stiff clubmoss (*Spinulum annotinum*). Areas along the ecotonal edge of the mesic northern forest and the adjacent wetland are dominated by hemlock with yellow birch, red maple, and occasional northern white-cedar (*Thuja occidentalis*).

Threats: Deer herbivory is likely impacting the site's species composition and structure (i.e., eliminating hemlock regeneration). Browsed sugar maple saplings and jewelweed (*Impatiens capensis*) were noted during the survey. Mature beech trees within the forest are beginning to die from beech bark disease. In the northern block of the forest there is a hunting blind with a wood stove. Hunters are cutting coarse woody debris for firewood and clearing trails with a chainsaw. One non-native earthworm was observed while digging a soil pit. Earthworms could potentially alter the soil decomposition rates and nutrient dynamics. Finally, the private portion of the old-growth forest could be logged.

Martin's Bluff mesic northern forest. Photo by Joshua G. Cohen.

Management Recommendations: The primary management recommendation is to allow natural processes (i.e., fire and windthrow) to operate unhindered (e.g., prohibit salvage logging). Private lands within and surrounding the site could be acquired or protected through conservation easements. The old-growth forest could be buffered by unmanaged forest and swamp. If the surrounding forest is managed, extending the rotation and maintaining late-successional features of the forest are recommended. Reducing deer densities on the island could be accomplished through culling and/or increasing late-successional habitat by allowing early-successional stands to senesce and succeed to more mature, shade-tolerant systems. In addition, establishment of deer exclosures within the site will foster conifer seedling and sapling regeneration. Placement of exclosures should be located around concentrations of large-diameter coarse woody debris or nurse logs since these microsites provide important establishment sites for hemlock, as well as yellow birch. The impacts of deer herbivory should be monitored, especially if exclosures are erected.



2014 aerial photograph of Martin's Bluff mesic northern forest.

7. Southwest Old Growth
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 91 acres
Element Occurrence Identification Number: 10493 (EO Update)

Site Description: This uneven-aged mesic northern forest is starting to accrue old-growth attributes and occurs on rolling ground moraine on the southwestern end of Beaver Island. The forest includes portions both above and below a steep nearshore terrace. Portions of the forest on top of the terrace are characterized by rolling terrain and are dominated by deciduous species. Below the terrace, the forest is dominated by hemlock on rolling to moderate terrain. The site is characterized by well-developed pit and mound topography, moderate levels of coarse woody debris, and numerous large canopy gaps. Canopy trees are large with many trees being greater than 70 cm DBH and many supporting a diverse array of funguses and mosses on their boles. An 82 cm hemlock (*Tsuga canadensis*) was cored and estimated to be 250 to 300 years old. Along the base of the steep terrace where there is significant groundwater discharge, old-growth mesic northern forest intergrades with old-growth hardwood-conifer swamp. In hemlock-dominated areas the soils are characterized by an acidic mor humus (5cm deep and pH 4.5) over leached sands (pH 4.5-5.0) over loamy sands (pH 5.0-5.5).

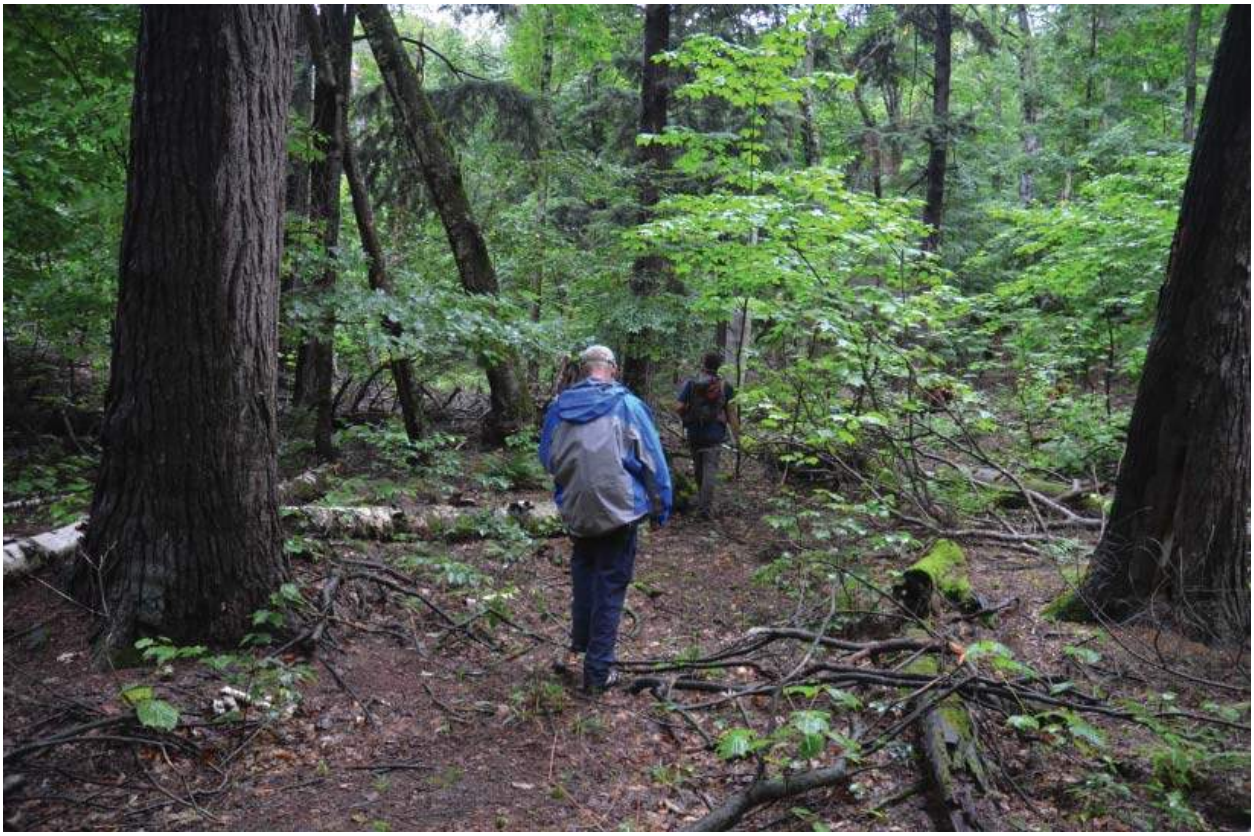
The canopy is dominated by large-diameter (> 70 cm), old-growth (250+ years old) sugar maple (*Acer saccharum*), hemlock, American beech (*Fagus grandifolia*), and yellow birch (*Betula alleghaniensis*). Northern white cedar (*Thuja occidentalis*) occurs locally as a canopy associate. Canopy dominance varies locally with hemlock dominant bellow the terrace and deciduous species dominant on top of the terrace. The forest is characterized by uneven-aged structure with sugar maple, beech, hemlock, balsam fir (*Abies balsamea*), and yellow birch in the subcanopy. Numerous canopy gaps of diverse age, size, and shape are found throughout the site. Many canopy gaps have recently formed due to the mortality of canopy beech from beech bark disease. Many class 1 (recently dead with fine branching) beech snags occur throughout the site. The tall shrub and low shrub layers are sparse (both 5-10%) with characteristic species including sugar maple, balsam fir, striped maple (*Acer pensylvanicum*), beech, and hemlock (uncommon). The ground cover is dominated by sugar maple seedlings with characteristic species including starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), oak fern (*Gymnocarpium dryopteris*), naked miterwort (*Mitela nuda*), ground-pine (*Dendrolycopodium obscurum*), running ground-pine (*Lycopodium clavatum*), and spinulose woodfern (*Dryopteris carthusiana*).

Threats: West Side Drive passes through a portion of this element occurrence. Deer herbivory is likely impacting the site's species composition and structure (i.e., eliminating hemlock regeneration). Mature beech trees within the element occurrence are succumbing to beech bark disease. Large areas of blowdown are correlated with the recent mortality of beech from beech bark disease. These blowdowns are susceptible to invasive species incursions. The invasive multiflora rose (*Rosa multiflora*) was documented locally in the understory. Finally, the private portion of the old-growth forest could be logged.

Management Recommendations: The primary management recommendation is to allow natural processes (i.e., fire and windthrow) to operate unhindered (e.g., prohibit salvage logging). Private lands within and surrounding the site could be acquired or protected through conservation easements. The old-growth forest could be buffered by unmanaged forest. If the surrounding forest is managed, extending the rotation and maintaining late-successional features of the forest are recommended. Reducing deer densities on the island could be accomplished through culling and/or increasing late-successional habitat in the surrounding landscape by allowing early-successional stands to senesce and succeed to more mature, shade-tolerant systems. In addition, establishment of deer exclosures within the site will foster conifer seedling and sapling regeneration. Placement of exclosures should be located around concentrations of large-diameter coarse woody debris or nurse logs since these microsites provide important establishment sites for hemlock, as well as white pine and yellow birch. The impacts of deer herbivory should be monitored, especially if exclosures are erected. Monitoring for invasive species should also be implemented.

Southwest Old Growth mesic northern forest. Photo by Joshua G. Cohen.

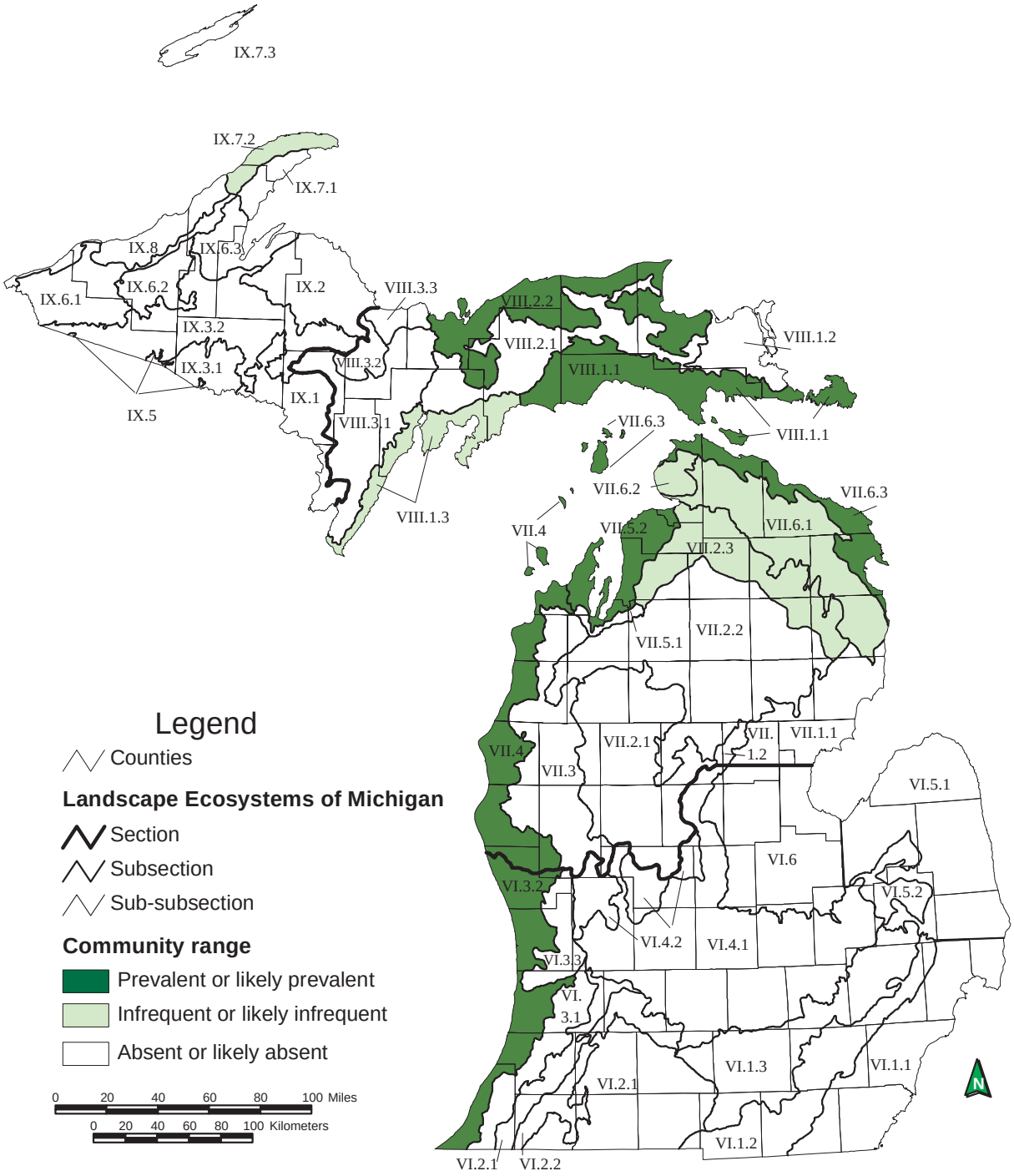
Southwest Old Growth mesic northern forest. Photos by Bill Parsons.



2014 aerial photograph of Southwest Old Growth mesic northern forest.

OPEN DUNES

Overview: Open dunes is a grass- and shrub-dominated multi-seral community located on wind-deposited sand formations near the shorelines of the Great Lakes. Dune formation and the patterning of vegetation are strongly affected by lake-driven winds. The greatest concentration of open dunes occurs along the eastern and northern shorelines of Lake Michigan, with the largest dunes occurring along the eastern shoreline due to the prevailing southwest winds (Kost et al. 2007, Cohen et al. 2014).



Map 6. Distribution of open dunes in Michigan (Albert et al. 2008).

8. Cable Bay
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 30 acres
Element Occurrence Identification Number: 530 (EO update)

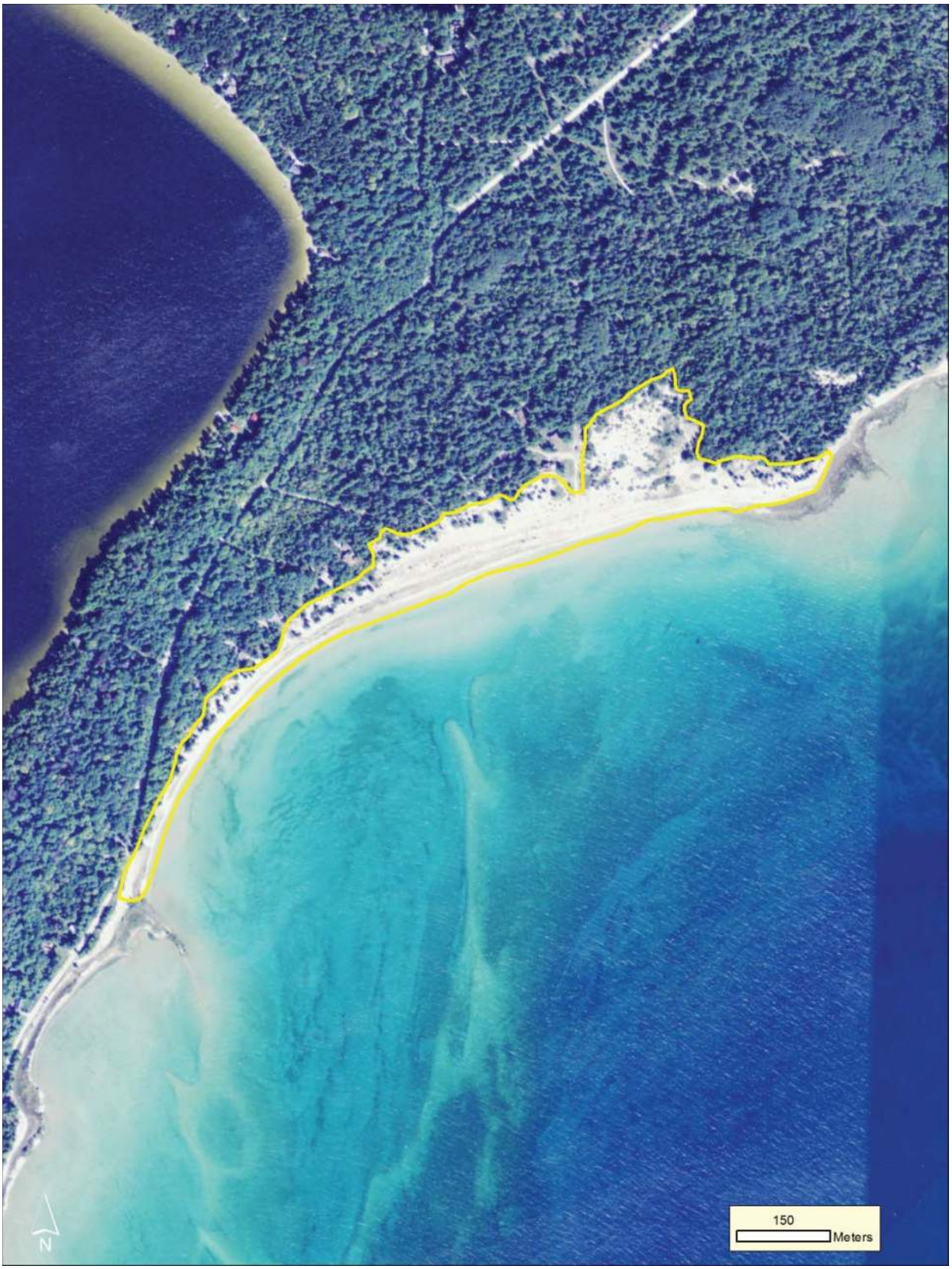
Site Description: This site is characterized by low parabolic dunes and a low foredune that occurs along the southeastern shore of Beaver Island. The soils are fine-textured, wind-blown and wave-worked, alkaline (pH 8.0) sands. The parabolic dunes and associated blowout are found in the northeastern portion of the site. Low foredunes form a long tail to the southwest.

The ground cover of the open dunes is dominated by marram grass (*Ammophila breviligulata*) and sand reed grass (*Calamovilfa longifolia*). Prevalent ground cover species include wormwood (*Artemisia campestris*), white camas (*Anticlea elegans*), Pitcher's thistle (*Cirsium pitcheri*, state and federally threatened), Lake Huron tansy (*Tanacetum bipinnatum*, state special concern), beach pea (*Lathyrus japonicus*), plains puccoon (*Lithospermum caroliniense*), harebell (*Campanula rotundifolia*), wheat grass (*Elymus lanceolatus*), June grass (*Koeleria macrantha*), common horsetail (*Equisetum arvense*), Gillman's goldenrod (*Solidago simplex*), and common milkweed (*Asclepias syriaca*). Lake Huron tansy is concentrated in areas of low foredune. Invasive species are locally common and include spotted knapweed (*Centaurea stoebe*), Canada bluegrass (*Poa compressa*), and bladder campion (*Silene vulgaris*). The low shrub layer ranges from 20 to 50% with prevalent low shrubs including common juniper (*Juniperus communis*), soapberry (*Shepherdia canadensis*), creeping juniper (*Juniperus horizontalis*), and bearberry (*Arctostaphylos uva-ursi*). The understory is scattered (3-12%) with characteristic species including balsam poplar (*Populus balsamifera*), northern white-cedar (*Thuja occidentalis*), paper birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), sandbar willow (*Salix exigua*), and choke cherry (*Prunus virginiana*). Infrequent scattered overstory trees include northern white-cedar, white pine (*Pinus strobus*), paper birch, trembling aspen, red pine (*Pinus resinosa*), and balsam fir (*Abies balsamea*) with canopy coverage between 1 and 10%.

Threats: The primary threat to these dunes is posed by continued residential development and ensuing correlated anthropogenic impacts, especially dune erosion and devegetation caused by foot traffic. On the private portions of this complex, numerous houses occur on the margins of the dunes and even within the open dunes. Bare sand increases in areas near residences due to devegetation and erosion from foot traffic. Invasive species are locally common and include spotted knapweed, Canada bluegrass, and bladder campion. Deer trails and browse were noted throughout the dunes. Along the nearshore areas, concentrations of dead zebra mussel shells are potentially limiting vegetative establishment and growth.

Management Recommendations: The main management recommendation is to limit human traffic in the dunes by posting signs about the fragile nature of dune ecosystems. Portions of the complex occurring on private lands could be acquired or protected through conservation easements. Spotted knapweed, Canada bluegrass, and bladder campion should be removed now while they are confined to small portions of the occurrence and control efforts should be monitored.

Cable Bay open dunes. Photos by Joshua G. Cohen.



2014 aerial photograph of Cable Bay open dunes.

9. McCauley Point
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 30 acres
Element Occurrence Identification Number: 20737 (New EO)

Site Description: This small site is characterized by a low parabolic dune and a low foredune that occur along the northwestern shore of Beaver Island along McCauley Point. The soils are fine-textured, wind-blown, and wave-worked, alkaline (pH 8.0) sands. The parabolic dune and associated blowout are found in the central portion of the site. The blowout contains snags of ancient cedars indicating that the blowout occurs where there was a former forested dune. Low foredunes form a tail to the south and pockets of interdunal wetland and a gravel dune field that is punctuated by small dune mounds occur in the northern portion of the complex.

The ground cover of the open dunes is dominated by marram grass (*Ammophila breviligulata*) and sand reed grass (*Calamovilfa longifolia*). Marram grass is especially dominant along the blowout. Prevalent ground cover species include wormwood (*Artemisia campestris*), common milkweed (*Asclepias syriaca*), Pitcher's thistle (*Cirsium pitcheri*, state and federally threatened), beach pea (*Lathyrus japonicus*), Gillman's goldenrod (*Solidago simplex*), plains puccoon (*Lithospermum caroliniense*), wheat grass (*Elymus lanceolatus*), white camas (*Anticlea elegans*), harebell (*Campanula rotundifolia*), June grass (*Koeleria macrantha*), and little bluestem (*Schizachyrium scoparium*). The non-native bladder campion (*Silene vulgaris*) was noted locally within the open dunes. The low shrub layer ranges from 30 to 50% with prevalent low shrubs including bearberry (*Arctostaphylos uva-ursi*), common juniper (*Juniperus communis*), creeping juniper (*Juniperus horizontalis*), sand cherry (*Prunus pumila*), soapberry (*Shepherdia canadensis*), snowberry (*Symphoricarpus albus*), and silky dogwood (*Cornus amomum*) along with sapling balsam poplar (*Populus balsamifera*) and white spruce (*Picea glauca*). The understory is scattered (5-10%) with characteristic species including choke cherry (*Prunus virginiana*), northern white-cedar (*Thuja occidentalis*), balsam poplar, paper birch (*Betula papyrifera*), and blue-leaf willow (*Salix myricoides*). Infrequent scattered overstory trees include northern white-cedar, white pine (*Pinus strobus*), paper birch, and balsam fir (*Abies balsamea*) with canopy coverage ranging from 1 to 3%. Areas of low foredune are characterized by marram grass, wormwood, common evening-primrose (*Oenothera biennis*), common milkweed, Pitcher's thistle, and plains puccoon with scattered woody species including balsam poplar, silky dogwood, and sand cherry.

Threats: The primary threat to these dunes is posed by continued residential development and ensuing correlated anthropogenic impacts, especially dune erosion and devegetation caused by foot traffic. On the private portions of this complex, numerous houses occur on the margins of the dunes. Bare sand increases in areas near residences due to devegetation and erosion. Invasive species are locally common along the shoreline of Beaver Island and include spotted knapweed (*Centaurea stoebe*), Canada bluegrass (*Poa compressa*), and bladder campion, which was noted within this site.

Management Recommendations: The main management recommendations are to control invasive species and limit human traffic in the dunes by posting signs about the fragile nature of dune ecosystems. Portions of the complex occurring on private lands could be acquired or protected through conservation easements. Monitoring for invasive species should be implemented. Bladder campion should be removed now while it is confined to small portions of the occurrence and control efforts should be monitored.

McCauley Point open dunes. Photos by joshua G. Cohen (above) and Bill Parsons (below).

2014 aerial photograph of MacCauley Point open dunes.

10. McFadden Point
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 102 acres
Element Occurrence Identification Number: 10808 (EO update)

Site Description: This site is characterized by high parabolic dunes and a low foredune that occur along the western shore of Beaver Island. The soils are fine-textured, wind-blown and wave-worked, alkaline (pH 8.0) sands. The high parabolic dunes are found in the northern portion of the site with a steep foredune adjacent to the sand and gravel beach. Within this northern portion of the dune complex, the foredune is backed by a significant dune field characterized by an extensive area of gravel flats. Within the parabolic dunes, one of the more extensive blowouts or dune fingers is approximately 0.25 miles in length. An area with low foredunes forms a long tail to the south and is adjacent to limestone cobble shore. Houses are scattered throughout the forested dunes just behind the low foredunes.

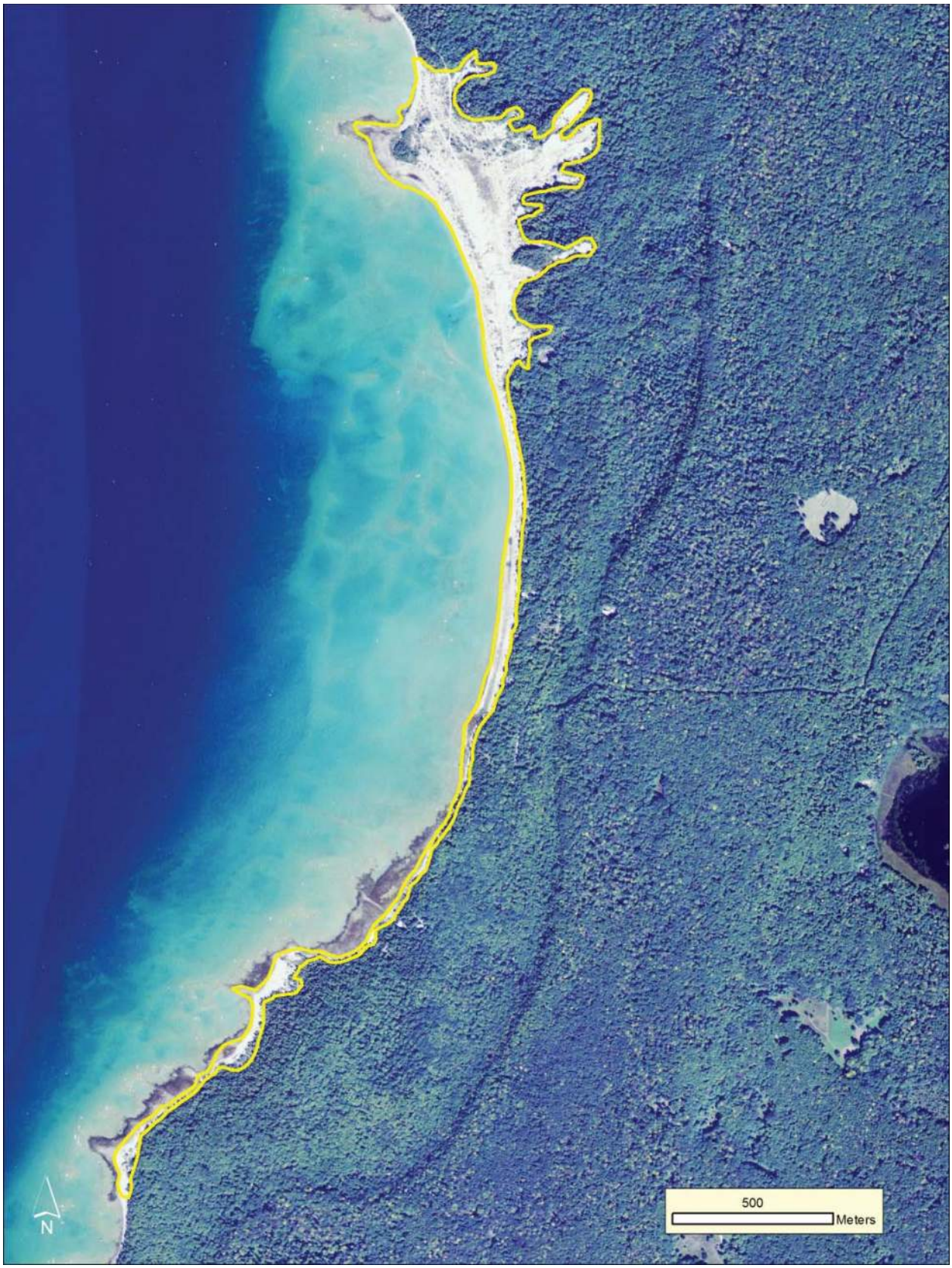
Marram grass (*Ammophila breviligulata*), sand reed grass (*Calamovilfa longifolia*), and little bluestem (*Schizachyrium scoparium*) are prevalent on the dunes. Characteristic herbaceous species include beach pea (*Lathyrus japonicus*), Pitcher's thistle (*Cirsium pitcheri*, state and federally threatened), wormwood (*Artemisia campestris*), white camas (*Anticlea elegans*), plains puccoon (*Lithospermum caroliniense*), harebell (*Campanula rotundifolia*), common horsetail (*Equisetum arvense*), Gillman's goldenrod (*Solidago simplex*), and common milkweed (*Asclepias syriaca*). Lake Huron tansy (*Tanacetum bipinnatum*, state special concern) is uncommon but concentrated in areas of low foredune. Dune fields and back dunes support scattered patches of bearberry (*Arctostaphylos uva-ursi*) and common juniper (*Juniperus communis*). Additional low shrubs include sand cherry (*Prunus pumila*), shrubby cinquefoil (*Dasiphora fruticosa*), creeping juniper (*Juniperus horizontalis*), and soapberry (*Shepherdia canadensis*). Scattered (5-10%) understory species include balsam poplar (*Populus balsamifera*), paper birch (*Betula papyrifera*), balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), northern white-cedar (*Thuja occidentalis*), white pine (*Pinus strobus*), sandbar willow (*Salix exigua*), sand-dune willow (*S. cordata*), choke cherry (*Prunus virginiana*), and silky dogwood (*Cornus amomum*). Infrequent, scattered overstory trees include northern white-cedar, paper birch, white pine, white spruce, balsam fir, and balsam poplar. An 18 cm red pine (*Pinus resinosa*) was cored and estimated to be 25 years old.

Threats: The primary threat to these dunes is posed by continued residential development and ensuing correlated anthropogenic impacts, especially dune erosion and devegetation caused by foot traffic and off-road vehicle impacts. Spotted knapweed (*Centaurea maculosa*) was noted along portions of the low dunes but is currently uncommon and has not yet impacted species composition and structure.

Management Recommendations: It is imperative to eliminate off-road vehicle traffic along the beach and limit human traffic in the parabolic dunes. Posting signs about the fragile nature of dune ecosystems may help reduce vehicular and foot traffice. Portions of the complex occurring on private lands, especially the areas of parabolic dunes in the northern end of the site, could be acquired or protected through conservation easements. Spotted knapweed should be removed now while it is confined to small portions of the occurrence and control efforts should be monitored.

McFadden Point open dunes. Photos by Joshua G. Cohen.

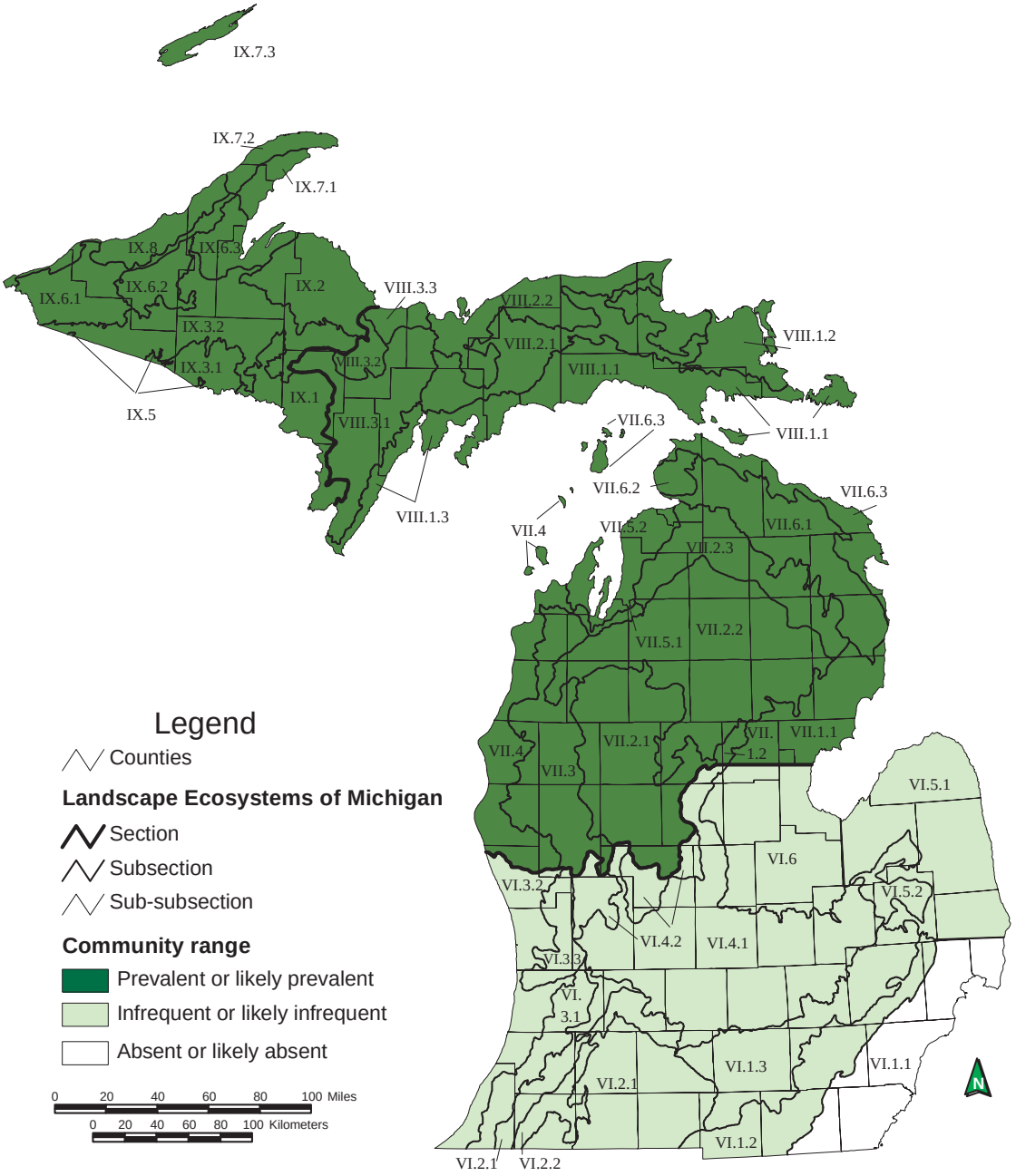
McFadden Point open dunes. Photos by Bill Parsons.



2014 aerial photograph of McFadden Point open dunes.

POOR CONIFER SWAMP

Overview: Poor conifer swamp is a nutrient-poor forested peatland that occurs most commonly in the Upper Peninsula and northern Lower Peninsula and infrequently in the southern Lower Peninsula. Poor conifer swamp develops on extremely acidic, saturated peat in depressions on glacial outwash plains, moraines, and sandy glacial lakeplains, and within kettles on pitted outwash plains and ice-contact topography. Natural processes that influence species composition and community structure include windthrow, flooding by beaver, insect outbreaks, peat accumulation, and occasional fires. The community is characterized by the prevalence of coniferous trees, ericaceous shrubs, and sphagnum mosses (Kost et al. 2007, Cohen et al. 2014).



Map 7. Distribution of poor conifer swamp in Michigan (Albert et al. 2008).

10. Greene's Lake Swamp
Natural Community Type: Poor Conifer Swamp
Rank: G4 S4, apparently secure globally and within the state
Element Occurrence Rank: AB
Size: 121 acres
Element Occurrence Identification Number: 20688 (New EO)

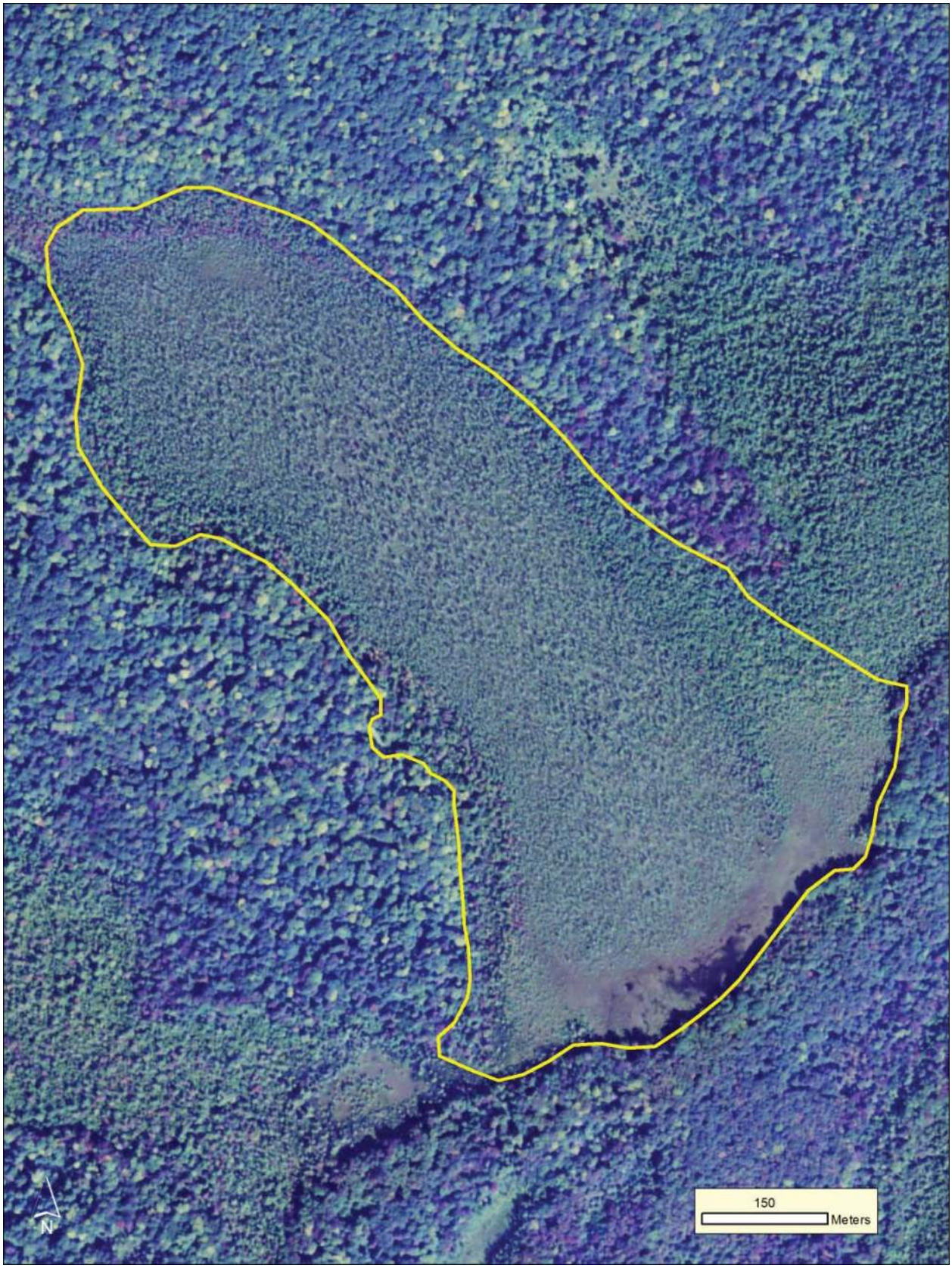
Site Description: This poor conifer swamp is part of large peatland complex associated with Greene's Lake. Poor conifer swamp, rich conifer swamp, and bog occupy a former lake basin associated with Greene's Lake. This peatland formed through lake filling or terrestrialization. The bog occurs just south of Greene's Lake and transitions to poor conifer swamp in the central lobe of the basin to the south. The two lobes flanking this central lobe are minerotrophic and dominated by rich conifer swamp. Sphagnum hummock and hollow microtopography and animal trails generate fine-scale gradients in soil moisture and soil chemistry, which contribute to floristic diversity. Where the poor conifer swamp narrows and along the swamp margins there is a shift in species composition due to the minerotrophic influence of groundwater seepage from the adjacent upland. The peatland experiences significant water level fluctuations, indicated by the pronounced hummock-hollow microtopography and depth of late spring inundation in the hollows. The fine-textured and apparently clay-rich till landform likely impedes drainage, resulting in significant increases in water level in the wetland basin during wet periods. The complex drains to the southeast. A 13.1 cm black spruce (*Picea mariana*) was cored and estimated to be 112 years old. A 19.3 cm tamarack (*Larix laricina*) was cored and estimated to be 65 years old with fast growth for the first 35 years. The soils of the poor conifer swamp are characterized as deep (> 1 meter), acidic (pH 4.5) fibric to hemic peats.

The canopy is dominated by tamarack and black spruce with scattered white pine (*Pinus strobus*). Canopy trees typically range in DBH from 10 to 20 cm DBH and 20 to 40 ft in height with canopy closure ranging from 50 to 60%. Characteristic understory species include scattered (20-40%) sapling black spruce and tamarack. Ericaceous species dominate the dense (80-95%) low shrub layer with leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), Labrador tea (*Rhododendron groenlandicum*), bog rosemary (*Andromeda glaucophylla*), Canada blueberry (*Vaccinium myrtilloides*), and stunted black spruce. Characteristic ground cover species include cottongrasses (*Eriophorum* spp.), small cranberry (*Vaccinium oxycoccos*), pitcher-plant (*Sarracenia purpurea*), creeping snowberry (*Gaultheria hispidula*), and false mayflower (*Maianthemum trifolium*). The swamp is characterized by a sphagnum carpet and well-developed sphagnum hummock and hollow microtopography. Along the margins and in the narrows of the swamp where groundwater influence is evident, floristic diversity increases and minerotrophic indicators are prevalent including winterberry (*Ilex verticillata*), mountain holly (*I. mucronata*), red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*). Ground cover species in this zone include lake sedge (*Carex lacustris*), royal fern (*Osmunda regalis*), and mad-dog skullcap (*Scutellaria lateriflora*). The bog margin along the southern edge of the swamp is characterized by leatherleaf, twig-rush (*Dulichium arundinaceum*), and native reed (*Phragmites australis* subsp. *americanus*).

Threats: Species composition and vegetative structure are patterned by natural processes. No current threats were observed during the course of the survey.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the poor conifer swamp. Monitor for invasive species.

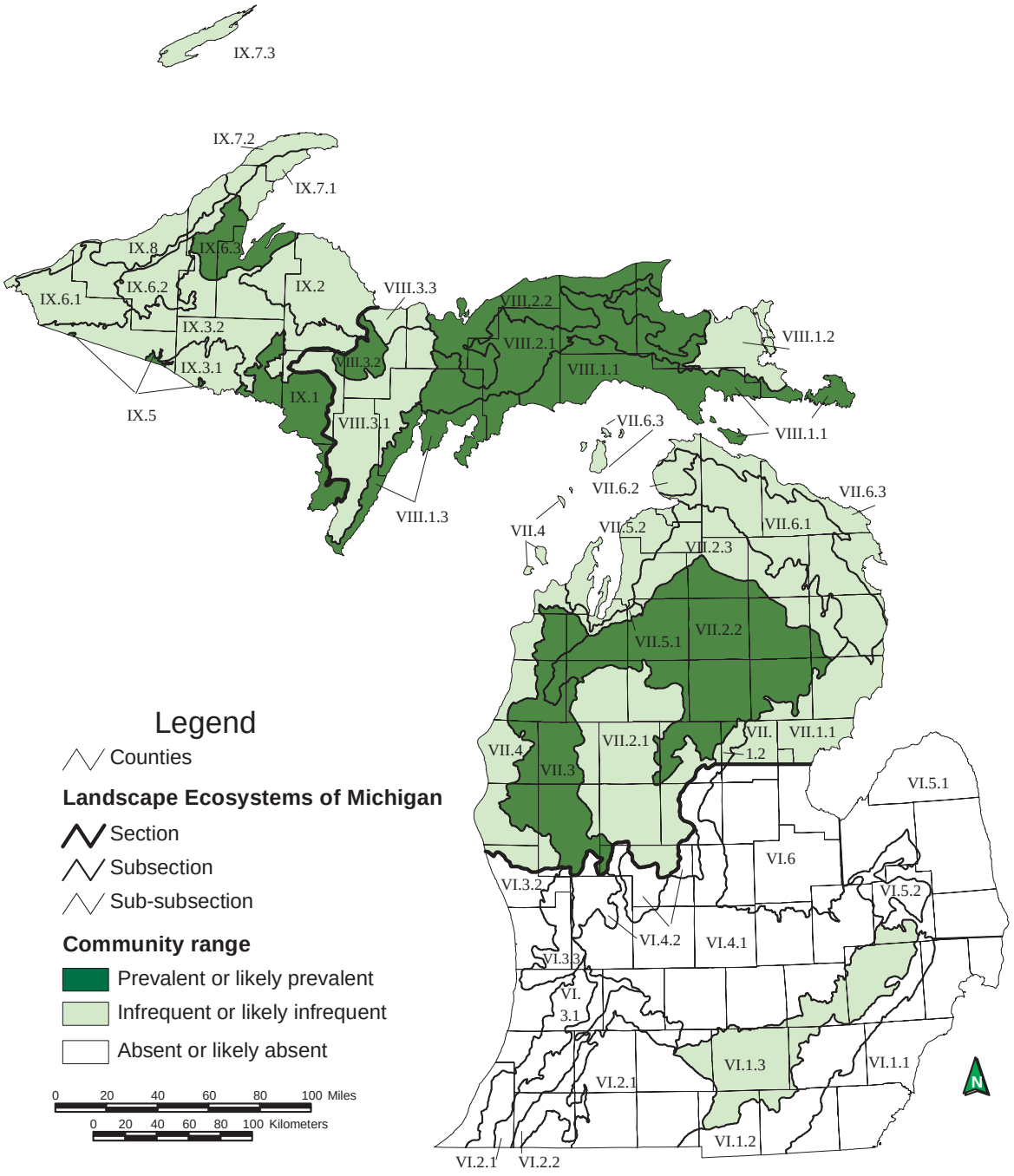
Greene's Lake Swamp poor conifer swamp. Photos by Bill Parsons (above) and Joshua G. Cohen (below).



2014 aerial photograph of Greene's Lake Swamp poor conifer swamp.

POOR FEN

Overview: Poor fen is a wetland dominated by sedges, shrubs, and stunted conifers, and moderately influenced by groundwater. The community occurs within kettle depressions in outwash plains and moraines, and in mild depressions on glacial outwash plains and glacial lakeplain primarily in the Upper Peninsula and northern Lower Peninsula and rarely in the southern Lower Peninsula. Poor fen typically develops on slightly acidic to strongly acidic peat. Natural processes that influence species composition and community structure include groundwater seepage and lateral flow, peat accumulation, flooding by beaver, insect outbreaks, and occasional fires (Kost et al. 2007, Cohen et al. 2014).



Map 8. Distribution of poor fen in Michigan (Albert et al. 2008).

11. Egg Lake
Natural Community Type: Poor Fen
Rank: G3 S3, rare globally and within the state
Element Occurrence Rank: B
Size: 40 acres
Element Occurrence Identification Number: 2988 (EO Update)

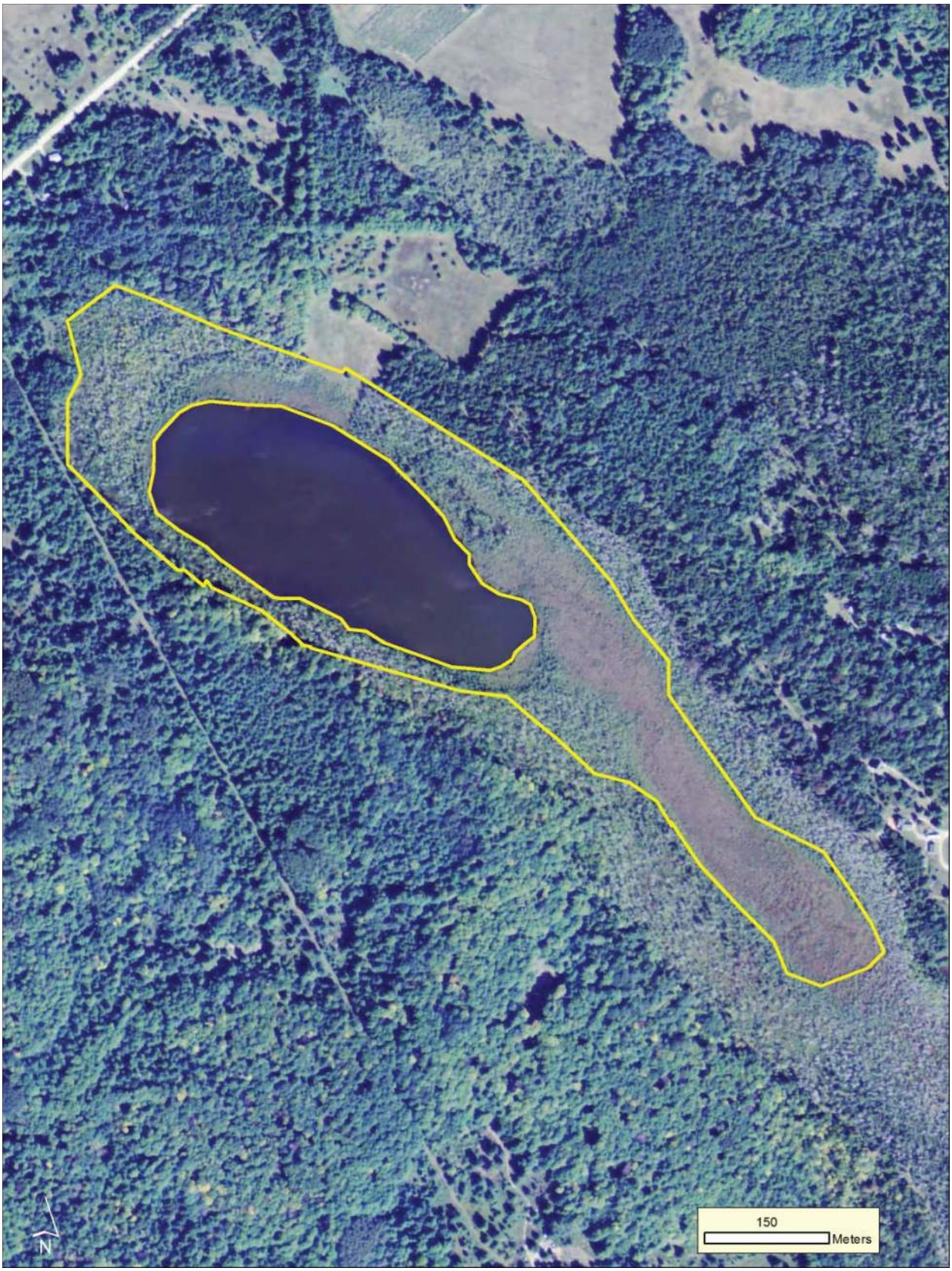
Site Description: This open peatland system occurs on a poorly drained flat lakeplain with saturated and inundated sphagnum and sedge peats that range from weakly minerotrophic to ombrotrophic. Groundwater influence creates weakly minerotrophic conditions along the peatland margin. A peat sample from the minerotrophic peatland margin was > 1 meter and slightly acidic throughout the profile (pH 6.5-6.8). A peat sample from the central portion of the fen was also > 1 meter in depth but was more acidic with very strongly acidic conditions found on the sphagnum hummocks (pH 4.5) and the peat throughout the rest of the profile being strongly acidic (pH 5.5). On areas of floating mat, peat depths were observed to be 50 cm over water. Fine-scale gradients in soil moisture and chemistry are also generated by sphagnum hummock and hollow development. These gradients in soil and water chemistry generate high floristic diversity (over 60 species were noted during the 2006 survey) and complex ecological zonation.

The graminoid dominated portions of fen are dominated by twig-rush (*Cladium mariscoides*), sedges (*Carex lasiocarpa*, *C. sterilis*, and *C. limosa*), white beak-rush (*Rhynchospora alba*), and golden-seeded spike-rush (*Eleocharis elliptica*). Characteristic ground cover species include pitcher-plant (*Sarracenia purpurea*), marsh fern (*Thelypteris palustris*), dwarf raspberry (*Rubus pubescens*), cranberries (*Vaccinium* spp.), rose pogonia (*Pogonia ophioglossoides*), marsh cinquefoil (*Comarum palustre*), bog buckbean (*Menyanthes trifoliate*), cottongrasses (*Eriophorum* spp.), round-leaved sundew (*Drosera rotundifolia*), false asphodel (*Triantha glutinosa*), bog goldenrod (*Solidago uliginosa*), horned bladderwort (*Utricularia cornuta*), and bluejoint grass (*Calamagrostis canadensis*). The fen is characterized by clumps of ericaceous shrubs including leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), Labrador tea (*Rhododendron groenlandicum*), and bog rosemary (*Andromeda glaucophylla*). Additional shrubs include alder-leaved buckthorn (*Rhamnus alnifolia*), sweet gale (*Myrica gale*), Canada blueberry (*Vaccinium myrtilloides*), bog willow (*Salix pedicellaris*), and huckleberry (*Gaylussacia baccata*). Sweet gale is prevalent along the margin of Egg Lake. Tree saplings and understory shrubs occur scattered throughout the fen and include tamarack (*Larix laricina*), black spruce (*Picea mariana*), northern white-cedar (*Thuja occidentalis*), red maple (*Acer rubrum*), winterberry (*Ilex verticillata*), mountain holly (*I. mucronata*), and black chokeberry (*Aronia prunifolia*). Shrub and tree cover increases with proximity to the upland margin where the groundwater influence is more prevalent.

Threats: The species composition and structure of the fen is patterned by natural processes. Reed canary grass (*Phalaris arundinacea*) was observed locally along the lake margin. However, this species is currently not altering the hydrology or reducing species diversity. The site contains several private inholdings that could be developed in the future.

Management Recommendations: The main management recommendation is to allow natural processes to operate unhindered. Adjacent forest and swamp should be left uncut. Maintaining a forested buffer surrounding the poor fen will help ensure the stability of the fen's hydrologic regime. The population of reed canary grass should be monitored and controlled if necessary. Portions of the wetland complex occurring on private lands could be acquired or protected through conservation easements.

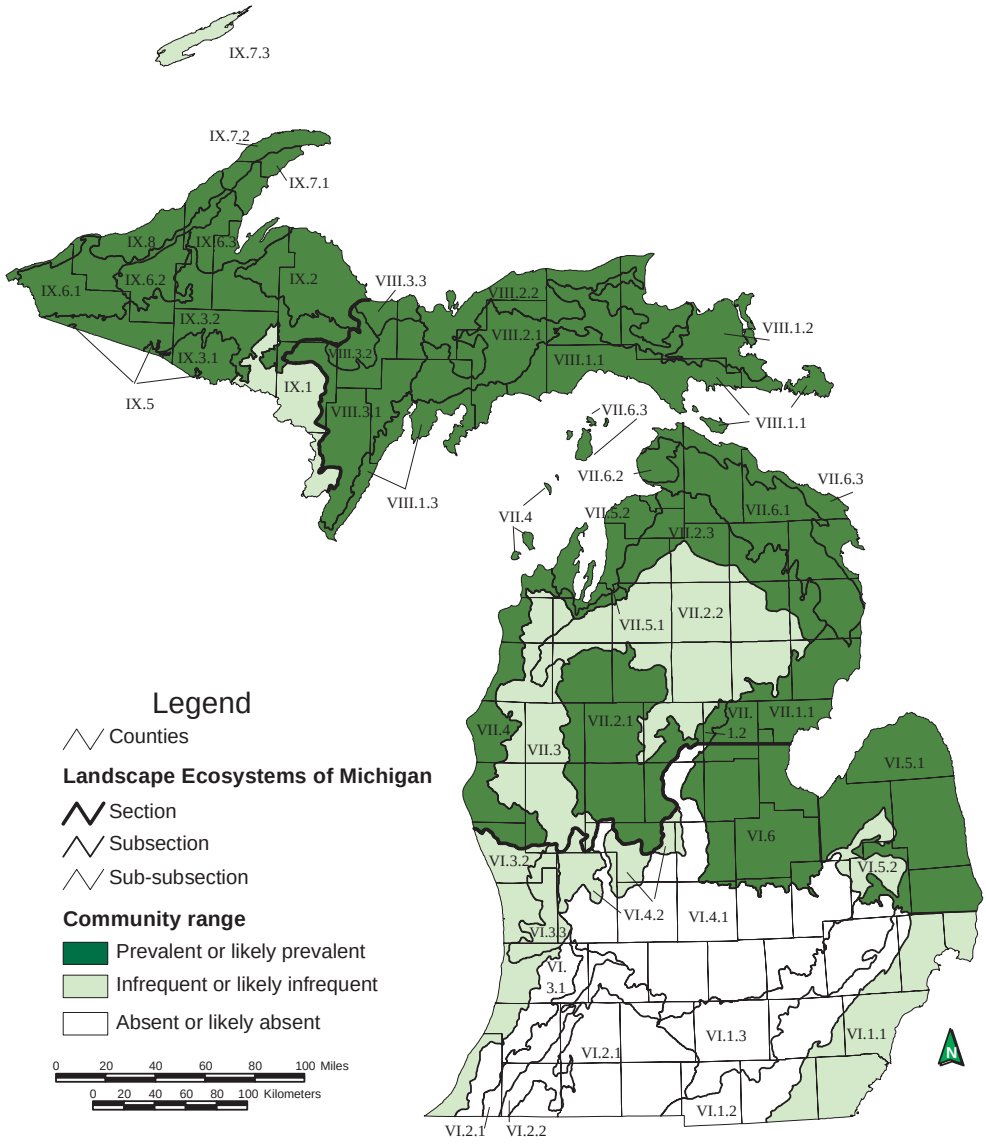
Egg Lake poor fen. Photos by Joshua G. Cohen.



2014 aerial photograph of Egg Lake poor fen.

RICH CONIFER SWAMP

Overview: Rich conifer swamp is a groundwater-influenced, minerotrophic, forested wetland dominated by northern white-cedar (*Thuja occidentalis*) that occurs on organic soils (i.e., peat) primarily north of the climatic tension zone in the northern Lower and Upper Peninsulas. Rich conifer swamp occurs in outwash channels, outwash plains, glacial lakeplains, and in depressions on coarse- to medium-textured ground moraines. It is common in outwash channels of drumlin fields and where groundwater seeps occur at the bases of moraines. Rich conifer swamp typically occurs in association with lakes and cold, groundwater-fed streams. It also occurs along the Great Lakes shoreline in old abandoned embayments and in swales between former beach ridges where it may be part of a wooded dune and swale complex. Windthrow is common, especially on broad, poorly drained sites. Fire was historically infrequent. Rich conifer swamp is characterized by diverse microtopography and ground cover. The community is also referred to as cedar swamp (Kost et al. 2007, Cohen et al. 2014).



Map 9. Distribution of rich conifer swamp in Michigan (Albert et al. 2008).

12. Doty's Swamp
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: C
Size: 82 acres
Element Occurrence Identification Number: 20690 (New EO)

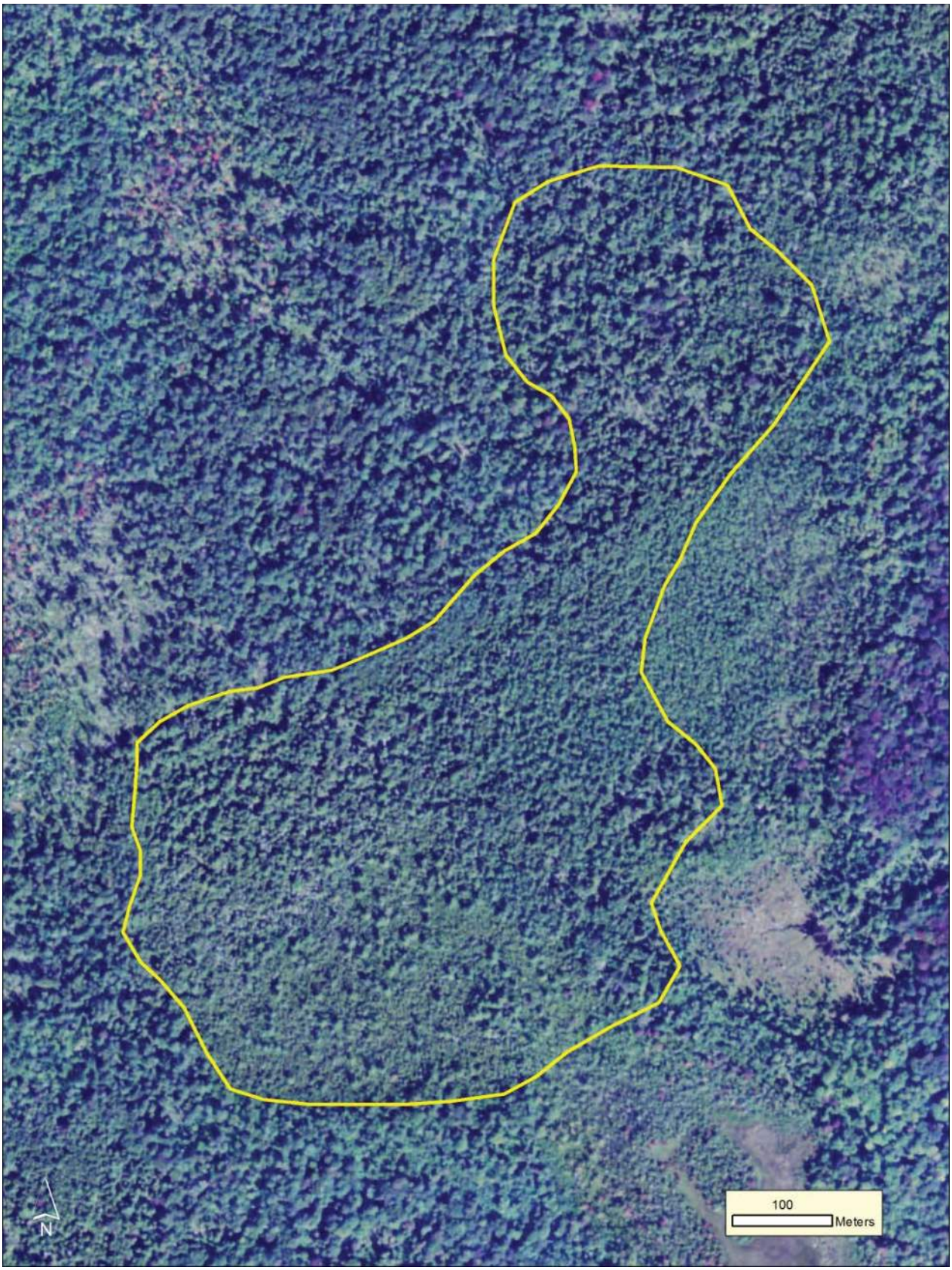
Site Description: Rich conifer swamp is part of large swamp complex northwest of Lake Geneserath. This young swamp likely established following a wildfire. Charcoal was observed within the soil profile. A 30.1 cm northern white-cedar (*Thuja occidentalis*) was cored and estimated to be 108 years old. The soils of the rich conifer swamp are shallow (10-30 cm), slightly acidic (pH 6.5) hemic to sapric peats over wet, medium-textured sands that are slighty acidic to circumneutral (pH 6.8-7.0). Sphagnum hummock and hollow microtopography is developing locally. Windthrow is prevalent throughout the swamp with numerous areas of heavy blowdown.

The canopy is dominated by northern white-cedar and locally by tamarack (*Larix laricina*). Canopy associates throughout the swamp include paper birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), black ash (*Fraxinus nigra*), black spruce (*Picea mariana*), hemlock (*Tsuga canadensis*), and white pine (*Pinus strobus*). Canopy trees typically range in DBH from 20 to 40 cm. Characteristic understory species include balsam fir (*Abies balsamea*), mountain maple (*Acer spicatum*), winterberry (*Ilex verticillata*), and black ash (*Fraxinus nigra*). Common species in the low shrub layer include alder-leaved buckthorn (*Rhamnus alnifolia*), Labrador tea (*Rhododendron groenlandicum*), Canadian fly honeysuckle (*Lonicera canadensis*), and swamp fly honeysuckle (*L. oblongifolia*). Characteristic ground cover species include sedges (*Carex trisperma, C. disperma,* and *C. flava*), starflower (*Trientalis borealis*), wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), goldthread (*Coptis trifolia*), dwarf raspberry (*Rubus pubescens*), bunchberry (*Cornus canadensis*), blue-bead lily (*Clintonia borealis*), oak fern (*Gymnocarpium dryopteris*), naked miterwort (*Mitela nuda*), creeping snowberry (*Gaultheria hispidula*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), and dwarf scouring rush (*Equisetum scirpoides*). Areas with a more open canopy dominated by tamarack have a more prevalent graminoid component in the ground cover.

Threats: Species composition and vegetative structure are patterned by natural processes and also influenced by deer browse pressure. Deer browse pressure is likely limiting cedar regeneration and impacting floristic composition and vegetative structure.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the swamp. Reducing local deer densities in the surrounding landscape would help reduce deer browse pressure. Monitor for invasive species and deer browse.

Doty's Swamp rich conifer swamp. Photos by Joshua G. Cohen.



2014 aerial photograph of Doty's Swamp rich conifer swamp.

13. Greene's Lake Swamp
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 93 acres
Element Occurrence Identification Number: 20689 (New EO)

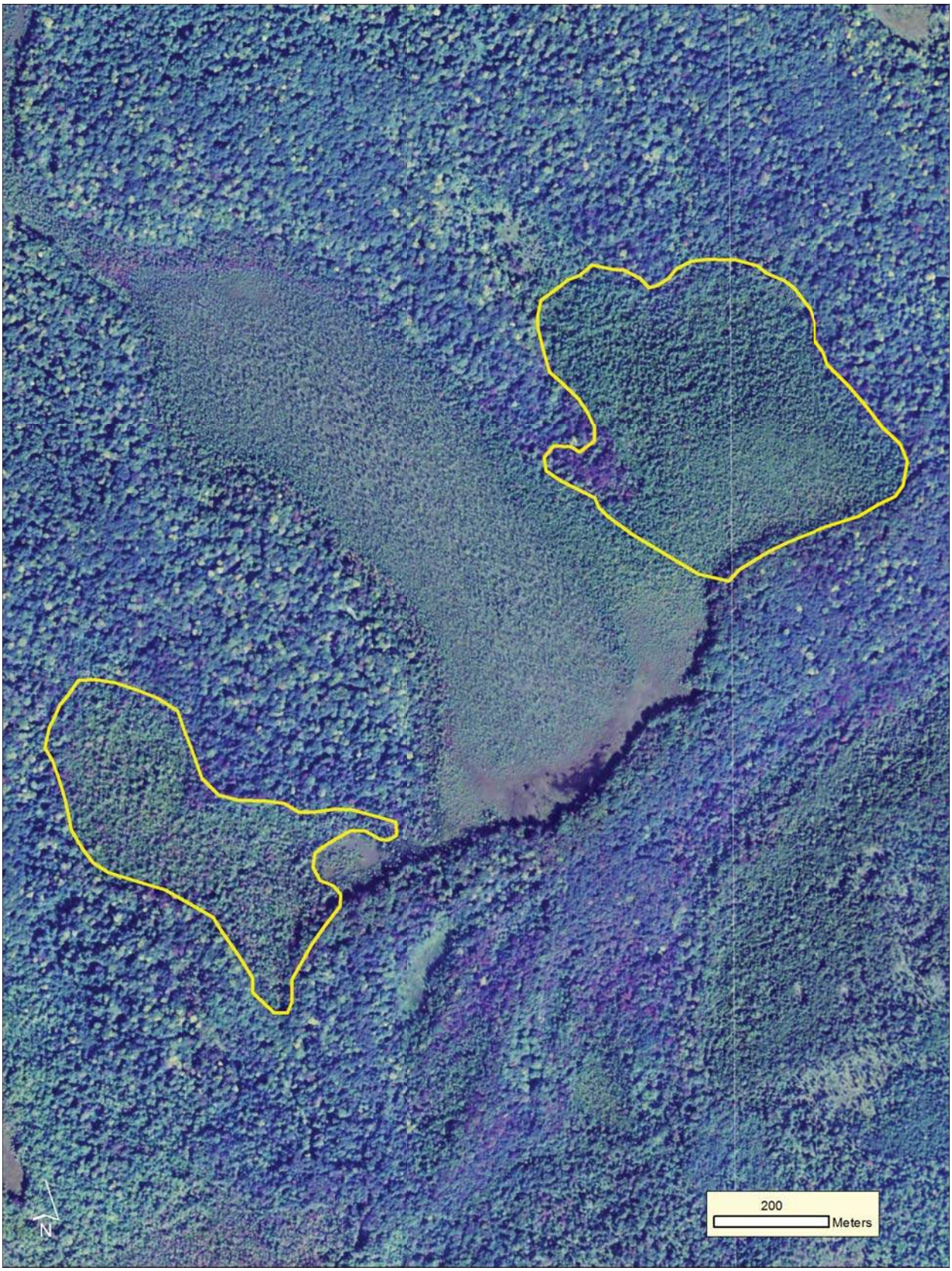
Site Description: This rich conifer swamp is part of large peatland complex associated with Greene's Lake. Rich conifer swamp, poor conifer swamp, and bog occupy the former lake basin associated with Greene's Lake. This peatland formed through lake filling or terrestrialization. The nearby bog occurs just south of Greene's Lake and transitions to poor conifer swamp in the central lobe of basin. The two lobes flanking this central lobe are minerotrophic and dominated by this rich conifer swamp. Sphagnum hummock and hollow microtopography and animal trails generate fine-scale gradients in soil moisture and soil chemistry, which contribute to floristic diversity. The peatland experiences significant water level fluctuations, indicated by the pronounced hummock-hollow microtopography and depth of late spring inundation in the hollows. The fine-textured and apparently clay-rich till landform likely impedes drainage, resulting in significant increases in water level in the wetland basin during wet periods. The complex drains to the southeast. A 32 cm northern white-cedar (*Thuja occidentalis*) was cored and estimated to be 180 years old and a 16.5 cm northern white-cedar was cored and estimated to be 159 years old. Based on the high number of deer trails, scat, and evidence of winter browse, this portion of the swamp is likely used as a winter deer yard. Beaver activity was noted to the north of the rich conifer swamp and beaver have likely impacted the peatland complex. The soils of the rich conifer swamp are characterized as deep (> 1 meter), slightly acidic to circumneutral (pH 6.8-7.0) peat.

The canopy of the rich conifer swamp is dominated by northern white-cedar and locally by tamarack (*Larix laricina*). Tamarack tends to dominate in wetter portions of the swamp where the canopy is more open. Canopy associates throughout the swamp include black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), and black spruce (*Picea mariana*). Canopy trees typically range in DBH from 10 to 30 cm with canopy closure ranging from 50 to 85%. Characteristic understory species include scattered (10-30%) sapling balsam fir (*Abies balsamea*) and black ash with winterberry (*Ilex verticillata*) occurring locally. Common species in the low shrub layer include alder-leaved buckthorn (*Rhamnus alnifolia*) and Labrador tea (*Rhododendron groenlandicum*) with balsam fir and black ash. Characteristic ground cover species include sedges (*Carex trisperma, C. disperma*, and *C. stricta*), starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), dwarf raspberry (*Rubus pubescens*), bunchberry (*Cornus canadensis*), creeping snowberry (*Gaultheria hispidula*), royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), skunk-cabbage (*Symplocarpus foetidus*), false mayflower (*Maianthemum trifolium*), northern bugle weed (*Lycopus uniflorus*), Jack-in-the-pulpit (*Arisaema triphyllum*), gay-wings (*Polygala paucifolia*), and bulblet fern (*Cystopteris bulbifera*). Sphagnum hummock and hollow microtopography is localized. Areas with a more open canopy dominated by tamarack have a more prevalent graminoid component in the ground cover.

Threats: Species composition and vegetative structure are patterned by natural processes and also influenced by deer browse pressure. The rich conifer swamp is likely used as a deer yard. Deer trails and deer browse were noted throughout the swamp. Deer browse pressure is likely limiting cedar regeneration and impacting floristic composition and vegetative structure. Scattered cut stumps in the rich conifer swamp indicate that the site was historically logged.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the swamp. Reducing local deer densities throughout the landscape would help reduce deer browse pressure. Monitor for invasive species and deer browse.

Greene's Lake Swamp rich conifer swamp. Photos by Joshua G. Cohen.



2014 aerial photograph of Greene's Lake Swamp rich conifer swamp.

14. Little Sand Bay
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: C
Size: 17 acres
Element Occurrence Identification Number: 20692 (New EO)

Site Description: This rich conifer swamp occurs along with boreal forest along the northeastern shoreline of Beaver Island adjacent to Little Sand Bay. The rich conifer swamp occurs inland from a sandy bay that supports interdunal wetland and a low foredune with open dunes vegetation. To the north of the rich conifer swamp is a small pocket of boreal forest. Immediately adjacent to the rich conifer swamp to the east is a narrow forested swale that has been flooded by beaver and as a result the canopy of northern white-cedars (*Thuja occidentalis*) is flood-killed. Inland from the rich conifer swamp is managed northern hardwoods. Fine-scale gradients in hydrology and soils make mapping this rich conifer swamp and the adjacent boreal forest precisely difficult. Windthrow is prevalent throughout the forested wetland, and as a result, the rich conifer swamp is characterized by high levels of coarse woody debris and uneven-aged stand patterning at multiple scales. Large areas of blowdown occur throughout the swamp as do small-scale windthrow gaps. A 42 cm northern white-cedar was cored and estimated to be 135 years old. Beaver sign and deer browse occur throughout. The soils of the rich conifer swamp are characterized by shallow (20-50 cm), slightly acidic to circumneutral (pH 6.8-7.0) peats over circumneutral (pH 7.0) sands.

The canopy is dominated by northern white-cedar with canopy associates including paper birch (*Betula papyrifera*), red maple (*Acer rubrum*), white spruce (*Picea glauca*), and tamarack (*Larix laricina*). Canopy trees typically range in DBH from 15 to 40 cm with some localized areas with larger northern white-cedar (> 50 cm). Characteristic understory species include balsam fir (*Abies balsamea*) and mountain maple (*Acer spicatum*). Common species in the low shrub layer include balsam fir, black ash (*Fraxinus nigra*), and green ash (*F. pennsylvanica*). Characteristic ground cover species include dwarf raspberry (*Rubus pubescens*), creeping snowberry (*Gaultheria hispidula*), twinflower (*Linnaea borealis*), starflower (*Trientalis borealis*), bunchberry (*Cornus canadensis*), sedge (*Carex pedunculata*), wild sarsaparilla (*Aralia nudicaulis*), oak fern (*Gymnocarpium dryopteris*), skunk-cabbage (*Symplocarpus foetidus*), Canada mayflower (*Maianthemum canadense*), royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), false mayflower (*Maianthemum trifolium*), northern bugle weed (*Lycopus uniflorus*), Jack-in-the-pulpit (*Arisaema triphyllum*), gay-wings (*Polygala paucifolia*), bulblet fern (*Cystopteris bulbifera*), blue-bead lily (*Clintonia borealis*), goldthread (*Coptis trifolia*), cinnamon fern (*Osmunda cinnamomea*), wild blue flag (*Iris versicolor*), and small enchanter's-nightshade (*Circaea alpina*).

Threats: Species composition and vegetative structure are patterned by natural processes but have been influenced by past logging, deer herbivory, and beaver flooding. Deer browse and cut stumps were noted throughout.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the swamp. Reducing local deer densities throughout the landscape would help reduce deer browse pressure. Monitor for invasive species and deer browse.

Little Sand Bay rich conifer swamp. Photo by Joshua G. Cohen.

2014 aerial photograph of Little Sand Bay rich conifer swamp.

STEWARDSHIP PRIORITIZATION RESULTS

The stewardship scores for each natural community element occurrence are presented in Table 2. We sorted the element occurrences by their stewardship prioritization scores and assigned them a high (red), medium (yellow), or low (blue) stewardship priority. During the course of the 2016 surveys, invasive species were noted to be most common within the open dune ecosystems. Open dunes are also negatively impacted by erosion from foot traffic and off-road vehicle activity. Within the interior of the island, the most notable threat to ecosystems is high deer browse pressure. Deer herbivory has negatively impacted the floristic composition and vegetative structure of forested uplands and lowlands with the mesic northern forests, boreal forests, and rich conifer swamps significantly altered. High priority stewardship sites on Beaver Island included the highest quality open dunes and mesic northern forest occurrences. Low priority sites include more common natural community types (e.g., bog and poor conifer swamp) that occur within the interior of the island and do not currently have threats that jeopardize their ecological integrity.

Table 2. Stewardship prioritization for natural community element occurrences on Beaver Island. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Surveysite	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
530	Open Dunes	Cable Bay	C	G3	3.00	S3	3.00	3.00	3.00	4.00	10.00
20737	Open Dunes	McCauley Point	C	G3	3.00	S3	3.00	3.00	3.00	4.00	10.00
9292	Open Dunes	Iron Ore Bay	C	G3	3.00	S3	3.00	3.00	3.00	4.00	10.00
10808	Open Dunes	McFadden Point	C	G3	3.00	S3	3.00	3.00	3.00	4.00	10.00
5002	Open Dunes	Sand Bay	C	G3	3.00	S3	3.00	3.00	3.00	4.00	10.00
626	Mesic Northern Forest	Martin's Bluff	BC	G4	2.00	S3	3.00	2.50	3.50	4.00	10.00
10493	Mesic Northern Forest	Southwest Old Growth	BC	G4	2.00	S3	3.00	2.50	3.50	4.00	10.00
6089	Interdunal Wetland	Little Sand Bay	BC	G2?	4.00	S2	4.00	4.00	3.50	2.00	9.50
6701	Open Dunes	Lookout Point	CD	G3	3.00	S3	3.00	3.00	2.50	4.00	9.50
6311	Boreal Forest	French Bay	B	GU	3.00	S3	3.00	3.00	4.00	2.00	9.00
9328	Mesic Northern Forest	Font Lake Old Growth	CD	G4	2.00	S3	3.00	2.50	2.50	4.00	9.00
4742	Mesic Northern Forest	Lake Genesereth Old Growht	CD	G4	2.00	S3	3.00	2.50	2.50	4.00	9.00
9259	Dry-mesic Northern Forest	Pointe La Par	B	G4	2.00	S3	3.00	2.50	4.00	2.00	8.50
20689	Rich Conifer Swamp	Greene's Lake Swamp	BC	G4	2.00	S3	3.00	3.00	3.50	2.00	8.50
2437	Boreal Forest	Little Sand Bay	C	GU	3.00	S3	3.00	3.00	3.00	2.00	8.00
2988	Poor Fen	Egg Lake	B	G3	3.00	S3	3.00	3.00	4.00	1.00	8.00
20690	Rich Conifer Swamp	Doty's Swamp	C	G4	2.00	S3	3.00	3.00	3.00	2.00	8.00
20692	Rich Conifer Swamp	Little Sand Bay	C	G4	2.00	S3	3.00	3.00	3.00	2.00	8.00
20688	Poor Conifer Swamp	Greene's Lake Swamp	AB	G4	2.00	S4	2.00	2.00	4.50	1.00	7.50
20442	Bog	Greene's Lake	AB	G3G5	1.50	S4	2.00	1.75	4.50	1.00	7.25
12097	Bog	Fox Lake Bog	AB	G3G5	1.50	S4	2.00	1.75	4.50	1.00	7.25

Control of invasive species in open dune ecosystems and deer browse pressure in forested ecosystems are the highest stewardship priorities on Beaver Island. McFadden Point open dunes pictured above and Southwest Old Growth mesic northern forest pictured below. Photos by Joshua G. Cohen.

DISCUSSION

This report provides site-based assessments of 15 natural community element occurrences within Beaver Island that occur on state land. Threats, management needs, and restoration opportunities specific to each individual site have been discussed. The baseline information presented in the current report provides resource managers with an ecological foundation for prescribing site-level biodiversity stewardship, monitoring these management activities, and implementing landscape-level biodiversity planning to prioritize management efforts. The framework for prioritizing stewardship and monitoring efforts across sites across the island will help facilitate difficult decisions regarding the distribution of finite stewardship resources for site-based management.

The framework for stewardship and monitoring prioritization presented in this report offers a method for targeting biodiversity management and monitoring on the island. This method could be refined to suit the specific and local needs of resource agencies. This stewardship prioritization could also be refined within broader ecological or political regions such as ecological subsection, county, or the entire Beaver Island Archipelago. In addition, the stewardship priority scores could be sorted by natural community type. Furthermore, other indices could be incorporated into the stewardship prioritization matrix. Additional indices to consider incorporating include indices that measure or score the potential for management success of a site, the presence of rare species, and the functionality of the landscape surrounding the site. Implementation of stewardship efforts within prioritized areas will need to be followed by monitoring to gauge the success of biodiversity management efforts and refine future stewardship prioritization efforts.

Southwest Old Growth mesic northern forest.
Photo by Joshua G. Cohen.

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Egg Lake poor fen. Photo by Bill Parsons.

Appendix 1. Global and state element ranking criteria.

GLOBAL RANKS

G1 = critically imperiled: at very high risk of extinction due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.

G2 = imperiled: at high risk of extinction due to very restricted range, very few occurrences (often 20 or fewer), steep declines, or other factors.

G3 = vulnerable: at moderate risk of extinction due to a restricted range, relatively few occurrences (often 80 or fewer), recent and widespread declines, or other factors.

G4 = apparently secure: uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 = secure: common; widespread.

GU = currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

GX = eliminated: eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.

G? = incomplete data.

STATE RANKS

S1 = critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.

S2 = imperiled in the state because of rarity due to very restricted range, very few occurrences (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

S3 = vulnerable in the state due to a restricted range, relatively few occurrences (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 = uncommon but not rare; some cause for long-term concern due to declines or other factors.

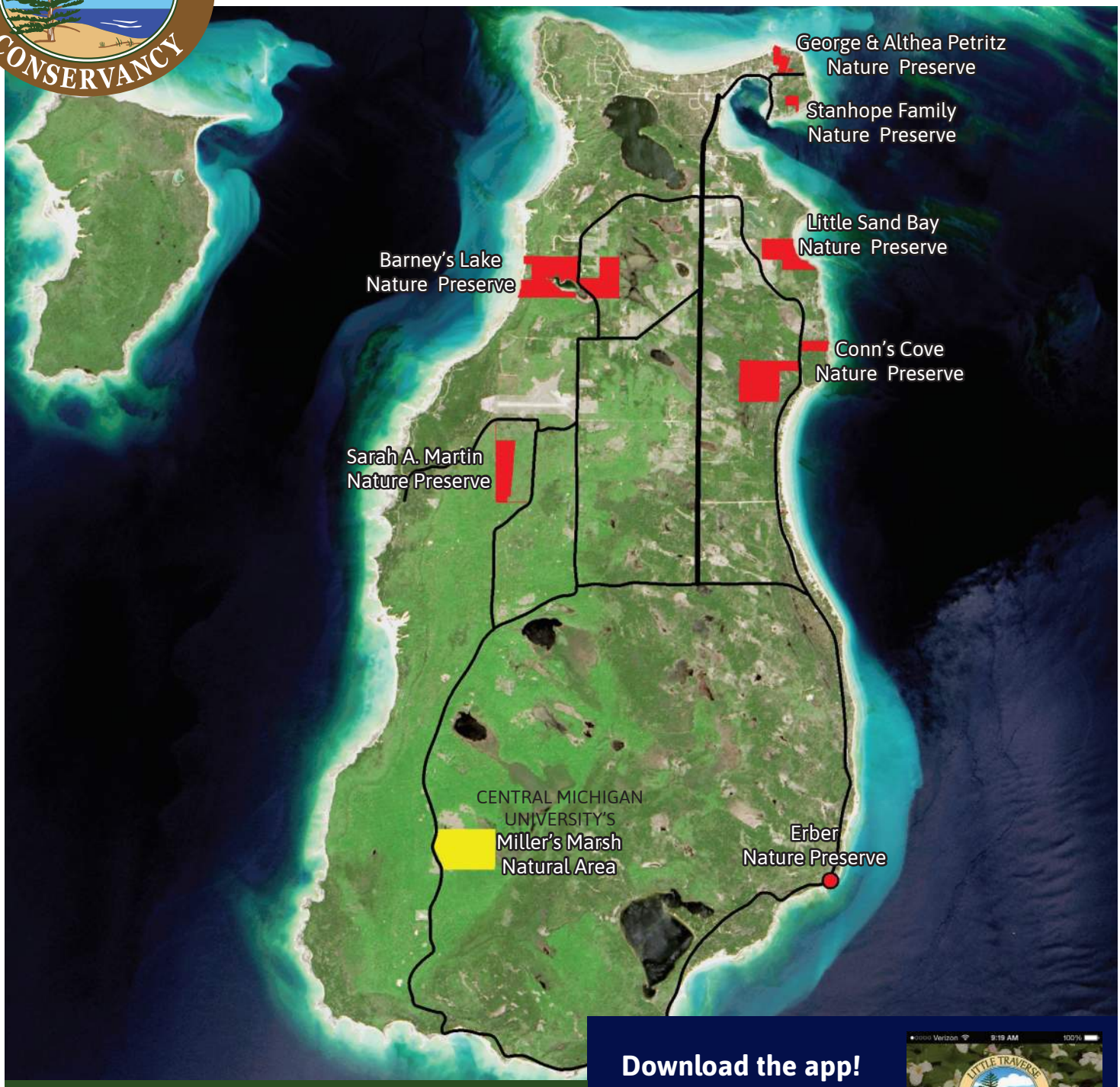
S5 = common and widespread in the state.

SX = community is presumed to be extirpated from the state. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

S? = incomplete data.

LITTLE TRAVERSE CONSERVANCY'S

Beaver Island Nature Preserves & Trails



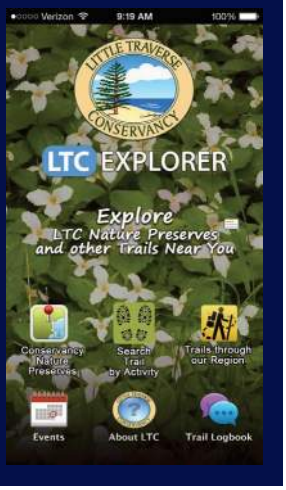
Since 1991 Little Traverse Conservancy has been working with the people of Beaver Island to conserve some of the most ecologically-significant island lands. Many privately-owned lands are now protected from future development with conservation easements. In addition, nearly 800 acres are available for public enjoyment as nature preserves or natural areas, as highlighted on this flyer. Those preserves described on the back include trails that are most conducive for hiking and similar activities.

LITTLE TRAVERSE CONSERVANCY - 3264 Powell Road
Harbor Springs, MI 49740 - 231.347.0991 - www.landtrust.org

Download the app!

Our free nature preserve app provides users with accurate, detailed, and interactive maps and information about LTC preserves that are best suited for outdoor recreation.

The app is available on both Google Play and the Apple App Store by searching "LTC Explorer."



Barney's Lake Nature Preserve

The original 120-acre preserve was a gift to the Little Traverse Conservancy in 1990 by the heirs of Bernard and Margaret O'Donnell. Located about three miles southwest of St. James, the old O'Donnell homesite is east of the lake across from the lake viewing/access area. Once cleared fields are now a study in plant succession. Stones are piled along the old field and pasture boundaries. Wildlife commonly seen in the area include loon, great blue heron, whitetail deer, beaver, and snowshoe hare. Recently, this preserve has grown to 337 acres, 4,900 feet of Barney's Lake frontage, and 1,770 feet of Lake Michigan frontage. Features include open bog, sedge meadow, cedar swamp, and uplands with old logging trails that allow for hiking and exploring. Significant improvements include boat racks and roughly three mile of trails.

From St. James, take Kings Hwy. south 1¼ miles to Barney's Lake Rd. North and turn right. Go 2½ miles and the preserve can be found on both sides of the road. Look for a preserve sign on the left. Parking is on the right.

Little Sand Bay Nature Preserve

Designated by a group of island residents as the number one priority for acquisition and preservation, the Conservancy purchased the original 60 acres in 1994. In 1999, LTC assisted the state in acquiring 30 acres to the north. And in 2011, LTC purchased a 28-acre addition to the preserve with funds from the J.A. Woollam Foundation. The preserve includes a mix of shrubs, cedar swamp, and sand dunes. A short trail (.4 mile) and foot bridges allow visitors to access the shore without damaging the sensitive habitat. When added with adjacent state land, nearly 1½ miles of Lake Michigan shoreline and a shallow swimming beach are now accessible.

From the Welke's Airport, go south on East Side Dr. for approximately 200 yards. Look for a sign on the left side of the road.

CENTRAL MICHIGAN UNIVERSITY'S
Miller's Marsh Natural Area

Purchased by Little Traverse Conservancy in 1997, this property was conveyed to Central Michigan University Biological Station in 1998. The 230-acre preserve consists of a large marsh containing floating aquatic plants, a sphagnum mat with water-tolerant shrubs, open fields to the north, and a mature northern mesic forest of mostly sugar maple and American beech throughout the preserve. There is an active beaver dam on the northeast shore of the marsh, and midland painted turtles can be observed sunning themselves on partially submerged logs. A one-mile loop trail passing through a variety of habitats circles the marsh.

From St. James, take the King's Hwy. south for 4 miles. Turn right (west) onto Paid Een Ogs Rd. Continue about 1½ miles. At the four corners and airport turn left (south) onto West Side Dr. Continue on West Side Dr. approximately five miles to Miller's Marsh which will be on the left (east) side of the road.

George & Althea Petritz Nature Preserve

At the northeast end of Beaver Island, this preserve is walking distance from town. A trail takes you through the 28½ acres to 500 feet of gorgeous Lake Michigan beach. The donor wrote: "People, animals, plants, and trees allowed. All other human-made structures or objects prohibited. I would like it to remain a place to quietly appreciate nature."

From St. James, take Main Street .7 mile north out of town. Turn left onto Lake Drive and travel .2 mile to the preserve sign on your left.

KEY

- Bicycling
- Canoeing/Kayaking
- Fishing
- Horseback Riding
- Birding Trail
- Swimming Beach

Remember to download the smart phone app (over) or visit our website for interactive maps: **www.landtrust.org**

PROTECTING THE NORTH COUNTRY WE ALL LOVE

St. James and Peaine Townships Terrestrial Invasive Species Program

Dear Beaver Island Resident,

We are writing to you today to introduce you to the St. James and Peaine Townships Terrestrial Invasive Species (TIS) Program. This program is a part of a community effort to curb and/or eradicate invasive species spread in the Beaver Island Archipelago, while promoting the knowledge, awareness, and protection of threatened & endangered species. This program is intended to create a local base of information and rapid response action plans towards invasive species management efforts with the assistance of the community and all groups currently working throughout the Islands towards the goal of protecting and valuing our native ecosystems.

Our 2022 TIS Crew consists of Shelby Harris, the Townships' Invasive Species Administrator, and two summer Field Technicians, Liz LaScala, and Hunter Torolski. You can get to know more about them on the back of this letter!

The TIS Program has two main goals:

1. To provide educational outreach to private landowners on Beaver Island aimed at increasing landowner awareness and engagement in protecting threatened and endangered species and rare communities.
2. To monitor and manage invasive plant/insect species at priority locations and protect threatened and endangered species.

In order to increase awareness and engagement, the TIS Crew will provide three different educational outreach events on the Island this year. Design educational content, such as fact sheets, monitor displays, and a guide on how to identify threatened, endangered, and invasive species that will be distributed. Send out survey letters to help gather an understanding of what Island residents already know about invasive, threatened, and endangered species that are found throughout the Islands.

Our Field Technicians will be spending the summer surveying the shorelines, roads, and trails for endangered, threatened, and invasive species. They will help manage and control invasive plants when found and interact with Island landowners about invasive plant management.

We are looking forward to a great field season and don't hesitate to say hello if you see us out and about! Together we can accomplish our goals of keeping our Islands environmentally healthy, full of native biodiversity and purely beautiful!

Sincerely,

Your TIS Crew

invasivespadm.bi@gmail.com
(231) 330-0422
Facebook page: Beaver Island Archipelago Terrestrial Invasive Species Program
Instagram: @invasivespadm.bi

Shelby Harris

Invasive Species Administrator

Aanii! Hello! My name is Shelby Harris, and I am the Island's new Terrestrial Invasive Species Administrator for St. James and Peaine Townships. My family is from Beaver Island and since I was a young girl, I've dreamt of finding a way to move to the Island full time and help my community here. After graduating from Northern Michigan University, earning a Bachelor of Science Degree in Zoology, I found work with the Pokagon DNR where I began my hands-on efforts in managing invasive species. Thankfully the Island's remoteness helps keep us separated from many invasive species threats faced on the mainland, but we are not in the clear. It is my and this new program's goal to educate Islanders and visitors in the identification and management of invasive species, while sharing further information towards the protection of the threatened & endangered species we harbor here within our archipelago's rare natural communities. I am thankful for this opportunity to help my ancestral lands and to share knowledge to my fellow community members. Chii Miigwetch! Thank you very much!

Hunter Torolski

Invasive Species Technician

Hi! My name is Hunter Torolski and I graduated from Central Michigan University in May of 2022. My major was Biology with a concentration in Ecology, Evolution, and Conservation. I worked with invasive plants on Beaver Island during the summer of 2021, and I'm excited to continue working with the St. James Terrestrial Invasive Species Program. Some projects that I'm looking forward to include surveying for invasive plants along the shoreline of Beaver Island and removing Autumn Olive.

Liz LaScala

Invasive Species Technician

Hello! My name is Liz LaScala, and I will be one of the Field Technicians with the St. James Terrestrial Invasive Species program this summer. I just recently graduated from Central Michigan University in May of 2022 with a Major in Biology concentrating in Ecology, Evolution and Conservation. I also gained my Minor in Outdoor Education and Environmental Interpretation. You may know me from last summer as I was doing invasive plant work in 2021 as well. I am excited to be back on the Island this summer to survey the trail systems and get to know the Beaver Island community through outreach events.

American Chestnut is State endangered and legally protected along with being globally vulnerable. While numerous specimens and stands are being planted across the state, including Beaver Island, most individuals succumb to Chestnut Blight that remains present in secondary hosts. This tree can be found in oak forests, distinguished by its elliptical leaves with sharp teeth, deep furrowed and brown bark and their bristly husked nuts. If a mature tree is found, report to the TIS Administrator.

Houghton's Goldenrod is Federally and State threatened, legally protected and globally vulnerable.

Found primarily in the Straits region near shorelines in linear interdunal areas, this perennial can be distinguished from Ohio Goldenrod found in the same interdunal areas or the Canada Goldenrod found in fields and along roadways. Houghton's Goldenrod possesses narrow leaves that fold along the midrib, while the others have much wider leaves. Its showy, yellow flowers can be found August- September like the others but will be flat-topped and have large, elongated rays compared to the pyramidal shape of the Canada Goldenrod or the tiny rays of the flat-topped Ohio Goldenrod. Houghton's is very vulnerable to ORV damage, excessive foot traffic and any disturbance or development to its habitat. If found report to the TIS Administrator and do not disturb.

Seaside Crowfoot is State threatened, legally protected and presumed extirpated. Last recorded within the Beaver Island Archipelago in 1957, this threatened perennial is found on moist, sandy or muddy shores and marshes along Great Lakes shorelines. Forming in clumps with kidney-shaped leaves and spreading by stolons/runners, the small (1cm or less) yellow flowers with 5 petals can be observed from June to August. If found report to your TIS Administrator and do not disturb.

Limestone Oak Fern is State threatened, legally protected and State imperiled. A small fern that can grow in dense white cedar swamps and limestone outcroppings within the Northern Great Lakes area. Its triangular leaves are broad, twice-divided, reaching from 3-20in long and the undersides covered by short, glandular hairs, which can distinguish it from the Common Oak Fern. Its leafstalks will also be covered in glandular hairs and can reach to about a foot in height once well-developed through the months of July and August. The greatest threat to this threatened species is the destruction of its habitat. If found do not disturb.

Threatened & Endangered Plant Species Management Plan

Problem Statement: Beaver Island's natural communities have been damaged as a result of climate, logging, recreation, development and introductions of invasive species. It is necessary for the integrity of our islands to identify threatened & endangered species along with invasive plant species to protect the former and control the latter.

Goal: To educate the community in awareness and engagement of protection for threatened & endangered native plants and to prevent, identify and eliminate specific invasive plant species to ensure that the Beaver Island Archipelago retains its environmental and economic integrity.

YOU can help: Locate, monitor, report & protect T&E species.

More information is available on the township webpages under "Invasive Species Watch" at www.stjamestwp.org and www.peainetwp.org. Or contact your local TIS Administrator at invasivespadm.bi@gmail.com

Updated: August 2022

Beaver Island's Terrestrial Invasive Species Program

T&E Plant Species

The purpose of this brochure is to help inform you of some of the Threatened & Endangered Species (T&E) found here within the Beaver Island Archipelago. The Beaver Island Archipelago was ranked as containing some of the most biologically diverse islands in Lake Michigan and as one of the top 10 most threatened islands as a result of human impacts, deer herbivory and invasive species.

- The Beaver Island Archipelago is home to twelve known threatened & endangered species with several of these species listed as globally rare and some endemic to the Great Lakes.
- Native plant species help maintain the natural heritage and biodiversity of our wetlands, fields, forests, lakes, and shorelines as well as our native animal populations that utilize and rely on these habitats in their day-to-day lives or migratory paths.
- The longer we wait and commit to no action, the closer these species come to extinction and extinction is forever.
- The longer we wait, the more expensive it will be to control invasive plants.
- You can be a part of the solution by learning about Beaver Island's T&E species and what you can do to help protect them.

Beaver Island's Threatened & Endangered Species:

What is a Threatened or Endangered Species??

A species' status as "threatened" or "endangered" is provided by meeting federal & state definitions based on the 1973 Endangered Species Act (ESA). A "threatened" status indicates the species is likely to become endangered within the foreseeable future. An "endangered" status indicates the species is in danger of extinction throughout all or a significant portion of its range.

Species Descriptions

Pitcher's Thistle is Federally and State threatened, legally protected and globally vulnerable. Endemic to Great Lakes open sand dunes and monocarpic, meaning that once a plant produces a rosette and it matures, which can take 5-8 years or more, the Pitcher's Thistle will only flower once. The unique prickly, spine-tipped flower heads are relatively large and can be cream-colored or slightly pink growing numerously from multiple blue-green steams. The narrow, deeply divided leaves are the same distinguishing blue-green color as the rest of the plant and densely covered with white-wooly hairs. The best time to observe this plant in flower on the island is from late-June to early September. Development of the Great Lakes shorelines is the biggest threat to this rare species and if found should not be disturbed.

Hill's Pondweed is State threatened, legally protected and globally vulnerable. Hill's Pondweed is an aquatic plant that can be found in cool, Northern Michigan ponds up to 3ft in depth or along alkaline streams on sandy, mucky substrates. It possesses stems that are slender and branched with alternate, narrow leaves that are submerged with three parallel veins. If found do not disturb.

Michigan Monkey Flower is Federally and State endangered with a critically imperiled global ranking. The only known plant entirely endemic to Michigan, this mat-forming, semi-aquatic, clonal plant can only be found in cold, calcareous springs, seeps and streams flowing through Northern white-cedar forests to bluffs near Great Lakes shorelines. The bright yellow, snapdragon-like, tubular flowers with a red-spotted lower lip of this endangered plant are needed to reliably identify the species, which can be observed from late June to the beginning of August. Its leaves are rounded, opposite with coarsely sharp-toothed margins and its stems are lax, rooting freely at their lower leaf nodes. If found do NOT disturb as this plant is highly susceptible to disruptions of its hydrology, oxygenation, turbidity and sun exposure.

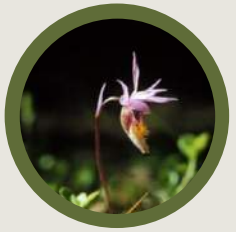
Lake Huron Tansy is State threatened and legally protected. This perennial can be found along sandy or rocky shores of Northern dunes of the Great Lakes. One that can be confused with the invasive Common Tansy, the Lake Huron Tansy possesses large, daisy-like, yellow flowers that bloom on the islands from June to September on long-stalks but with 5-12 round flower heads per stalk and with dissected (repeated & deep partitions), hairy and compound leaves. The Common Tansy will have reddish-brown stems, button or flat-topped flower heads and alternate leaves. The Lake Huron Tansy can be found throughout the Archipelago but if found do not disturb

False Violet/Star Violet is State threatened and legally protected. This small perennial can be distinguished from the Common Blue Violet by possessing densely hairy leafstalks, radially symmetrical flowers and being found among moist coniferous uplands rather than open areas. Their leaves are circular and heart-shaped and the flowers consist of five white petals and can grow 1-3in tall, flowering throughout different periods of the summer depending on various factors. If found do not disturb.

Broomrape or Yellow Clustered/Sand Cancer-root is State threatened and legally protected. This small forb grows 1-6in tall along Lake Michigan open dunes, and is parasitic on the roots of Wormwood. Its stem is colorless, as the plant completely lacks chlorophyll, with tiny scale-like hairy leaves that are pale yellow-brown in color, bearing a terminal cluster of 3-10 pale symmetrical tubular flowers that are rose-purple when in bud, becoming pinkish to creamy white upon maturity. It is easiest to see after flowering when the plant becomes dark brown and forms erect fruiting capsules in late July or August. These plants are especially susceptible to ORV damage and excessive foot traffic. If found do not disturb.

Dwarf Lake Iris is Federally threatened, State threatened, legally protected, as well as globally vulnerable and endemic to Great Lakes shorelines. This small, perennial forb consists of sword-like (short, flat and pointed) leaves growing 4-6in tall from an enlarged node and a single, showy iris flower with three petals of deep blue, only growing 1-2in tall. The Dwarf Lake Iris spreads mostly through rhizomes to form dense clumps along calcareous shorelines of the northern Great Lakes near boreal forests, flowering on the island in May to early June. If found do not disturb.

Calypso/Fairy Slipper is State threatened and legally protected. It is a small perennial orchid that can grow from 3-6in tall with one oval leaf that flares over the ground, persisting through winter until a new flower blooms. The single to rarely two flowers are made up of fanning, narrow petals, similar in size and pink to purple in color, with a pouch below, crested by yellow hairs. This species can be seen blooming May to late June in moist coniferous and hardwood forests. If found do not disturb.



Garlic Mustard is an herbaceous (not woody) plant that tolerates shade and is found most commonly in mature woods and along trails. Its leaves are triangular in shape with toothed edges, smelling like garlic when crushed. The plant grows 12-36 inches in height. The small flowers are white with four petals and occur in clusters at the top of the plant. On Beaver Island, it will be the only plant of its height flowering in the woods in May besides the Trillium.

Bush Honeysuckle was introduced to North America from Eurasia. There are two species that are found on Beaver Island, and they are difficult to distinguish from the two native bush honeysuckle species. The two introduced species, Tartarian and Morrow honeysuckle, have pinkish-white or pink flowers, but the native bush honeysuckles have yellow flowers. In addition, the older stems of the introduced honeysuckles are hollow, but the older stems of native plants are solid. Usually found in sunny areas, they form dense stands that can be 6 feet tall.

Narrow-leaf Cattail grows in wetlands, just like our native common cattail species. In fact, it grows alongside the native cattails, even hybridizing with them. Luckily, this invasive is easily distinguishable. The narrow-leaf cattail has about an inch-long gap between the male and female flowers on the flowering stalk that is the typical brown "cattail" for which the plant is named. The native common cattail does not have a gap between the flowers. Its brown "cattail" is one long, smooth structure.

Japanese Knotweed is an aggressive herbaceous (not woody) plant that can grow 3 to 15 feet tall in large monoculture groves. Often found near water ways and disturbed areas, this invasive can grow roots deeper than 10 feet and spread its rhizomes (horizontal roots) more than 60 feet away from original shoots. Can be distinguished by its smooth, hollow and tinted red stems along with its broad, heart-shaped leaves. Extremely difficult to remove - even cut foliage can re-establish the plant - it is important to keep vigilant in the management of this plant on Beaver Island.

Invasive Plant Species Management Plan

Problem Statement: Beaver Island's natural resources have been damaged as a result of climate, logging, recreation, development and introductions of invasive species. It is necessary for the integrity of our islands to identify threatened & endangered species along with invasive species to protect the former and control the latter.

Goal: To educate the community in monitoring and assessing management action plans to protect threatened & endangered native plants and prevent, identify and eliminate specific invasive plant species to ensure that the Beaver Island Archipelago retains its environmental and economic integrity.

YOU can help: Locate, monitor, report & control invasives.

More information is available on the township webpages under "Invasive Species Watch" at www.stjamestwp.org and www.peainetwp.org. Or contact your local TIS Administrator at invasivespadm.bi@gmail.com or (231) 330-0422.

Updated: August 2022

Beaver Island's Terrestrial Invasive Species Program

Invasive Plant Species

This brochure is to help inform you of some of the terrestrial invasive species (TIS) found here within the Beaver Island Archipelago. Without action, these invasives will have a negative impact on outdoor activities, real estate values, the island's economy and our environment. Invasive plants are spreading on almost all private and public lands throughout our islands.

- Invasive plants can decrease your ability to enjoy hunting, fishing, boating, gathering, bird watching, and other recreational pursuits.
- Invasive plants, if left unchecked, will limit many uses of our islands now and for future generations.
- Invasive plants can harm the natural heritage and biodiversity of our wetlands, fields, forests, lakes, and waterways.
- The longer we wait, the more expensive it will be to control invasive plants.
- You can be a part of the solution by learning about Beaver Island's invasive plants and taking action to prevent their spread.

Beaver Island's Top Ten Invasive Species Invasive Species:

What is an invasive plant?!

Invasive plants are nonnative, rapidly reproducing species, which threaten the integrity of natural areas. Once established in an area, invasive species can have devastating effects. Finding and treating invasive plants as soon as they appear saves time and money on future efforts.

What should you look for?

Phragmites is a very tall grass that occurs as both native and nonnative species. The two subspecies are difficult to tell apart, but in general the invasive species occurs along Lake Michigan and inland lake shorelines in very dense stands that shade out other plants. The seed heads are large and loose and resemble a feather duster when mature. The leaves are dark green, and the stems are solid green, dull colored, slightly ribbed, with little or no red, along with tiny, white hairs and larger ligules where the leaf blade meets the sheath. Native Phragmite plants have shiny, smooth stems with leaf sheaths that fall off easily exposing their red stems and more of a yellow-green leaf color and little to no hairs or ligules.

Autumn Olive is a shrub that is found in open habitats such as road sides and old fields. It has small oval or lance-shaped leaves that alternate in their attachment to the stem. The leaves are usually grayish-green in color, and their undersides are silvery-white. The flowers are small, light yellow, and very fragrant. They appear soon after the plant leafs-out in the spring or early summer. In the fall, the plant will be covered with small, edible red fruits with white spots. Seeds are spread by birds.

European Marsh/Swamp Thistle is a thistle that grows 3 to 6 feet tall. It has a rosette (circle) of leaves from its first-year growth at the base that are long, spiny, and deeply lobed. The stem is thick, often reddish, and covered with hairy spines and equally spiny, hairy leaves. The multiple pinkish-purple flowers appear at the top of the stem in a tight cluster from June- August. On Beaver Island this plant is more likely to be found in moist areas than in dry sand. Can be confused with native thistles found here on the island so if in doubt, consult an expert before removing any thistles.

Spotted Knapweed/Star Thistle is an herbaceous (non-woody) plant found mostly in dry, open areas. The first year after germination it lives as a rosette (circle) of irregularly lobed gray-green leaves, and during the second year it flowers profusely from long, branched stalks up to 40 inches tall. The stem leaves are alternating, lance-shaped or slightly lobed. The small pink to purple flowers is thistle-like in appearance and occur on individual stalks. The plant is difficult to eliminate due to its deep taproot that will regrow if the above ground plant is removed. **Warning**: Spotted knapweed contains an irritant chemical, so gloves should be worn while pulling. Because of its thistle-like appearance and gray-green leaves, it can be mistaken for native plants when not flowering, including wormwood and the federally endangered Pitcher's (Beach) Thistle. If in doubt, consult an expert before removing.

Japanese Barberry is commonly planted in yards ornamentally to then escape by birds and other wildlife spreading seeds. A multi-stemmed, thorny shrub that, once escaped, can be found in a range of habitats, in shade or full sun. Grows in various colors – starting green in the spring and turning red in the fall – and to various heights – 1 to 6 feet tall depending on soil and climate conditions. Different from the native American Barberry in possessing smooth, oval-shaped leaves rather than toothed. Bright red, egg-shaped berries fruit and persist on shrub from July through the winter. As this shrub is warmer and more humid than other plants, it is a "tick haven", increasing the risk of transmission of tick-borne diseases.

Wild Parsnip is an herbaceous (not woody) plant that grows about 4 feet tall in full sun conditions. Its flowers are produced in an umbel, which is a multi-branched head composed of small flowers and shaped like a flat umbrella. Similar to native parsnips but much smaller and with yellow flowers rather than white, producing in July and August throughout Beaver Island. Wild parsnip has a deeply grooved stem (like the grooves on a celery stalk) once the plant is mature. **Warning**: if the sap from cutting leaves and stems gets on the skin which is then exposed to sunlight, there is a risk of developing reddening and blisters. Gloves, long sleeves and long pants should be worn when removing this plant.

Implementation Plan for the Management of State-owned Lands on Beaver Island

Addendum to the
Management Plan for State-owned Lands
on Northern Lake Michigan Islands

May 2022

Michigan Department of Natural Resources
Wildlife Division

Jennifer Kleitch and Erin Victory
Edited and reviewed by the
Northern Lake Michigan Islands Collaborative

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INTRODUCTION AND PURPOSE

The Management Plan for State-owned Lands on Northern Lake Michigan Islands (Management Plan), finalized in February 2017, sets forth a broad vision for the management of state lands on the Beaver Island archipelago.

The Northern Lake Michigan Islands Collaborative (NLMIC) was formed (pursuant to Goal 1) to identify and carry out the various activities needed to achieve the six goals within the Management Plan. Under the NLMIC umbrella, several interests coalesced into subject-matter subcommittees and began to undertake activities, including drafting complementary step-down plans to implement the other goals of the Management Plan.

One of these subcommittees, the Landscape Level Planning Subcommittee (LLPS), was formed to ensure various natural resource, cultural, and economic values associated with state-owned land management and protections are considered. Those concerns coalesced into the following charges representing Goals 2 (ecology) and 5 (timber) from the Management Plan, with some integration of Goal 3 (cultural resources):

1. Support the vision, goals, and objectives stated in the Management Plan.
2. Create a landscape level map that provides guidance for management to meet these goals on state-owned lands.
3. Define management goals in each zone delineated on the map.
4. Review and update the map periodically.

This Implementation Plan is based on the work done by the LLPS between 2015 and 2019. That work resulted in a map (Figure 1) depicting three management zones across state-owned lands on Beaver Island and associated definitions. Zone boundaries were honed over time applying a Geographic Information Systems (GIS) model with the assistance of GIS experts from Little Traverse Bay Bands of Odawa Indians (LTBB). Using the model, the LLPS looked for areas and linkages between rare and significant resources, wildlife species and timber stands potentially suitable for harvest. These zones form the basis for management on Beaver Island state-owned lands and provide guidelines for compatible uses.

Definitions of the zones:

Special Conservation Zone:

Areas of state-owned properties that encompass and connect rare or high-quality natural communities, habitat for rare species, mature forest stands, shorelines, streams, and other important natural features and that will be protected in perpetuity. Natural processes will be allowed to occur in this zone. Any management would be for the benefit of restoring ecological function or addressing a threat to ecological processes. In forested communities, this will lead to the development of old growth conditions, featuring within-stand age diversity, large diameter trees, large snags, and downed logs.

Selective Management Zone:

Areas of state-owned properties where mid- to late-successional forests are maintained and/or restored. Selective timber management techniques appropriate for the forest community type will be implemented that prioritize the generation of forest products and that approximate ecological processes such as gap formation through harvest. Timber

harvest practices will also promote large diameter trees and coarse woody debris for wildlife benefits and increase forest structure complexity.

Habitat Maintenance and Restoration Zone:

Areas of state-owned properties where the full suite of habitat management techniques, including early-successional forest management, is available to achieve habitat goals or to restore the full habitat potential of a site or landscape for identified species.

Important cultural resources are found within all zones defined above. Due to the sensitive nature of their locations, they are not included in the map that was developed. Rather, they are addressed in the Cultural Resources and Implementation sections within this plan, in the context of forest management.

Once the zones were delineated, it was possible to do a cover type analysis to assess the current forest condition, and to then operationalize protections and management within the zones. This Implementation Plan is complementary to any other step-down plans created by the other subcommittees, and it recognizes that other activities may occur on state land within these zones. The zone definitions listed herein are universally applicable and will determine what activities are compatible. Once finalized, this Implementation Plan will become an addendum to the Management Plan itself.

COVER TYPE ANALYSIS

In 2017 and 2018, Michigan Natural Features Inventory (MNFI) completed inventory of 12,348 acres of state land on Beaver Island, including forest stand cover types, evaluation and ranking of Ecological Reference Areas (ERAs), and recording Element Occurrences (EOs) of high-quality natural communities. Rare species were noted opportunistically during the inventory. ERAs represent high quality examples of intact natural communities (as classified by Cohen et al. 2015)[1]. This information is important for making informed management decisions.

The majority of state-owned land on Beaver Island is forested (88%) and is concentrated in the south-central two-thirds of the island. The eastern portions are characterized by lowland cover types while the west is defined by a longitudinal ridge that hosts much of the Northern Hardwood cover type. Northern Hardwoods (33%), Lowland Coniferous (15%), Lowland Deciduous (15%), and Lowland Mixed Forest (12%) types are the most common cover types within all forested areas surveyed (Figure 2). Common non-forested lands include herbaceous open land (such as grassy areas and old fields), shrublands, wetlands (such as bogs, emergent wetlands, fens, shrub thickets, and wet meadows), water, and open dunes.

Special Conservation Zone Cover Types

The Special Conservation Zone constitutes 4,310 acres of state-owned land. Delineation of this zone was based largely on the location of areas of high conservation value, with an intent to connect and protect them from intrusive activities (e.g., timber harvest). Areas of high conservation value herein include non-dedicated Natural Areas, Critical Coastal Piping Plover Habitat, Critical/Barrier Dunes, rare species habitat, natural communities, and ERAs. There are

[1] Cohen, Josh, M. Kost, B. Slaughter, D. Albert. 2015. A Field Guide to the Natural Communities of Michigan. Michigan State University Press, 362.

currently 9 ERAs: bog (1), poor fen (1), dry-mesic northern forest (1), mesic northern forest (this ERA is made up of 3 small units in close proximity), boreal forest (1), and open dunes (4). Newly identified occurrences of rare natural communities will be added to this list as they are recorded.

Cover types within the Special Conservation Zone are largely lowland conifer/lowland mixed forests (27%) and northern hardwoods (27%) with the inclusion of upland conifers (15%) (Figure 3).

Selective Management Zone Cover Types

The Selective Management Zone totals 3,637 acres of state-owned land, which is dominated by northern hardwoods (60%; Figure 4). Most northern hardwood stands have up to 80% loss of the canopy beech resource due to beech bark disease and beech regeneration is evident, especially in canopy gaps, where beech thickets may persist. Generally, these stands reflect past timber management, which was largely focused on harvest of the highest quality trees. The majority of northern hardwood stands (64%) have basal area ranging between 81-110 (Figure 5). Hardwood stand sizes range from 2 to 314 acres (average 44 acres). Other cover types include lowland forests (coniferous, deciduous, and mixed) and smaller acreages of other forested and non-forested areas.

Habitat Maintenance and Restoration Zone Cover Types

The Habitat Maintenance and Restoration Zone totals 4,401 acres primarily concentrated on the eastern portions of state land. The majority of forested areas are in lowland types (61%) and are comprised of Lowland Deciduous Forest (26%), Lowland Mixed Forest (22%), and Lowland Coniferous Forest (13%) (Figure 6). Lowland and upland stands containing a major aspen component ($\geq$40% of the canopy species) total 888 acres (constituting 20% of the Habitat Maintenance and Restoration Zone). This total includes stands that are inaccessible for commercial forest management due to the structure of the surrounding forest (e.g., blow-downs and wetlands preventing access) and lack of roads or trails leading to the interior stands. Non-commercial forest management could be considered in those areas. The mixed aspen types have age classes ranging from 16 to 109 years old (Figure 7). Stand size averages 30 acres with a range of 1 to 95 acres.

WILDLIFE RESOURCES

A full discussion of the wildlife species, listing status, and research history for Beaver Island is covered in the Management Plan. Some of those species, such as ruffed grouse, white-tailed deer, and American woodcock, will directly benefit from the habitat management goals listed herein. Other species, including those that are state-listed endangered, threatened, or special concern are not directly addressed in this plan. Many of these rare species, however, are found in areas which will be protected within the Special Conservation Zone (e.g., piping plover).

CULTURAL RESOURCES

Cultural resources may be found in any areas discussed in this plan. As defined in the Management plan, cultural resources are: “Sites or objects that have important historical and

social significance, including meeting places, documents, objects, stone structures and stone works, archaeological sites and historic places. From a tribal perspective cultural resources are places where the lifestyle and culture of the Anishinaabek, past and present, has created some type of importance to the site. These include, but are not limited to fishing and hunting sites, places where spirits inhabit or use, places where specific plants, minerals, and rocks are obtained for traditional uses, places where ceremonies were or are performed, burial locations, and places where significant events occurred." These sites shall be evaluated when any management actions are proposed to ensure their protection.

RESPONSIVE MANAGEMENT

Actions described in this plan will take a systematic approach to improve resource management by studying past management outcomes, planning future actions, evaluating results of actions, and adjusting management practices as a result. Additionally, management may also be responsive to latest research outcomes, and to new or newly identified pests, diseases, and invasive species.

Climate Change

It is difficult to predict what will occur locally due to changes in climate, therefore a broad approach to mitigate negative impacts is needed. Some potential impacts at the landscape level include a range shift to the north for aspen and grouse, a higher incidence of disease impacts to deer, and expanding invasive species. Strategies within this plan that are aimed at addressing climate change include promoting biodiversity through a variety of forest types and conditions, removal of invasive species, and limiting incompatible uses (for example, ORV use) in sensitive environments. Climate change is expected to be one of the biggest drivers of ecosystem changes that will require responsive management strategies.

MANAGEMENT OUTCOMES

As previously discussed, the Management Plan provided a strategic framework for collaborative governance and outlined strategic management actions for state-owned lands. The following outcomes were extrapolated from the Management Plan goals and actions, and provide the framework that links both plans together:

1. Identify, protect, and monitor important ecological resources and mitigate threats that interfere with ecological processes.
2. Promote a variety of density and size classes and cover types through forest management activities that support economic opportunity and wildlife habitat.
3. Develop and implement procedures to carry out state-owned land forest management activities that incorporates transparency and public input within the NLMIC collaborative governance framework.

These outcomes will be operationalized in the Implementation section below via corresponding objectives and actions.

PLAN REVIEW AND APPROVAL

The Implementation plan including an alternatives analysis was drafted between 2019 and 2021. An alternatives analysis was reviewed by the LLPS and NLMIC and included four management alternatives: 1) status quo, 2) moderate management (DNR and LLPS preferred alternative), 3) ecological management, and 4) silvicultural management. Opportunities for review and comment by the LLPS and NLMIC were offered during the drafting period and resulted in better clarification and agreement on the plan elements. Alternative 2 was ultimately selected and this final plan was approved by the full NLMIC in November, 2021.

IMPLEMENTATION

What follows are specific actions intended to realize the three management outcomes stated above via the approach described in Alternative 2, Moderate Management (the preferred alternative).

This plan is entered into in good faith by the DNR Wildlife Division (WLD), the land administrator. The intent is to move forward on the actions listed below over the next 10 years. Budget and personnel capacities may change at any time due to factors outside of the DNR's ability to control. In this instance, the DNR WLD will work with the NLMIC and LLPS on how to move forward under different circumstances. This plan will be reviewed and revised 10 years from the approval date.

Outcome 1: Identify, protect, and monitor important ecological resources and mitigate threats that interfere with ecological processes.

Objective 1.1. Continue to monitor and maintain integrity, distribution, abundance, and management success across state-owned lands through partnerships.

Action 1.1.1. Seek funding opportunities to complete ERA surveys every 10 years.

Action 1.1.2. Work with partners annually to treat invasive species in any of the defined zones or consult on treatment potential and methods.

Objective 1.2. Ensure ecological processes are allowed to take place within the Special Conservation Zone, as defined by Figure 1, and prioritize management and restoration opportunities through partnerships, where appropriate, according to MNFI recommendations.

Action 1.2.1. Apply Conservation Values (3a) site conditions in the DNR inventory system to the Special Conservation Zone by the end of 2022, which will administratively code them as unavailable for management.

Action 1.2.2. Designate the Special Conservation Zone as a DNR Special Conservation Area by the end of 2022 to ensure current and future protections from timber management.

Action 1.2.3. Explore further protections such as Director's Order or Legislation for the Special Conservation Zone within the next 5 years.

Action 1.2.4. Create and implement ERA plans using information from MNFI Natural Community Surveys of Beaver Island Archipelago within the next 10 years.

Action 1.2.5. Consult MNFI models, indices and reports to prioritize management actions and seek partnerships for surveys, monitoring, restoration and treatment as time and personnel capacity allow.

Outcome 2: Promote a variety of age and size classes and cover types through forest management activities that support economic opportunity and wildlife habitat.

Objective 2.1. Promote mid- to late-successional northern hardwood forests within the Selective Management Zone, as defined by Figure 1, to increase economic opportunities.

Action 2.1.1. Conduct a minimum of 1 or 2 northern hardwood harvests in a decade for stands meeting silvicultural criteria and based on a forester's recommendation for treatment.

Action 2.1.2. Promote large stand sizes (250 acres or more) via timber sales to maintain forest contiguity to benefit area sensitive wildlife species.

Action 2.1.3. Stagger treated stands in space and time to promote forest diversity and sustainable harvest opportunities.

Action 2.1.4. Use timber sale specifications that retain coarse woody debris, fruit-bearing shrubs, and large diameter trees and snags for mature forest wildlife habitat.

Action 2.1.5. Integrate new northern hardwoods treatment recommendations as they become available from ongoing research.

Objective 2.2. Promote aspen forest through clearcutting harvest practices within the Habitat Maintenance and Restoration Zone, as defined by Figure 1, to enhance wildlife related recreation for ruffed grouse, American woodcock, and white-tailed deer.

Action 2.2.1. Conduct a minimum of 1 or 2 aspen harvests in a decade, and pair with hardwood treatments in the SMZ where possible.

Action 2.2.2. Focus management efforts on stands older than 40 years and maintain stand sizes of 40 acres or less within accessible aspen stands.

Action 2.2.3. Prioritize timber treatments based on stand age and vigor to maximize regeneration potential.

Outcome 3. Develop and implement procedures to carry out state land forest management activities that incorporates transparency and public input within the NLMIC collaborative governance framework.

Objective 3.1. Work with internal and external partners or contractors to conduct forest inventory, and to propose and oversee treatments on state-owned lands.

Action 3.1.1. Establish an internal DNR and public review process to meet forest certification requirements.

Action 3.1.2. Develop a timber sale timeline accessible to the NLMIC by the end of 2022 to ensure a full understanding of the process from forest inventory to forest stand treatment proposal to the timber sale to the harvest operation.

Action 3.1.3. Secure funding as needed to hire a forestry consultant to oversee timber sale administration and to provide resources to DNR foresters to travel to and from the island for forest inventory, timber sale set up and administration work.

Action 3.1.4. Conduct forest inventory using foresters as well as ecologists and other partners during the growing season and using an island-wide, landscape level approach approximately every 10 years, as opportunity and funding allow.

Action 3.1.5. Work with Forest Resources Division and partners to recommend timber sale prescriptions, specifications, and to administer timber sale operations as needed. An ecologist will assist in drafting these prescriptions and specifications, will help monitor the logging process, and will assist in providing a detailed report following the harvest.

Action 3.1.6. Work through these partners to conduct post-treatment monitoring to determine if short- and long-term management objectives were met as appropriate.

Objective 3.2. Work with qualified State and Tribal cultural resources staff and the NLMIC Cultural Resources Committee to ensure adherence to all cultural resources protections in state laws, policies, and procedures to avoid or minimize impacts to significant cultural resources when conducting management.

Action 3.2.1. Review all draft management actions for cultural resources concerns as they are proposed and prior to public review.

Action 3.2.2. Develop a procedure to address the inadvertent discovery of cultural resources during management actions.

Action 3.2.3. Partner on the appropriate development of public education and interpretative initiatives related to cultural resources.

Action 3.2.4. Collaborate to appropriately document newly discovered cultural resources as situations dictate.

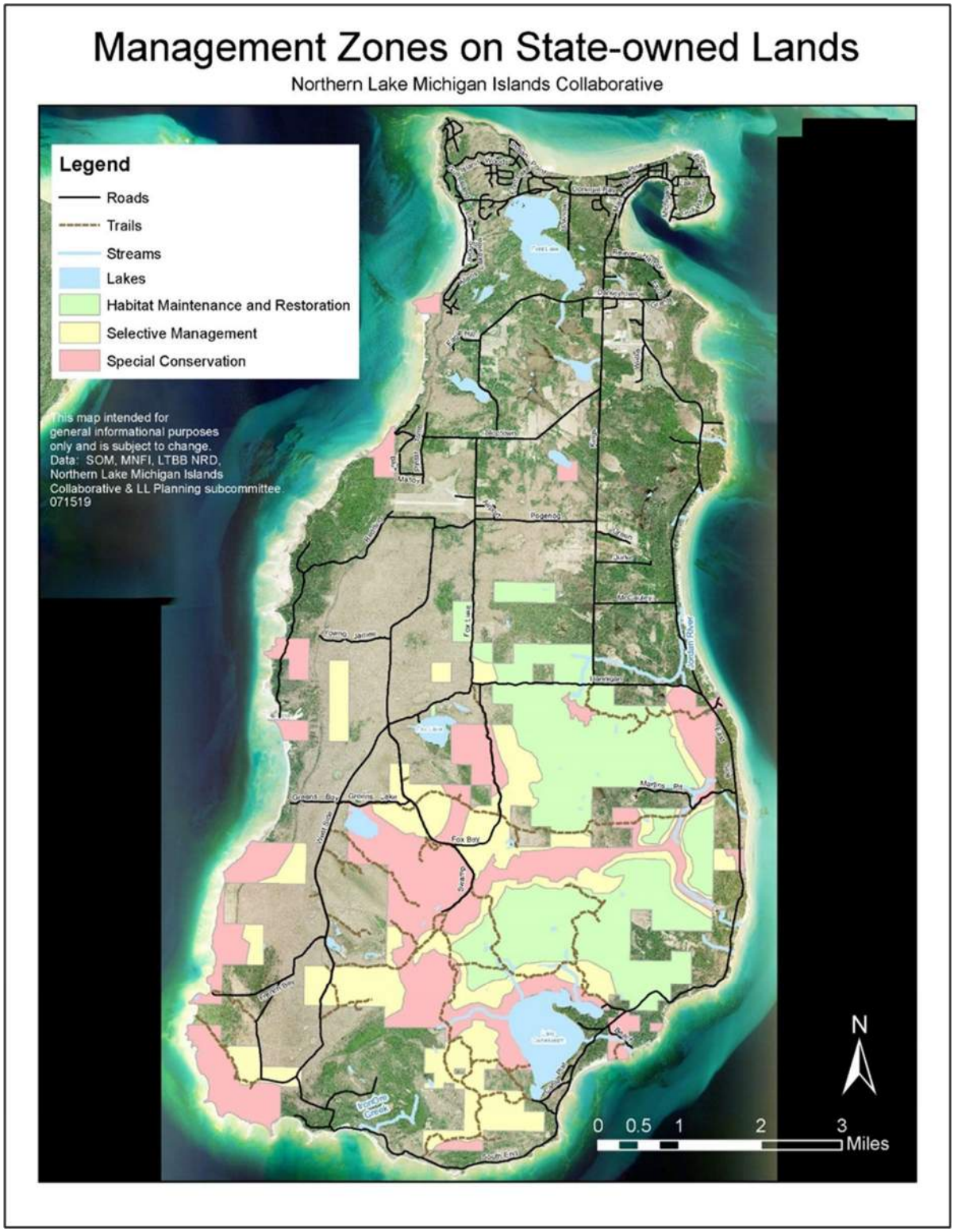

Figure 1. Map of Zones on Beaver Island State-owned lands produced by the Landscape Level Planning Subcommittee and approved by the Northern Lake Michigan Islands Collaborative in 2019.

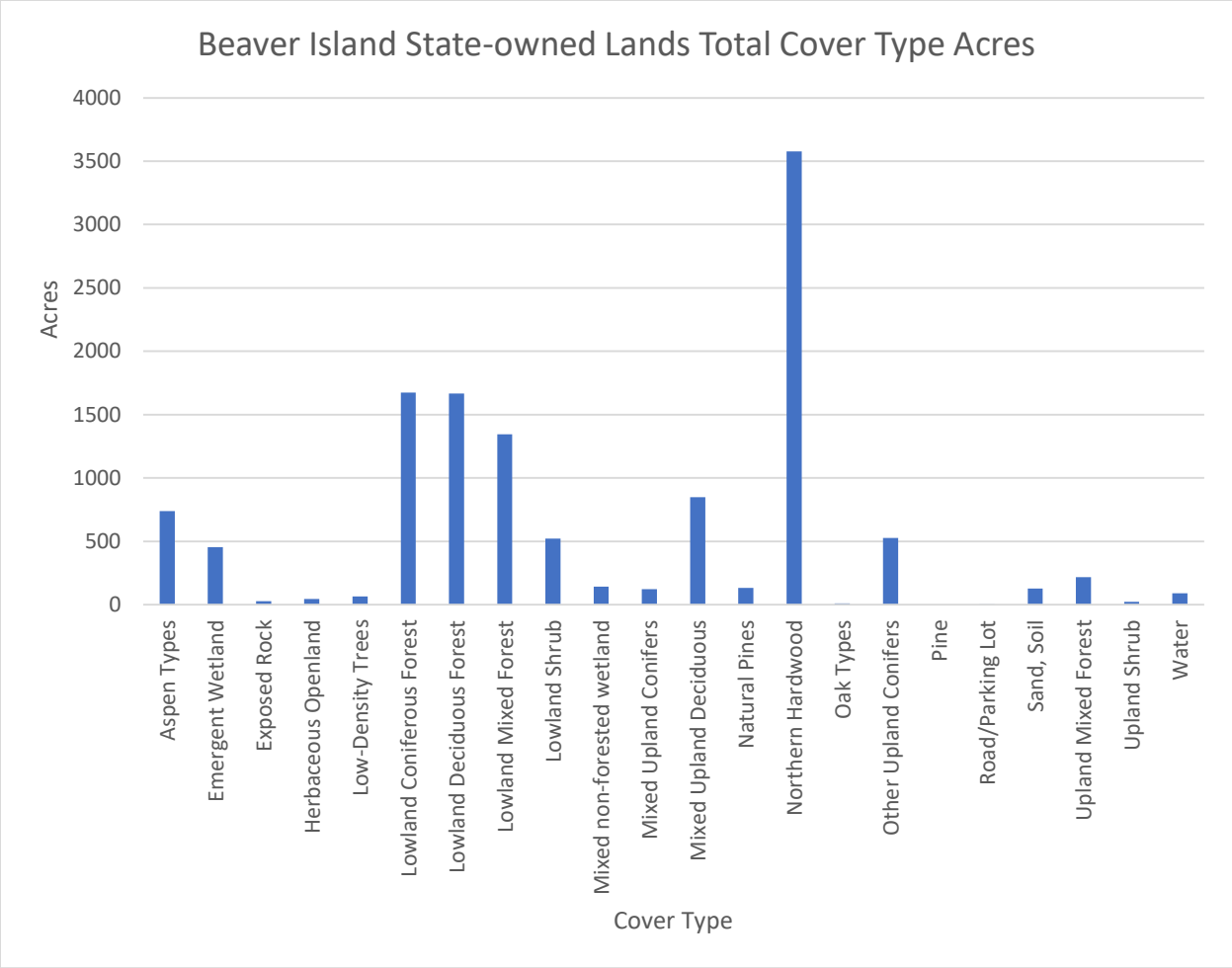

Figure 2. Cover type acres within State-owned lands inventoried by Michigan Natural Features Inventory on Beaver Island in 2017 and 2018.

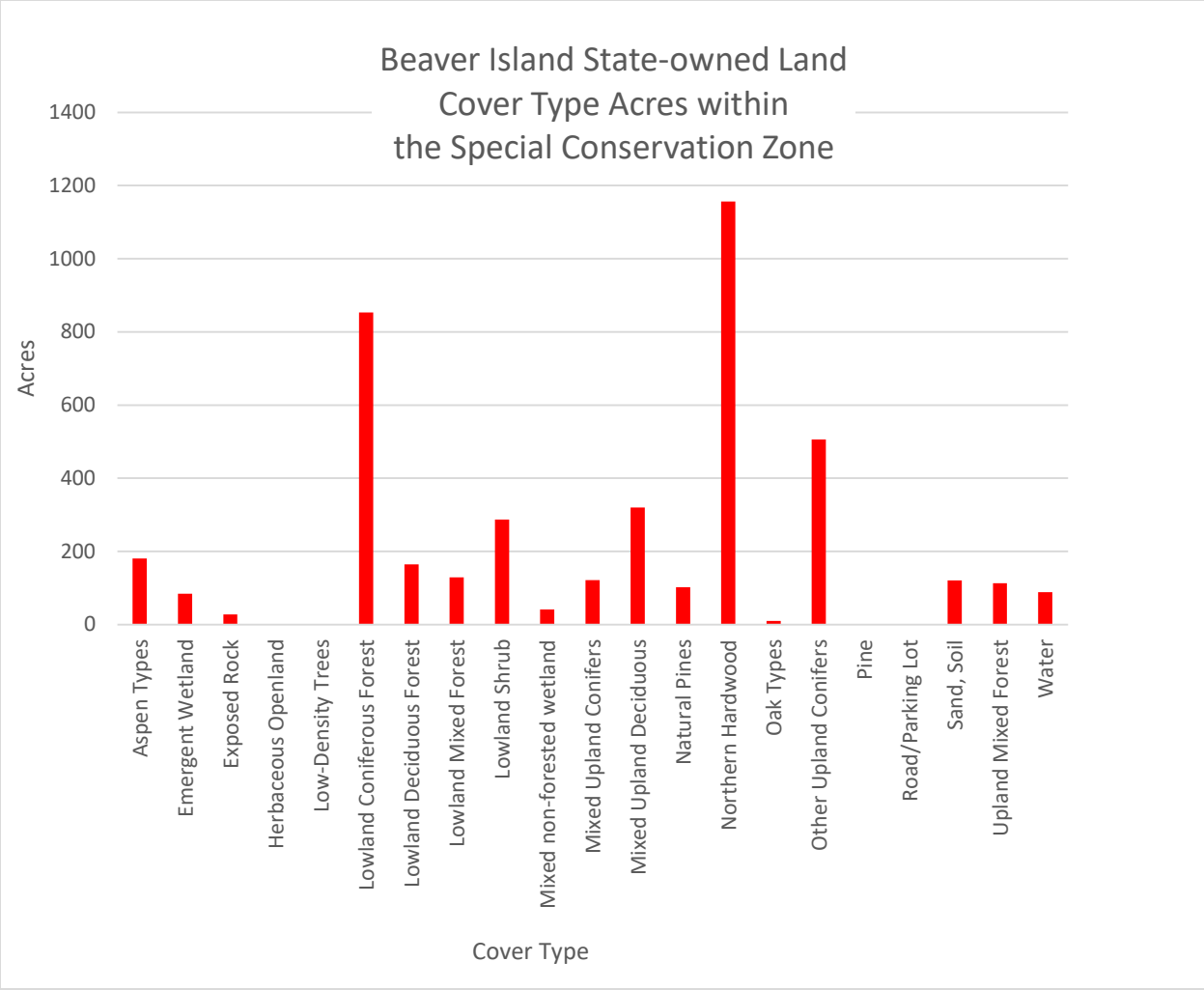

Figure 3. Special Conservation Zone cover type acres within State-owned lands on Beaver Island, 2019.

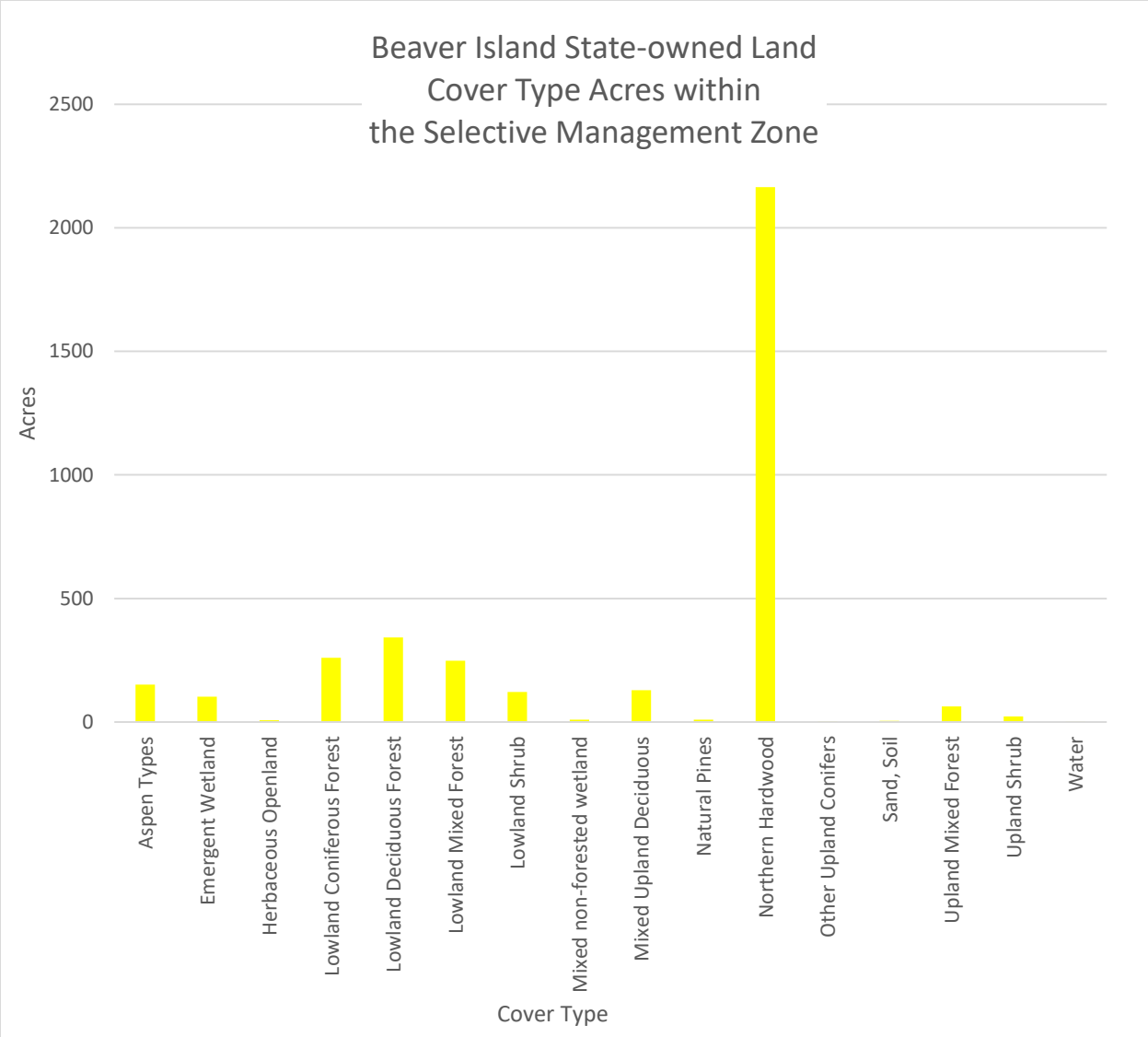

Figure 4. Selective Management Zone cover type acres within State-owned lands on Beaver Island, 2019.

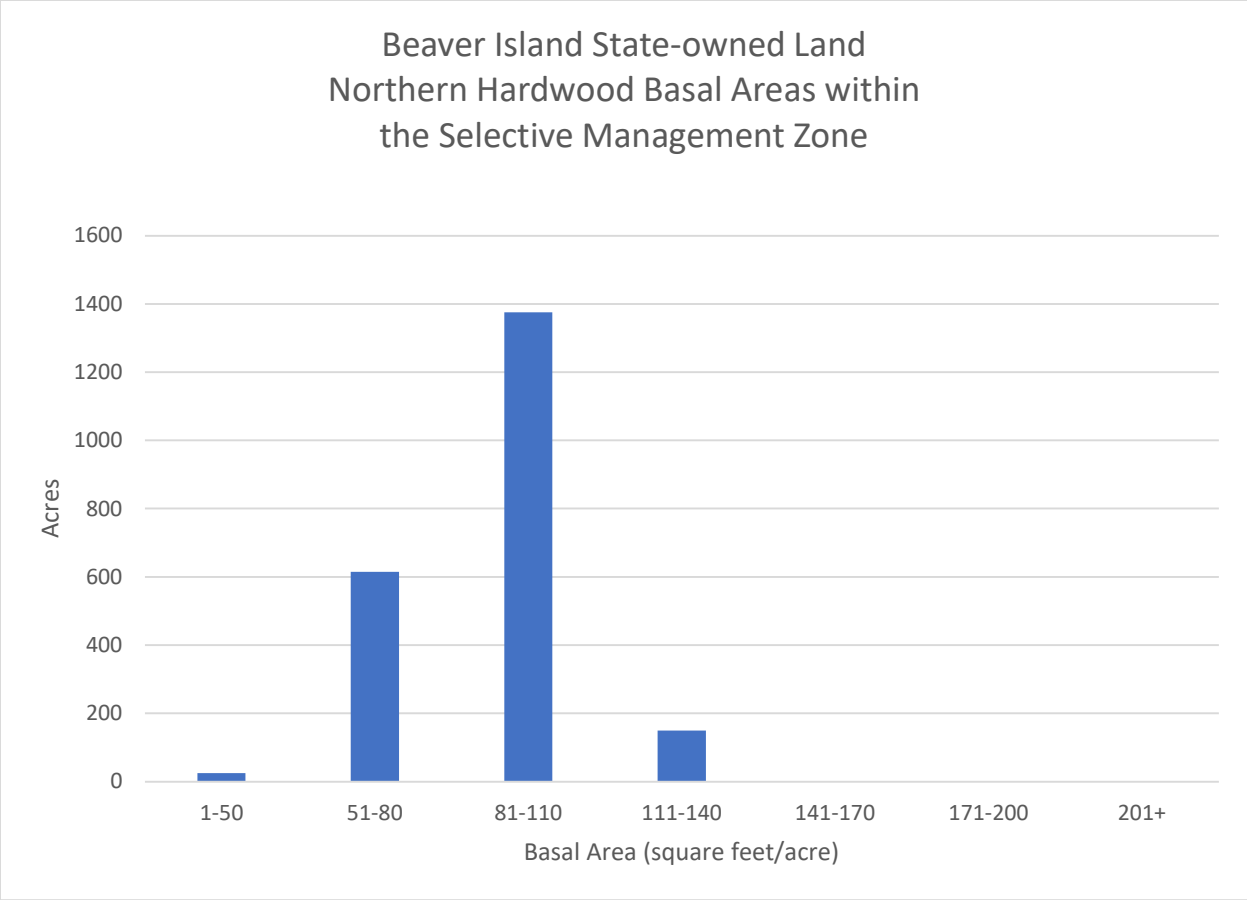

Figure 5. Selective Management Zones northern hardwood acres by basal area (square feet/acre) category within State-owned lands on Beaver Island, 2019.

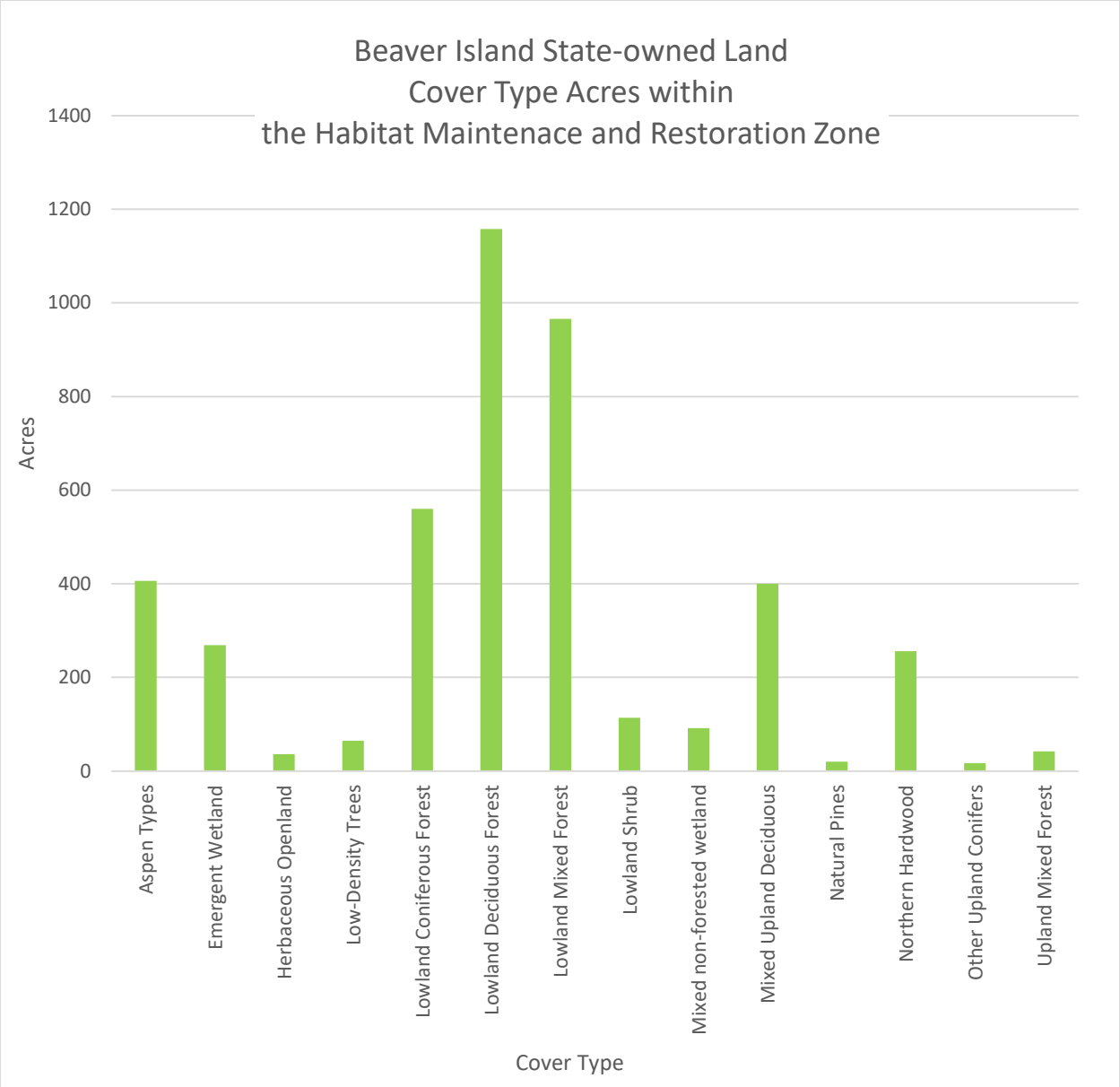

Figure 6. Habitat Maintenance and Restoration Zone cover type acres within State-owned lands on Beaver Island, 2019.

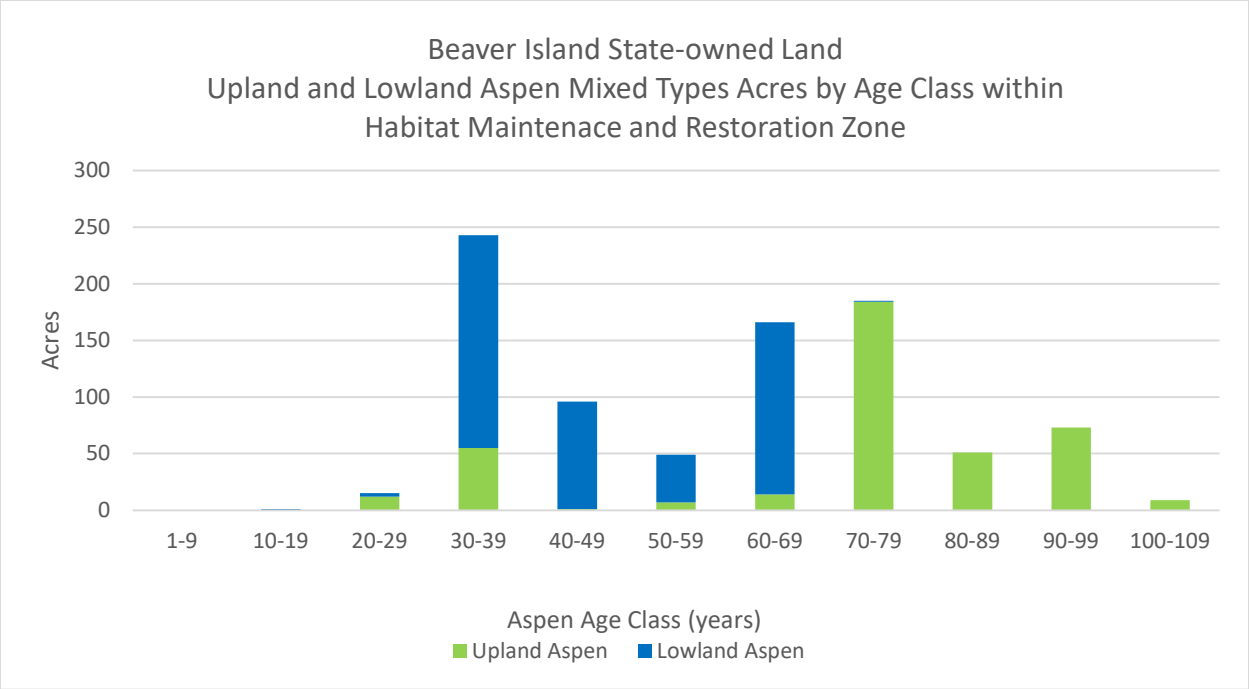

Figure 7. Habitat Maintenance and Restoration Zone acres of upland and lowland mixed aspen types by age class (years) within State-owned lands on Beaver Island, 2019.