NATURAL FEATURES OF BEAVER ISLAND: A LANDOWNER'S GUIDE

Acknowledgements

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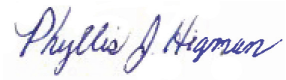
With gratitude,



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We collectively acknowledge that Michigan State University occupies the ancestral, traditional, and contemporary Lands of the Anishinaabeg – Three Fires Confederacy of Ojibwe, Odawa, and Potawatomi peoples. In particular, the University resides on Land ceded in the 1819 Treaty of Saginaw. We recognize, support, and advocate for the sovereignty of Michigan's twelve federally recognized Indian nations, for historic Indigenous communities in Michigan, for Indigenous individuals and communities who live here now, and for those who were forcibly removed from their Homelands. By offering this Land Acknowledgement, we affirm Indigenous sovereignty and will work to hold Michigan State University more accountable to the needs of American Indian and Indigenous peoples.

Cover photos: Bonner's Bluff (P. Higman); Dwarf lake iris Beaver Island Crew); Houghton's goldenrod (P. Higman), Ram's head lady-slipper (P. Higman); English sundew (Peter M. Dziuk); Lake Huron Tansy (E. Leuck), Calypso (C. Peirce); Pitcher's thistle (P. Higman); Butterwort (Peter M. Dziuk).

Other photos: P. Higman unless cited otherwise.

Congratulations and welcome to Beaver Island!




Now that you are a Beaver Island property owner you may want to learn more about what comes with the land that you just purchased. Your land may occur along the shores of Lake Michigan or an inland lake, it may be in the woods, or it may include old fields, grazing pastures, or orchards. Regardless, your land is home to suites of interacting plants and animals that you will fall in love with.

This booklet introduces you to the natural communities and rare and declining plant species (*natural features*) on the island to help you understand their importance so you can help protect them. *The natural features on or near your land provide the foundation for healthy ecosystems that are essential for a sustainable economy and thriving human communities on the island.* You can share in the responsibility of caring for the land by embracing and protecting the natural features on your property—they keep the island resilient and enable the way of life we all enjoy here.

Did you know that…

- …Beaver Island is home to over ***twelve*** vegetation types (*natural communities*), ***nine*** of which are *ranked vulnerable in the state*, ***four*** ranked *vulnerable globally*, and ***one*** ranked *imperiled both globally and in the state? **Five*** occurrences *are ranked as high quality.* The island is also home to ***thirty*** *rare or declining plant and animal species*, including ***thirteen*** listed as *federal and or state threatened or endangered.* How cool is that!


Pitcher's Thistle


Dwarf Lake Iris

- ...while the diverse natural vegetation on Beaver Island may seem untouched, it has actually been highly disturbed by the clearing of land for houses, schools, and businesses; farms, pastures, and orchards; and believe it or not, extensive logging of the Island's forests[1] during the peak of Michigan's logging era in the 1800's.

- …in spite of this disturbance, much of the natural vegetation is in recovery and can be protected? Why?

  First: The Island does not yet have bourgeoning development and population pressure.

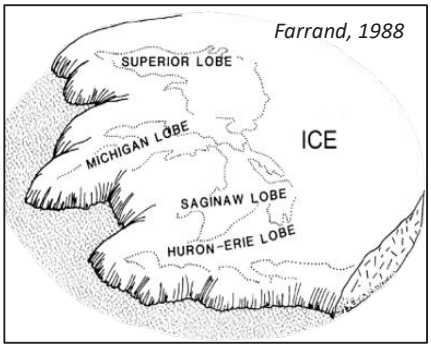
  Second: About one third of the island is owned by the state and is not open for development.

  Third: Islanders have been proactive about protecting the environment—they understand that the natural features of the island are the foundation for a sound economic future and strong property values.

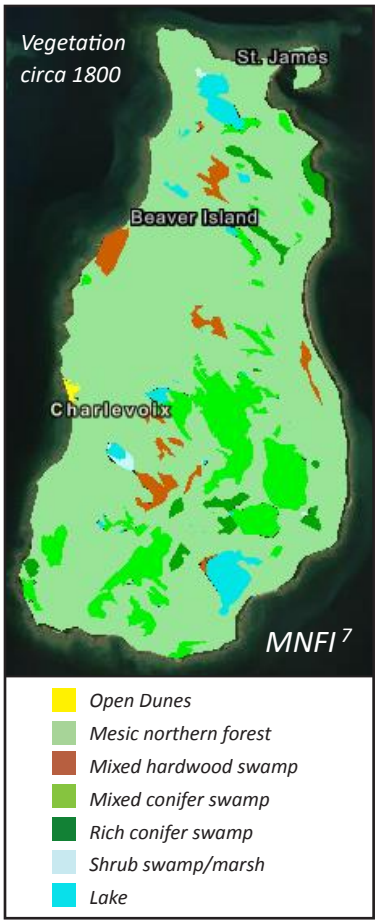
❖ …hundreds of hours have been spent on the collaborative development of a Master Plan[2] and an Implementation Plan for the Management of State-owned Land on Beaver Island[3], finalized and approved in 2023 and 2022, respectively. These plans help chart the way for keeping Beaver Island resilient into the future. These plans must be implemented and continually improved, rather than put on a shelf somewhere and forgotten. *You can help*!

Let's take a closer look…

What determines what plants grows where? There have been repeated advances and retreats of glaciers in Michigan[4,5]. These intimidating, mile-high ice sheets carried rocks, boulders, and other debris as they moved across the land, scraping, carving, and depositing, thereby molding the landscape as we know it today. They laid down and sorted soils and shaped the topography and hydrology of the land. What the glaciers left behind is a primary driver of what can grow where. As plants and animals returned to Michigan after the last glacial retreat approximately 10,000 years ago, recognizable groupings of plants and animals associated with the various parts of the sculpted landscape became apparent.



The Michigan Natural Features Inventory (MNFI) studied and interpreted the records of the early land surveyors who systematically surveyed almost every square mile of Michigan, identifying and measuring trees and describing the land and vegetation they encountered. Using these data, MNFI constructed a map of what the landscape was like prior to widescale European settlement in the early 1800s[6]. The map below left, shows the circa 1800 map as interpreted from these original surveys for Beaver Island[7]. Over many years of study and on-ground surveys, MNFI refined these maps and developed a classification of the different natural communities that occurred in Michigan at that time[9,10,11].



*Note: See page 6 for more details on Open Dunes on the Island.

What is a Natural Community?

"A natural community is an assemblage of interacting plants, animals, and other organisms that repeatedly occurs under similar environmental conditions across the landscape and is predominantly structured by natural processes rather than modern anthropogenic (human-created) disturbances"[8].

In short, they are native ecosystems established after the last glacial retreat that have been little disturbed by humans. The species assemblages of each community evolved together over thousands of years and have long-established relationships with one another. *Naturally occurring processes specific to each natural community type sustain them—processes such as small- or large-scale wind-throw by storms, fire, groundwater flow, flooding, water level fluctuations, and insect outbreaks.*

Natural Communities on Beaver Island today…

The descriptions on the following pages provide brief introductions to many (not all) of the common and otherwise unique natural communities on the island, and pictures of some of the characteristic plant species you might find in each. As you explore these, you will soon learn that many plant species occur in many different natural communities!

So, to determine the natural community type, additional factors must be considered, including soil type and pH, hydrology, natural disturbances, and plant species and abundance in each layer of the community—the ground layer, shrub layer, mature tree layer (canopy), and even super-canopy trees in some communities.

Don't fret! Just have fun exploring the land and seeing what you can find; a lifetime of exploration is just outside your door. Notice how plants look different at different times of the year. How many species can you recognize before and after flowering? (Check out Sea Rocket; page 8.) Seek out the many knowledgeable Islanders and Island friends that can help you learn more about your land, and check out the additional resources provided in Appendix D.

The natural communities and a category for human-created uplands are presented in the order below:

Great Lakes Shoreline Upland Natural Communities

- Open Dunes
- Limestone Cobble Shore
- Sand and Gravel Beach

Great Lakes Shoreline Wetland Natural Communities

- Interdunal Wetland

Forested Upland Natural Communities

- Boreal Forest
- Dry-mesic Northern Forest
- Mesic-northern Forest

Forested Wetland Natural Communities

- Rich Conifer Swamp
- Poor Conifer Swamp

Non-forested Wetland Natural Communities

- Poor Fen
- Bog
- Inland Emergent/Submergent Marsh

Human-created Uplands

- Cropland, Pastures, Orchards, and Old Fields

McCauley's Point Open Dune

Barney's Lake Emergent Marsh

West Side Drive through Mesic Northern Forest

Open Dunes – Great Lakes Shore Non-Forested Upland

Global and State Vulnerable (G3, S3)

The Great Lakes is home to the largest freshwater dunes in the world! They are formed by wind-blown sands that were carried and deposited by the melting waters of the receding glaciers, approximately 10,000 years ago. They are dynamic systems that are constantly shifting, driven by the wind and Great Lakes water levels.

A diverse group of grasses, shrubs, and wildflowers are adapted to these disturbances and the hot, dry environment. However, they are vulnerable to repeated disturbances by people, pets, and vehicles, which can crush plants, increase rates of erosion, and disturb sites required for germination. Undisturbed areas of sand are critical for some species.

Beach Grass

Canada Wild Rye

Sand Reed Grass

Many of the species shown below can be found at Bonner's Bluff, Cable's Bay, Donegal Bay, French Bay, Greene's Bay, Iron Ore Bay, Lookout Point, McCauley's Point, McFadden's Point, Petritz Preserve, and Sand Bay. Explore and enjoy these remarkable dunes and see what you can find—but be mindful of their vulnerability.

Four rare plants have been documented in Open Dunes on the Island: ***Federal and State Threatened Pitcher's Thistle*** (p. 28), ***State Threatened Pumpelly's Brome*** (p. 31), ***State Special Concern Lake Huron Tansy*** (p. 29), and ***State Threatened Clustered Broomrape*** (p. 30). The thistle and tansy are common, the brome was last formally documented in 1998, and the broomrape in 1958. Keep an eye out for them!


Creeping Juniper


Sand-dune Willow


Bearberry

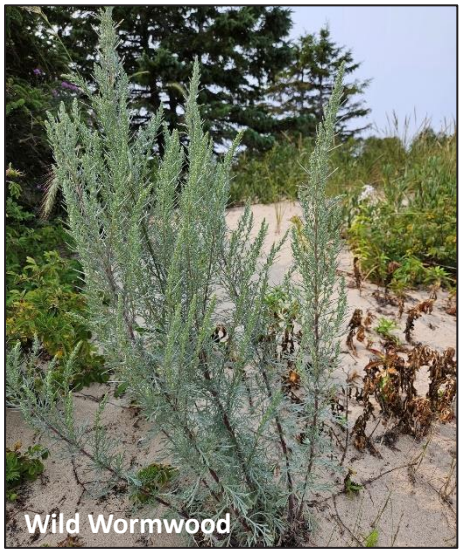

Sand Cherry

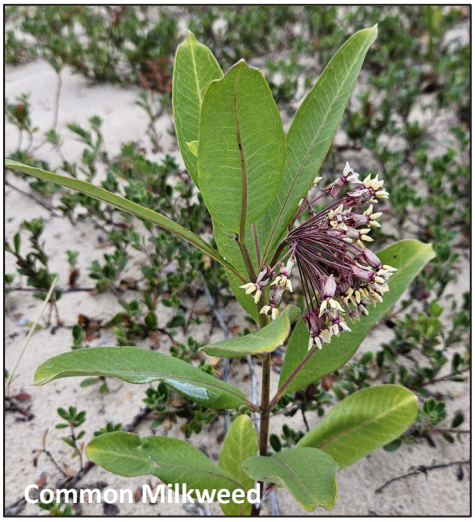

Liana N. May
Wood Lily


White Camus


Harebell


Hairy Puccoon


Wild Wormwood


Common Milkweed


Sand Coreopsis

What about Critical Dune Areas?

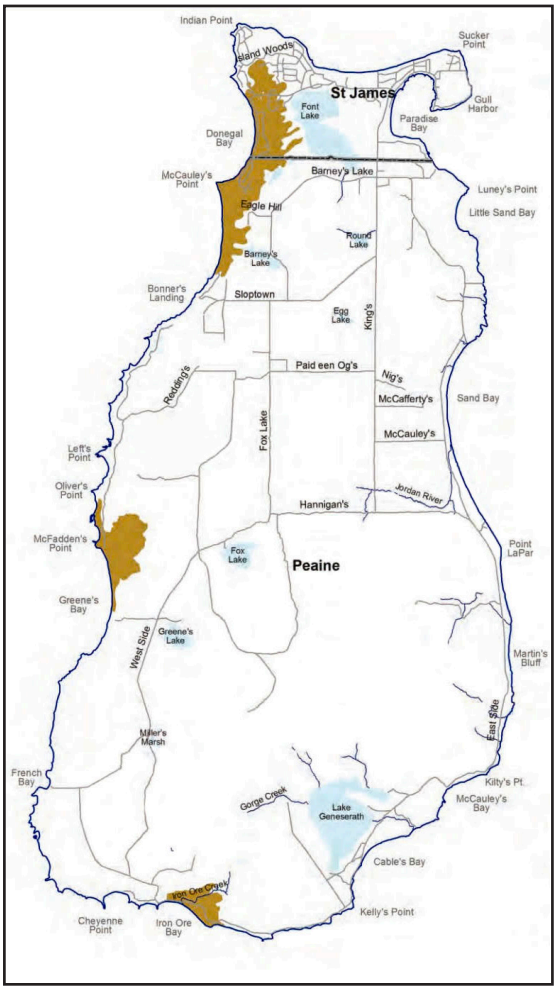
The first law to regulate Michigan's sand dunes was the Sand Dune Protection and Management Act of 1976. It was in response to sand mining, which had resulted in full-scale removal of some of Michigan's largest dunes[12]. As residential and recreational development pressure increased along the Great Lakes coastal zone in the 1980's, it was recognized that there was potential for further harm to Michigan's extensive coastal dunes. Approximately 74,000 acres of dune along 265 miles of Great Lakes shoreline were mapped and designated as Critical Dunes Areas (CDAs). An amendment to the original Act was passed in 1989, to regulate activities in the CDAs. The intention of this legislation is to balance the benefits of economic development, multiple uses, and public access with the benefits of protecting, preserving, restoring, and enhancing the diversity, quality, functions, and value of the Critical Dune Areas[13].

Critical Dune Areas include public and private property on the shores of Lakes Michigan and Superior. Developmental, silvi-cultural (forestry), and recreational activities in CDAs are regulated and require a permit under Part 353, Sand Dunes Protection and Management, of the NREPA. Regulatory authority goes to the water's edge[14].

An atlas with mapped locations of CDAs, organized by county and township is available online (p. 52-54)[15]. There are CDAs in both Peaine and St. James Townships as shown in brown on the map to the right. Public and private lands are shown on the on-line maps.

The MiEnviro Portal[16], a Map Explorer, is also available online, which enables users to zoom in and determine if a land-owner's property is in a CDA. Users can also find properties with past and pending permit applications in Michigan's CDAs.

If your property is in a Critical Dune Area, the first step is to contact the Island Townships' Zoning Administrator. Regulatory and per-mitting decisions are made on a site by site basis.



Federal and State Threatened Pitcher's Thistle (p. 28) or State Special Concern Lake Huron Tansy (p. 29) are most likely to occur on these properties, but State Threatened Clustered Broomrape (p. 30) and State Threatened Pumpelly's Brome (p. 31) could also be found. Keep your eyes open for the teeny-tiny broomrape that lacks the green pigment chlorophyll, and the tall, graceful brome grass that has purple-flushed fruits with hairy margins—they have both been observed on the Island before and it would be awesome to find them again!

There may also be Interdunal Wetlands (p. 9) in Critical Dune Areas that could harbor the late-blooming Federal and State threatened Houghton's Goldenrod (p. 32) or the carnivorous State Special Concern Butterwort (p. 33). This would be a delight!


McCauley's Point Looking North

Limestone Cobble Shore – Great Lakes Shore Non-Forested Upland

Global Imperiled to Vulnerable, State Vulnerable (G2G3, S3)

This shoreline community occurs where limestone or dolomite cobble—naturally rounded stones that are bigger than a pebble and smaller than a boulder—lie on top of sand along Great Lakes coastal shores.

Due to Great Lakes storm waves and changing water levels, only sparse vegetation can grow between the stones; typically grasses, sedges, rushes, and wildflowers, with occasional saplings and stunted trees.

Pitcher's Thistle (p. 28), ***Lake Huron Tansy*** (p. 29), ***Pumpelly's Brome*** (p. 31), ***Michigan Monkey-flower*** (p. 37), and ***Houghton's Goldenrod*** (p. 32), sometimes extend onto cobble shores from their primary habitats.

Balsam Poplar

Little Green Sedge *(Carex viridula)*

Rush

Kalm's Lobelia

Grass-leaved Goldenrod

Limestone Calamint

Sand and Gravel Beach – Great Lakes Shore Non-Forested Upland

Global Vulnerable [inexact], State Vulnerable **(G3?, S3)**


Joshua G. Cohen

Sand and Gravel Beach occurs along the Great Lakes shores directly adjacent to the water's edge. Vegetation is sparse here due to wave action and ice abrasion, which make it hard for many plants to get a foothold.

Sea Rocket, Silverweed, and Beach Pea are able to establish and are commonly found sprawling across the sand. They are able to disperse effectively in this wave-washed community.

Pitcher's Thistle, Lake Huron Tansy, and Pumpelly's Brome (p. 28, 29, 31) occasionally extend from Open Dune onto Sand and Gravel Beach.


Sea Rocket leaves


Sea Rocket flowers


Sea Rocket fruits


Sea Rocket seedlings


Silverweed


Beach Pea


Pam Grassmick

Piping Plover breeding adult

The Great Lakes shores are famous for having some suitable nesting habitat remaining for the ***Federal and State Endangered Piping Plover*** (*Charadrius melodus*). This small migratory shore-bird ***nests and feeds in coastal Sand and Gravel Beaches*** from April through mid-July to early September, and then departs on its long migration back to its wintering grounds in the Gulf Coast. ***Active nesting sites, including High Island's sand spit, are off-limits from April 15 to July 15 to protect the young.***

The majority of their Great Lakes habitat has been lost due to alteration and development of the coastal zone. Extensive efforts are made every year to identify and protect nesting sites. Eight chicks fledged in the wild on High Island spit in 2023—a record for the site. The Piping Plover has nested on Beaver Island historically and it would be exciting to see it happen again!

Interdunal Wetland – Great Lakes Shore Non-Forested Wetland

Global Imperiled [inexact], State Imperiled (G2?, S2)

Interdunal Wetlands occur in sandy depressions within Open Dunes and between beach ridges on the Great Lakes shores. Soils are typically calcareous (vs acidic), from traces of calcium in the shoreline sands. They are dominated by shrubs, rushes, and sedges, with a diversity of wildflowers. Well-known Interdunal Wetlands occur at Little Sand Bay and Donegal Bay along the shoreline between dune ridges.

Three rare species are known from Interdunal Wetlands: ***State Special Concern Butterwort*** (p. 33), ***State Special Concern English Sundew*** (p. 34), and ***Federal and State Threatened Houghton's Goldenrod*** (p. 32). Walking through these wetlands to get to the lake alters the hydrology and crushes plants. Avoid this by using appropriate raised boardwalks.


Baltic Rush


©2015 Katy Chayka

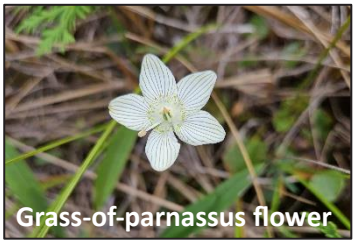
Baltic Rush fruits


Small Fringed Gentian


Indian Paintbrush


Bird's-eye Primrose


Bird's-eye Primrose


Grass-of-parnassus flower


Bird's-eye Primrose leaves


Grass-of-parnassus leaves


©2007 Peter M. Dziuk

Horned Bladderwort


False Asphodel flowers


False Asphodel fruits


Balsam Ragwort


R. W. Smith

Purple False Foxglove


Ohio Goldenrod


Ohio Goldenrod leaves


Panicled Aster

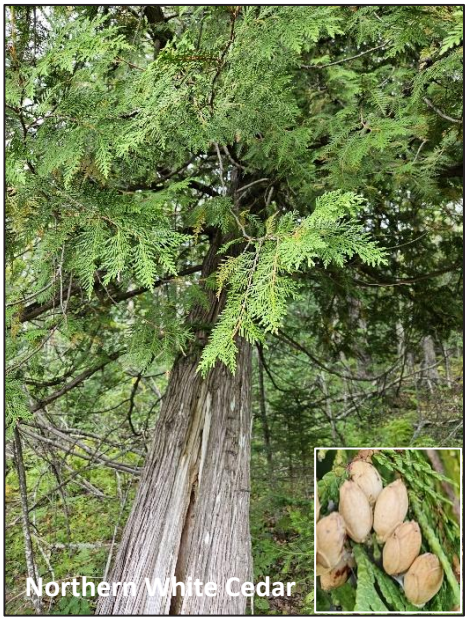
Boreal Forest – Upland Forest

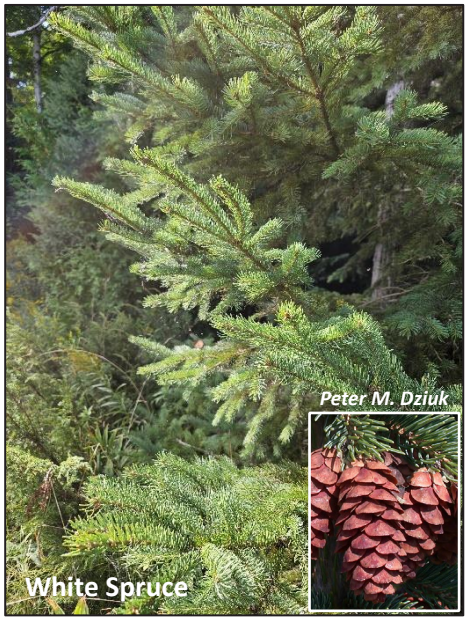
Global Unrankable, State Vulnerable (GU, S3)

Boreal Forests are upland forests on sandy or sandy loam soils that are not saturated with water. The soils overlie bedrock or cobble and thus the trees are shallow rooted. Dominant trees include Northern White Cedar, White Spruce, and Balsam Fir.

They occur mostly along the northern Great Lakes shores, and often have an abrupt boundary between adjacent natural communities. They are exposed to high shoreline winds, and downed trees are common.

These forests provide critical feeding, roosting and perching habitat for migrating shorebirds, waterfowl and songbirds in the spring.





Boreal Forests occurs in the northern portion of Little Sand Bay and along the southwest shoreline. They are fun to explore, but with their abundant downed trees, be prepared for difficult traversing under the canopy.

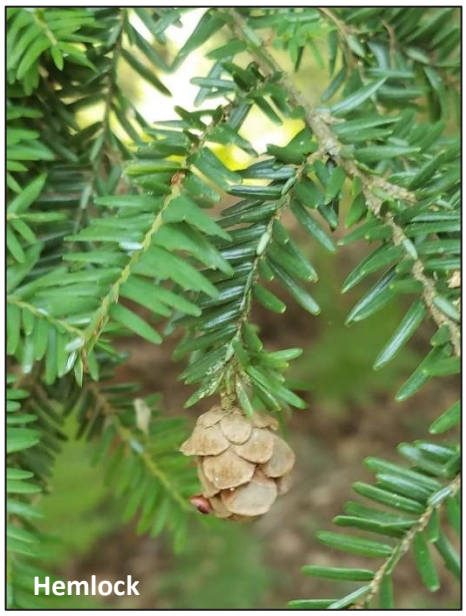
Federal and State Threatened Dwarf Lake Iris (p. 35) often occurs at the lakeward edge of Boreal Forests, extending just beyond the canopy where there is more sunlight, which boosts flowering. ***State Threatened Calypso*** (p. 38) and ***State Special Concern Ram's Head Lady-slipper*** (p. 36) can also occur in Boreal Forests.

Dry-mesic Northern Forest – Upland Forest

Global Apparently Secure, State Vulnerable (G4, S3)

This upland forest occurs on well drained sandy soils. It is dominated by pines and hardwoods that historically originated after infrequent catastrophic fires. To maintain this forest type, periodic low intensity fire is necessary—it creates light and soil conditions favorable to the dominant tree species: White Pine, Red Pine, Hemlock, and Red Oak.

In the Lower Peninsula, ***State Special Concern Ram's Head Lady-slipper*** (p. 36) and ***State Threatened False Violet*** *and* ***Pine-drops*** occur in Dry-mesic Northern Forests. To date, only the Ram's Head Lady-slipper has been documented on Beaver Island, the latter two have been documented on the mainland.


Hemlock


Red Oak

Red Oak acorns

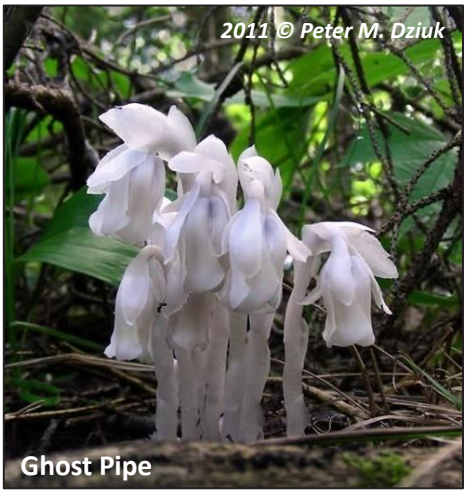

Huckleberry


Bracken Fern

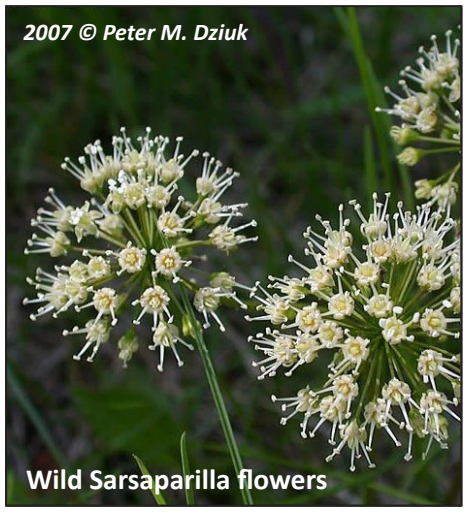
Pink Lady-slipper


Huckleberry fruits

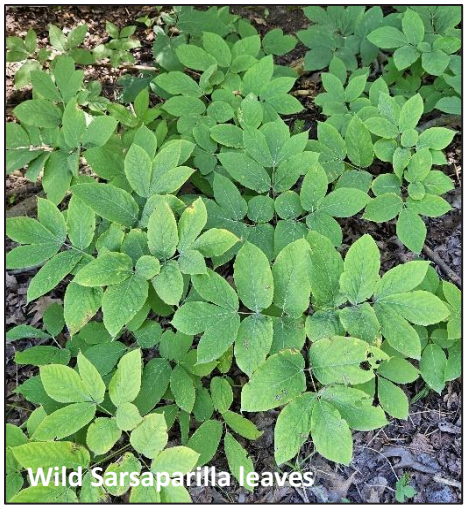

Wild Columbine



Ghost Pipe



Wild Sarsaparilla flowers


Wild Sarsaparilla leaves


Star-flower

Mesic Northern Forest – Upland Forest

Global Apparently Secure, State Vulnerable (G4, S3)

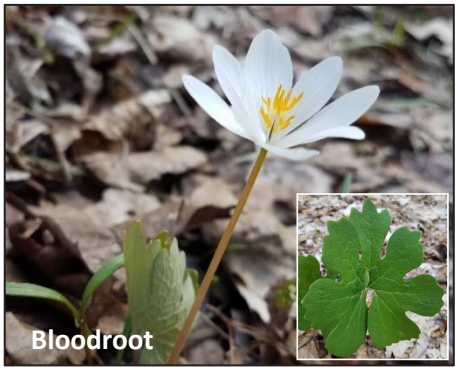
These forests are dominated by Sugar Maple and American Beech trees, with associates of White Ash, Yellow Birch, and Basswood, and White Pine and Hemlock conifers.

It is the dominant upland forest type on the Island and although hard to imagine today, these forests were almost completely cut in the late 1800's just after the peak of logging on the mainland[1]. Current mesic forests on Beaver are second or third growth forests.

These forests regenerate by the creation of small canopy gaps from windfall trees. Light reaches the seedlings in the gap so they can grow and mature. Trees of all ages occur in these forests. These multi-generational forests, with large, old growth trees, once dominated vast areas of the Great Lakes Region.

These forests are known for their spring wildflowers that flourish in the sunlight prior the canopy hardwoods leafing out. Plan an early spring trip to the island, so you can see them in flower! The rich soils also support a diversity of ferns and clubmosses—these lack showy flowers. No rare plants are currently documented in Beaver Island's Mesic Forests.


2004© Peter M. Dziuk
Round-lobed Hepatica


Bloodroot


Carolina
Spring Beauty

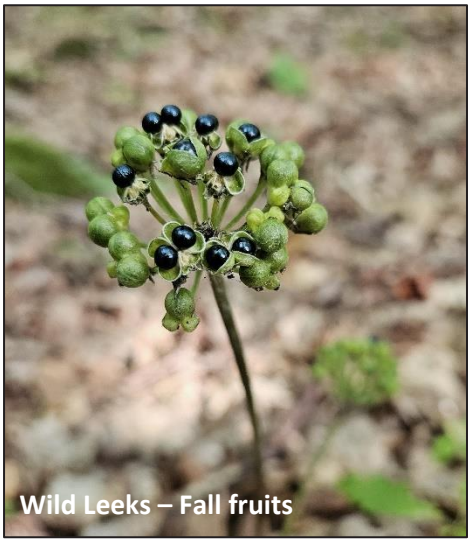

C. Peirce
Dutchman's-breeches


R. Schipper
Yellow Trout Lily


Common Trillium


Yellow Violet


Wild Leeks - Spring leaves


Wild Leeks – Fall fruits


Downy Soloman-Seal


Stiff Clubmoss


Ostrich Fern


©2014 Peter M. Dziuk
flowers of Downy
Solomon-seal


Maidenhair Fern

Rich Conifer Swamp – Forested Wetland

Global Apparently Secure, State Vulnerable (G4, S3)

This forested wetland has soils that are composed of partially decomposed vegetation (peat), that are saturated with mineral-rich groundwater and covered by a thick layer of mosses.

Northern White Cedar dominates, and Tamarack, Spruces, and White Pine are common associates.

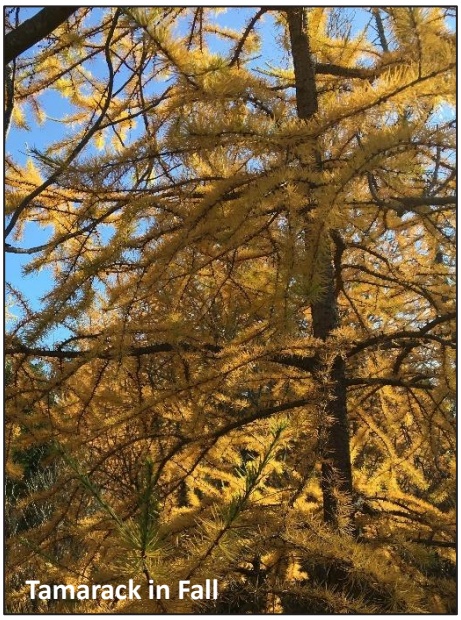
Because the peat is saturated with water, oxygen is only available near the surface, resulting in shallow and spreading roots. Wind-throw causes downed and leaning trees, forming a complex environment that provides habitat for a diversity of species.

Exploration is challenging, like it is for Boreal Forests; but there is a lot to see and it is wet and wonderful!

Northern White Cedar

Peter M. Dziuk

Black Spruce



Tamarack in Fall

Tag Alder

Jack-in-the-Pulpit

Goldthread

This forest type depends upon small scale wind-throw events to ensure regeneration of the long-lived cedar that dominates the canopy. Cedar is the main winter food source for deer, and high deer populations can impede cedar regeneration. ***State and Federal Endangered Michigan Monkey-flower*** (p. 37) can be observed in seeps and streams in the Rich Conifer Swamp at Little Sand Bay. Keep an eye out for ***State Threatened Calypso*** (p. 38) or ***State Special Concern Ram's Head Lady-slipper*** (p. 36), which also are known to occur in Rich Conifer Swamps.


Showy Lady-slipper


Naked Miterwort leaves

Naked Miterwort flowers

Skunk-cabbage

Bulblet Fern

Jewelweed


Wild Blue Flag

Bluebead Lily


Sensitive Fern


Dwarf Raspberry

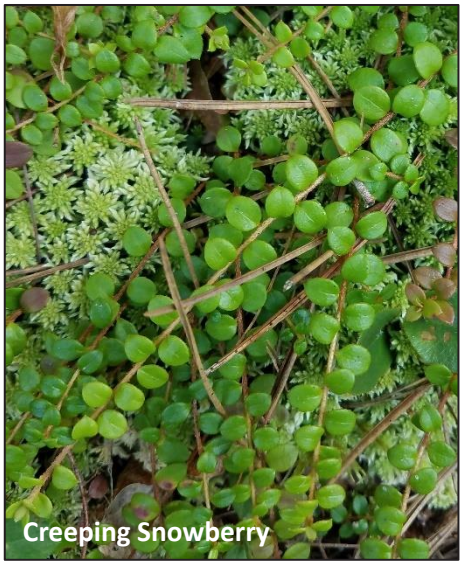
Poor Conifer Swamp – Forested Wetland

Global Apparently Secure, State Apparently Secure (G4, S4)

Poor Conifer Swamp has extremely acidic soils of partially decayed vegetation (peat) that buffer it from a strong influence of nutrient-rich groundwater and therefore is lower in nutrients. It is dominated by conifers, especially Black Spruce, shrubs from the Heath Family (*Ericaceae*) such as Leatherleaf and Blueberries, and Sphagnum Mosses.

It has many species in common with Poor Fens and Bogs but has at least 25% cover by mature trees and/or more than 50% cover by shrubs > 1.5 m tall. Trees and tall shrubs in fens and bogs are widely scattered and stunted. Currently, no endangered, threatened, or special concern plants are known from Poor Conifer Swamp on the Island.

Like Rich Conifer Swamps, the soils of Poor Conifer Swamps are saturated with water, limiting oxygen availability, and trees are shallow-rooted and susceptible to windthrow. Insect herbivory is also common. These factors result in dead standing trees (snags), woody debris, and canopy gaps that provide habitat for a diversity of plants and animals. Big mounds of Sphagnum Mosses occur throughout—be careful when venturing into this impressive forested wetland!



Poor Fen – Non-Forested Wetland

Global Vulnerable, State Vulnerable (G3, S3)

Poor Fens have acidic, water-saturated soils composed of partially decomposed vegetation (peat) like Poor Conifer Swamps, but they lack cover by tall mature trees. They receive water from precipitation and some exposure to groundwater. The vegetation is dominated by sedges, with scattered shrubs and stunted conifers.

The saturated soils limit oxygen for plant decomposition, and partially decomposed vegetation builds up over time, accumulating among the interwoven rhizomes (underground stems) and roots of sedges. Over time, this peat gradually separates the wetland from groundwater. Poor Fens, however, are still moderately influenced by groundwater.

Where mineral-rich groundwater brings nutrients into the community, species that thrive in high nutrients conditions will usually be present. Indicator Species (reflecting mineral-rich groundwater) include Wiregrass Sedge, Michigan Holly, Mountain Holly, Buckbean, Marsh Cinquefoil, and Bog Sedge. Poor Fens, Bogs, and Poor Conifer Swamps typically occur together in large wetland complexes and it is difficult to draw exact lines between them—nature is full of Transition Zones! Areas where there is less groundwater influence may appear more bog-like. *Navigate these wetlands carefully and keep track of where you are—map and compass advised—so you can emerge safely!*

State Special Concern English Sundew (p. 34) is known to occur in bogs, all types of fens, interdunal wetlands, and on volcanic bedrock. It has been reported in Poor Fen and Interdunal Wetland on the Island.

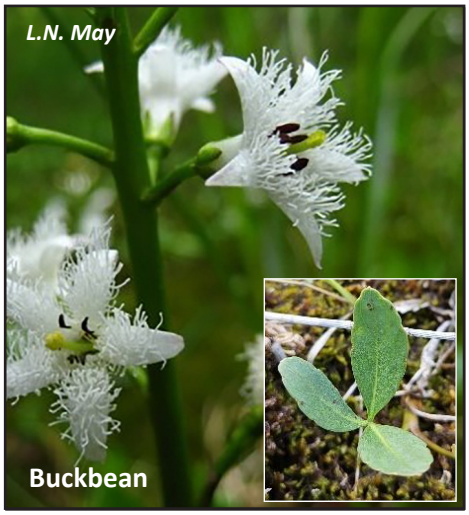

Michigan Holly

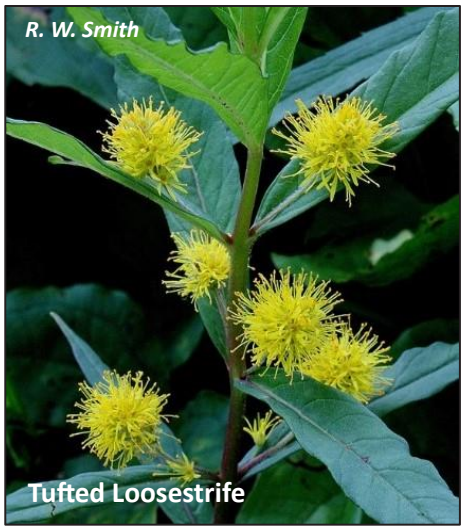

Mountain Holly


Chokeberry


Flat-leaved Bladderwort


Rush Aster





Bog – Non-Forested Wetland

Global Vulnerable to Secure; State Apparently Secure (G3G5, S4)

Bogs occur on acidic, saturated soils of partially decayed vegetation (peat) with a deep carpet of Sphagnum Mosses. Sphagnum holds huge amounts of water, keeping oxygen levels low, slowing the decay of vegetation. As Sphagnum keeps expanding and peat accumulates, it eventually separates the wetland from the groundwater completely. Bogs receive water and nutrients primarily from precipitation—rain, snow, sleet, and hail.

High quality Bogs occur on the southeast portions of Fox and Greene's Lake but, no rare species have been documented at either site *yet*. ***State Special Concern English Sundew*** (p. 34) is a candidate!

Bogs are notable for many colorful species of Sphagnum Mosses and insectivorous plants, including Pitcher Plant, Spatulate-leaved Sundew, and Round-leaved Sundew. However, these species can also be found in Poor Fens and Poor Conifer Swamps. Linear-leaved Sundew (p. 34) prefers non-acid conditions, such as those of Interdunal Wetlands.


Pitcher Plant leaf


Pitcher Plant flower


2005 © Peter M. Dziuk
Spatulate-leaved Sundew


R.W. Smith
Dragon's Mouth


Liana N. May
Round-leaved Sundew

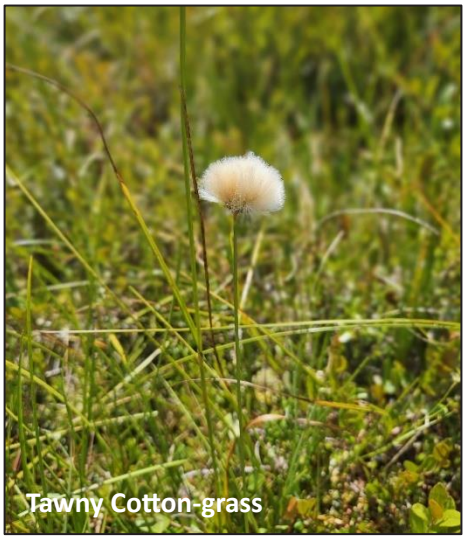

Grass-pink


Cranberry


2005 © Peter M. Dziuk.
Rose Pogonia


stunted Tamarack


Sphagnum Moss


Tawny Cotton-grass

Emergent and Submergent Marsh – Non-Forested Wetland

Global Unrankable; State Apparently Secure (GU, S4)

These marshes are non-forested, herbaceous wetlands on the shores of inland lakes and streams with water depths of six inches or more throughout the growing season. Together, Submergent and Emergent Marshes include plants that grow submerged in the water, plants with leaves that float on the water, and plants that emerge out of the water.

The only rare marsh species currently documented from Beaver Island is the ***State Special Concern American Shore-grass*** (p. 39), which occurs in Fox Lake. This population is noteworthy as the southern-most occurrence in the state; all other known occurrences are in the Upper Peninsula.

Marshes along the Great Lakes shores are classified separately as ***Great Lakes Marsh***—vegetation is similar but unlike inland marshes, they are influenced by the water levels of the Great Lakes, which can fluctuate dramatically in the short term, in a season, and from year to year. The Shore-grass has not yet been documented in Great Lakes Marsh.

Sweet-scented Waterlily

Yellow Pond-lily

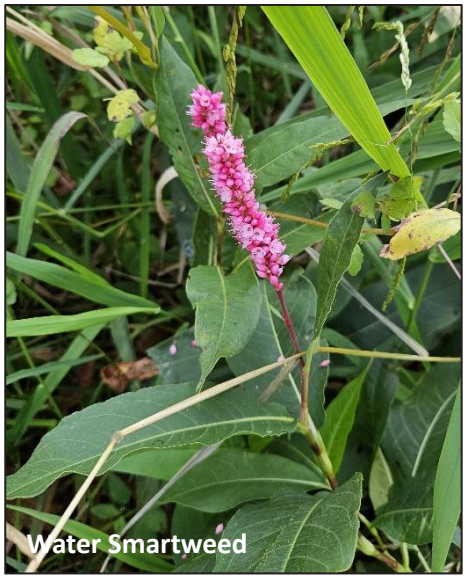
Watershield

R.W. Smith


©2008 Katy Chayka
©2008 Katy Chayka
Common Arrowhead


Pickerel-weed


Swamp Milkweed

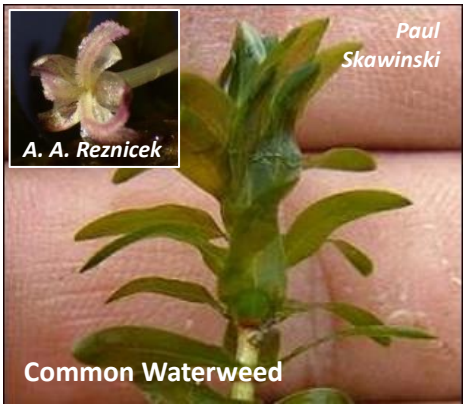

Water Smartweed


Hop Sedge

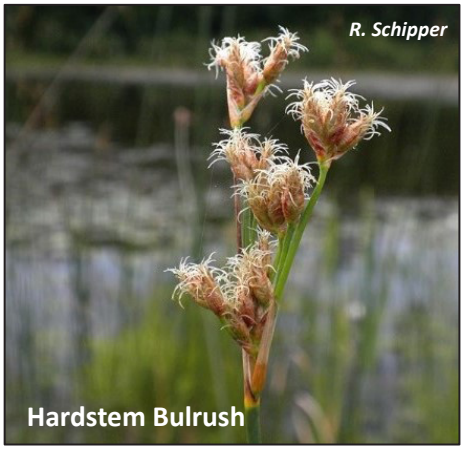

B. S. Walters
Green-fruited Bur-reed


B. S. Walters
Boneset


©2006 Katy Chayka
Joe-pye-weed


Paul Skawinski
A. A. Reznicek
Common Waterweed


Threesquare


R. Schipper
Hardstem Bulrush


2013 ©Peter M. Dziuk
Richardson's Pondweed

Human-created Open Uplands–Crop Lands, Pastures, Orchards, Old Fields

Not a Natural Community, Not ranked

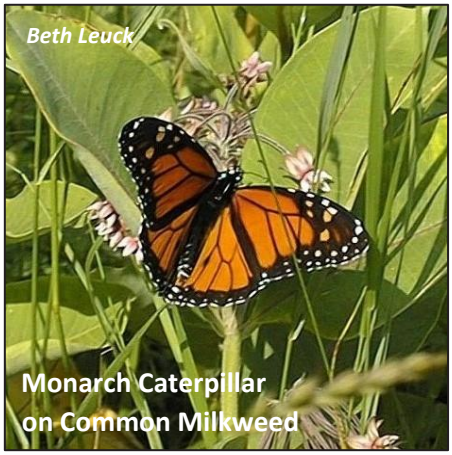
These are disturbed areas that have been cleared and built upon, farmed, grazed, planted to orchards, or otherwise dramatically altered from the native vegetation for human needs. They may still be in active production, or abandoned lands dominated by old field vegetation, or partially recovered lands with some species native to the Island.

A primary concern for these areas is to determine if any *non-native invasive species* (p. 40) are present that pose a threat to less disturbed natural areas on the Island.

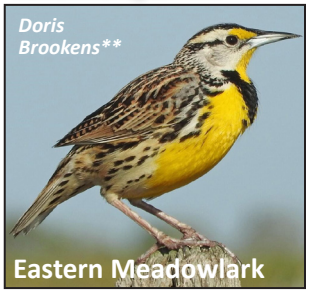
Invasive species typically get their first foothold by colonizing disturbed lands. Eventually, they spread into natural communities, taking food, water, and shelter away from the native species. Some of the most problematic species, such as Autumn Olive, Eurasian Honeysuckles, and Spotted Knapweed, have already reached the Island, but these invasions are not anything like the widespread invasions on the mainland yet. *Now is the time to stop their reproduction and dispersal.*

Some of these sites benefit desirable species, such as Monarch Butterflies. They lay their eggs on Milkweed plants because that is the only thing that their hatchling caterpillars can eat.

Common Milkweed thrives in Open Dunes and some Human-created Uplands on the Island, providing suitable sites for Monarchs to lay their eggs. The Milkweed nourishes the emerging caterpillars, enabling them to pupate and transform into adult butterflies that will make the over-2000 mile journey to their wintering grounds in Mexico.



Monarchs are in dramatic decline throughout their range primarily due to development, rampant use of pesticides, and climate change[17]. *Be sure to protect Milkweed on your property; it is a critical resource that will help sustain Monarchs*.



Many grassland birds are in decline for the same reasons as Monarchs, as well as fire suppression which allows shrubs and trees to establish in open lands. Birds such as Bobolink, Eastern Meadowlark, Grasshopper and Savanna Sparrow, Dickcissel, Upland Sandpiper, Horned Lark, and Lapland Longspur are able to hang on by using pockets of old farmland or pastures. These birds are ground nesters and mowing sites where they occur *before late July* will harm the nest, eggs, or young chicks. *Refrain from early mowing if your property has open uplands*.

Eastern Bluebirds utilize shrubby open lands and nest in tree cavities. They have made a come-back due to the use of nest boxes and a decline in pesticide use by property owners.

These Human-created Uplands currently provide critical stop-over sites for hundreds of migrating grassland birds. They need native plants that support the native insects they must eat to fuel their long migration journey south (see pp. 42-43).

*Macaulay Library at the Cornell Lab of Ornithology. (*ML274800761, **ML52473861, ***ML250241071)*

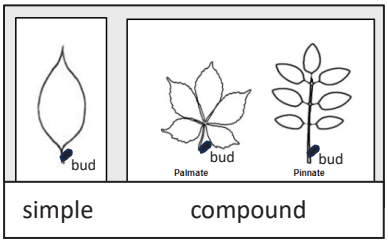
Rare and declining plant species known on Beaver Island…

It is possible that you could be harboring one or more rare plants on your property and can help them flourish!

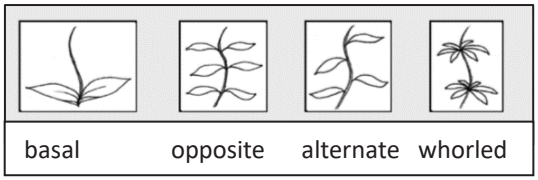
Rare plants are most likely to be found on coastal shoreline properties, especially Pitcher's Thistle and Lake Huron Tansy. New occurrences of Butterwort, Dwarf Lake Iris, Houghton's Goldenrod, and Clustered Broomrape are less likely to be discovered, but keep a lookout for them. There are almost certainly occurrences of Ram's Head Lady-slipper and Calypso to be discovered on the Island, and it is even conceivable that you could find a rare species not yet formally documented. The Island is approximately 55.8 square miles, with 35,712 acres of land, and more eyes are needed to survey private lands especially. If you don't find any rare species, no worries, enjoy the more common native species; they are just as fun to learn about.

Review the following detailed descriptions of the rare and declining plants on the Island to help confirm if you might have one. When in doubt, take well-focused pictures of the parts that distinguish the plant, and note or take pictures of the habitat and other species it is growing with as best you can. Experienced plant observers can usually confirm species from good photos showing important identification characteristics, the habitat type, and some associated species. Below is a cheat-sheet you can use.

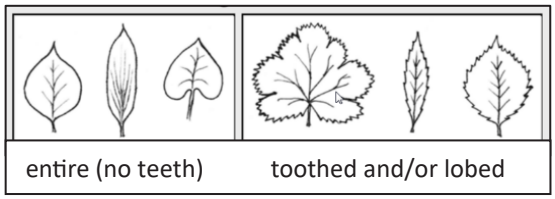
❖ ***Are the leaves simple or compound?***
(*a single leaf or multiple leaflets*)



❖ ***How are the leaves arranged?***

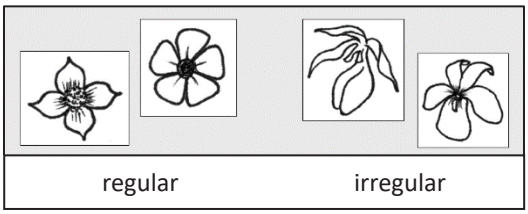


❖ ***What are the leaf margins like?***



❖ **Are the flowers difficult to see?**
- *Maybe it's a grass, sedge, moss, or clubmoss.*

❖ ***Are the flowers regular or irregular?***



❖ ***How many petals are there?***

❖ ***What color are the petals?***

❖ ***What time of year was it flowering?***

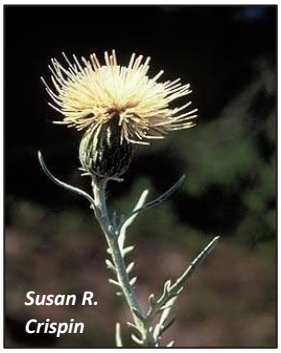
❖ ***What are the roots like?***

❖ ***Is it in a wetland or an upland?***

❖ ***What other species are growing with it?***

Sketches by Jennifer Kleitch

The currently known rare plant species on Beaver Island are detailed in the following pages, but before you go there, can you identify any of the species below? They may occur on your property!



Pitcher's Thistle (*Cirsium pitcheri*) – Open Dune

Federal and State Threatened (LT, T); Global and State Vulnerable (G3, S3)

Pitcher's Thistle is known ***only from the shores of the Great Lakes and no where else in the world***!

Natural Communities: Pitcher's Thistle occurs in Open Dune, occasionally extending to Sand and Gravel Beach and Limestone Cobble Shore.

Known Locations on Beaver: Bonner's Landing, Little Sand Bay, Cable's Bay, Donegal Bay, French Bay, Iron Ore Bay, Lookout Point, McFadden's Point, Petritz Preserve, and Sand Bay.

Roots: Its ***deep tap root*** enables it to withstand harsh dune conditions, but it does not regenerate new plants.

Stem and Leaves: It begins as a ***basal rosette*** of spine-tipped ***blue-green, white-woolly leaves*** with ***long, narrow lobes***. Leaves alternate up the stem when it flowers.

Flowers: After ***~2-8 years***, it produces ***large, cream-colored or slightly pink-tinted***, spine-tipped ***flower heads***.

Reproduction: It reproduces ***only by feathery seeds*** dispersed by wind. ***It only flowers and seeds once, then it dies.***

Best Survey Time: Flowering typically occurs from ***late June to early September***. It can be recognized throughout the growing season but is harder to distinguish after it senesces.

Protection: It is adapted to the dynamic, shifting dunes and can withstand sand burial, extreme heat, and desiccation. It requires bare sand to germinate.

- Maintain the natural dune processes and native dune species.
- Avoid dense plantings of other species, or trampling by humans, pets, or vehicles.
- Monitor and control invasive species.


Wild Wormwood rosette


Wild Wormwood fruit

Similar Species: The blue-green color, white-woolly leaves, and white flowers distinguish this from other thistles. However, ***it is easily confused with Wild Wormwood*** and ***invasive Spotted Knapweed*** *(sometimes referred to as Star Thistle)* before flowering**.**

Wild Wormwood *(Artemisia campestris)* has similar ***blue-green basal rosettes***, but its:

- ***leaves are branched*** and ***lack white-woolly hairs***, and it has
- spikes of ***small, spherical fruits.***

Spotted Knapweed (*Centaurea stoebe*) has:

- ***dark, green rosettes***, with ***wider lobes***
- and ***smaller, bright pink*** flower heads.
- **It is a prolific invader and a primary threat to native dune species**.


Spotted Knapweed rosette


Spotted Knapweed flowers

Lake Huron Tansy (*Tanacetum bipinnatum*) – Open Dune

State Special Concern (SC); Global Secure, State Vulnerable (G5, S3)

Natural Communities: This tansy occurs in Open Dune and sometimes extends into Sand and Gravel Beach and Limestone Cobble Shore.

Known Locations on Beaver: Bonner's Landing, Cable's Bay, Donegal Bay, Cheyenne Point, French Bay, Iron Ore Bay, Little Sand Bay, Lookout Point, McCauley's Bay, and McFadden's Point.

Leaves: ***Finely divided and hairy leaves*** emerge as ***basal rosettes*** and ***alternate along*** the ***stem*** when flowering.

Flowers: Approximately ***3-12 yellow flowerheads*** are borne at the tip of long stalks. Each head is comprised of ***many central disk flowers*** surrounded by a ***single circle of tiny ray flowers*** on the outer edge. The ***heads are large***, approximately ***½ - ¾ inches broad***.

Reproduction: It has ***long, slender underground stems*** (rhizomes) from which new plants arise. It also produces ***abundant seed***.

Best Survey Time: This species blooms from ***late June through July*** and ***can be recognized*** by its large brown fruit ***through September***.

Protection: Lake Huron Tansy is adapted to active dunes and can withstand burial by windblown sand and wave action.

- Maintain the dynamic natural shoreline communities.
- Avoid trampling or crushing by humans, pets, or vehicles.
- Monitor and control invasive species.

Similar Species: Lake Huron Tansy is distinct from other flowers by its large, yellow flower heads with a circle of ray flowers around the edge. However, when it is not in flower, the basal leaves can be confused with Garden Tansy, Silverweed, and Yarrow.

The non-native **Garden Tansy** (*Tanacetum vulgare)* is most similar, but it has:

- ***many more, much smaller, flower heads,***
- ***less finely divided leaves*** with ***no hairs,*** and
- it is ***invasive and spreads rapidly,*** forming ***dense colonies.*** Keep an eye out for it!

Silverweed (*Potentilla anserina*) has similar basal rosettes, but the leaves:

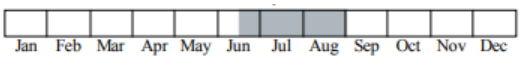
- are ***less finely divided,*** and
- ***distinctly whitened beneath***.

Yarrow (*Achillea millefolium*) leaves are:

- ***narrower*** and ***more delicately divided***, and
- its ***flower heads*** have fewer, ***cream-colored disk flowers*** and **prominent, white ray flowers**.

Clustered Broomrape (*Orobanche fasciculata*) – Open Dunes

State Threatened (T); Global Apparently Secure, State Imperiled (G4, S2)



Natural Communities: Clustered Broomrape occurs in Open Dune habitats which can be found on Beaver, High, North Fox and South Fox Islands within the Beaver Island Archipelago.

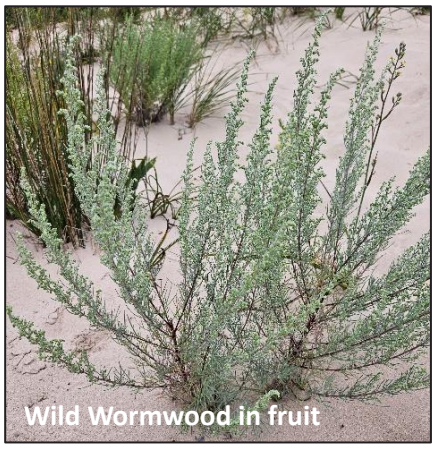
Known Locations on Beaver Island: This species has been reported from Donegal Point, Iron Ore Bay, and McFadden's Point.

Stem and Leaves: Clustered Broomrape is ***only 2-5.5 inches tall***. ***Part*** of the ***stem is underground***; the ***remaining portion emerges above ground***, with ***tiny***, ***hairy***, ***pale yellow-brown, scale-like leaves***.

Flowers: Clusters of ***pinkish-white, sticky flowers*** emerge on stalks from the stem tips. ***Yellow splotches in the throat*** of the flower guide potential pollinators to its sweet nectar.

Host Plant: Broomrape ***lacks the green pigment chlorophyll*** and cannot produce its own food. Throughout its range it ***relies on native host-plants by parasitizing them*** *for nutrients.* The only host plant documented to date in Michigan is ***Wild Wormwood*** (*Artemisia campestris*).

Best Survey Time: It typically flowers in ***late June*** but is ***easier to spot*** when it begins to produce ***fruit in late July and August*** as its darker brown color contrasts better against the sand.



Biodiversity Considerations:

- The primary consideration for this species is to sustain populations of its host plant Wild Wormwood, that it depends upon for nutrients.
- Both Clustered Broomrape and Wild Wormwood are vulnerable to trampling by people, pets, and vehicles, and require the dynamic dune processes to maintain germination sites.
- Monitor and control invasive species.

Similar Species: The more common **Cancer Root** (*Orobanche uniflora*) can easily be confused with Clustered Broomrape, but:

- ***only flower stalks*** (no stems) ***emerge above ground,***
- the base of the flowering stem has ***scales that are not hairy***, and
- its similar ***flowers*** typically have a ***blue or purple tint***, compared to the pinkish white cast of Clustered Broomrape.

Pumpelly's Brome (*Bromus pumpellianus*) – Open Dune

State Threatened (T); Globally Secure; Taxonomy Uncertain, State Imperiled G5T5, S2

This dune grass is a disjunct species in Michigan, isolated from its main range in Alaska, northwest Canada, and southward to the Rocky Mountains and Black Hills in the United States.

Natural Communities: Pumpelly's Brome occurs in Open Dunes and occasionally extends into Sand and Gravel Beach and Limestone Cobble Shore.

Known Locations on Beaver Island: Historically, it has been documented at Petritz Preserve, Bonner's bluff, and Donegal Bay.

Stem and Leaves: ***stems*** are ***usually pubescent*** with distinct ***long hairs*** at or adjacent to the ***nodes***; ***leaf blades*** are ***alternate*** and ***pubescent on the upper surface***, smooth or sparsely pubescent below.

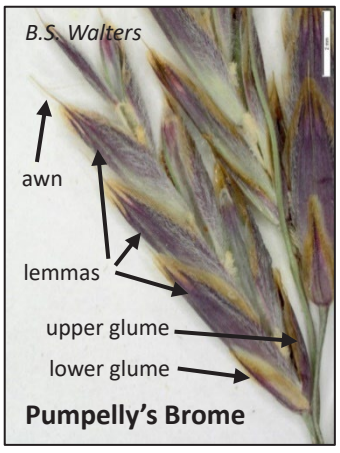
Flowers/Fruits:

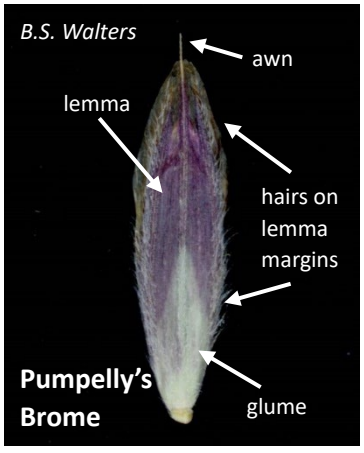
- **lower glume** with **one distinct nerve**; **upper glume** with **3-5 nerves**
- **lemmas** usually **flushed with purple, pubescent** with **hairs ≥ 0.5 mm long on margins**
- **short awns** (bristle at tip of lemma) mostly **1.5-4 mm long**

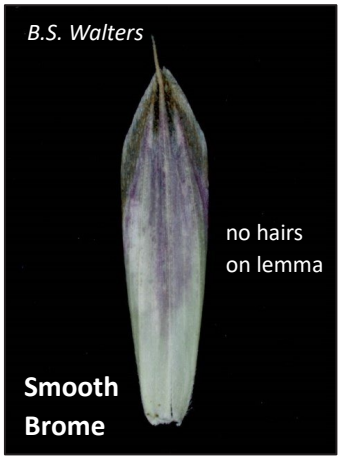
Roots: This brome has **elongate underground stems** (rhizomes).

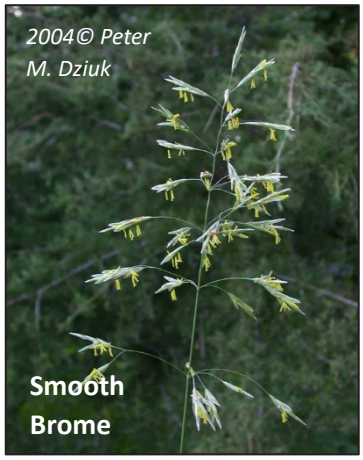
Reproduction: This perennial grass spreads primarily by rhizomes in Michigan. It can also produce seeds.

Best Survey Time: it is most easily detected by its purple flushed lemmas with long-hairy margins during full fruit in **July and August.**









Protection:

- Maintain the dynamic natural shoreline communities.
- Avoid trampling or crushing by humans, pets, or vehicles.
- Monitor and control invasive species.

Similar Species:

Smooth Brome (*Bromus inermis*) **is most similar,** but

- the ***lemmas*** and ***stems*** are ***not hairy,*** and
- it is a ***very weedy species*** found mostly along roadsides, in old fields, and disturbed ground.

Other brome grasses in Michigan differ by one or more of the following characters:

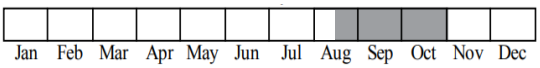
- **longer awns**
- **lack of elongate rhizomes**
- **three or more distinct nerves** on the **lower glume** and **five to seven nerves** on the **upper glume**

Other dune grasses are easily distinguished and include:

- **Beach Grass** (*Ammophila breviligulata*; p. 4)
- **Sand Reed Grass** (*Calamovilfa longifolia;* p 4)
- **Canada Wild Rye** (*Elymus canadensis*; p. 4)
- **Wheat Grass** (*Elymus lanceolatus; blue-green leaves*)
- **Little Bluestem** (*Schizachyrium scoparium; clumped*)
- **Big Bluestem** (*Andropogon gerardii; clumped*)

Houghton's Goldenrod (*Solidago houghtonii*) – Interdunal Wetland

State and Federal Threatened (T, LT); Global and State Vulnerable (G3, S3)



This species is known from the ***northern shores of Lake Michigan and Lake Huron*** and ***nowhere else in the world!***

Natural Communities: This is an Interdunal Wetland species, but it can extend onto Limestone Cobble Shore and Sand and Gravel Beach.

Known Locations on Beaver Island: To date, It has only been found at Donegal Bay, where it appears to be declining.

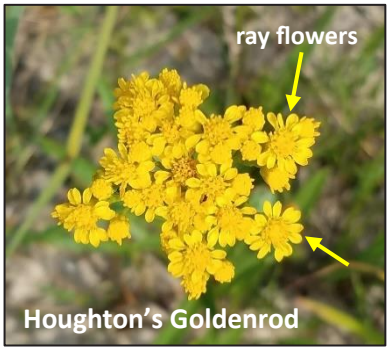
Leaves: It emerges as a ***basal rosette*** of ***lance-shaped, often folded leaves, less than 1 cm wide***. Leaves ***alternate*** up the flowering stalk ***decreasing in size to the top***. The leaves have ***no teeth***.

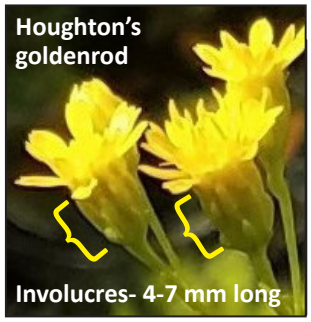
Flowers: It has a ***flat-top inflorescence*** of ***yellow flower heads*** at the tip of the stem. The heads are borne on ***finely hairy stalks*** and have ***conspicuous outer ray flowers*** that are ***3-4.5 mm long.*** The ***group of bracts*** (involucre) at the base of the flower heads is ***4-7 mm long***.

Reproduction: It spreads by ***short underground stems*** and by ***seed***.

Best Survey Time: It is best to conduct surveys from ***late August to early October,*** after peak flowering of the very similar Ohio Goldenrod.

Protection: Shoreline development is the primary concern for this species. Education about the presence and significance of interdunal wetlands will help avoid unintended impacts.





- Maintain hydrology of the wetland.
- Avoid activities in the wetland.
- Consider a raised board-walk over the wetland.
- Monitor and control invasive species

Similar Species: Two other flat-topped goldenrods occur in Interdunal Wetlands on the Island:

Ohio Goldenrod (*Solidago ohioensis*) has:

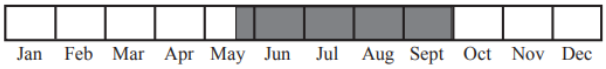
- ***flat and wider basal leaves***,
- ***tiny ray flowers*** **(1.5-3 mm)**, and
- ***flowering stalks*** that ***lack hairs***.

Grass-leaved Goldenrod (*Euthamia graminifolia)* has:

- narrow ***linear leaves*** the same size all the way up the stem,
- ***tiny ray flowers,*** and ***leaves*** that ***smell nice*** when crushed.

Voss's Goldenrod** (*S. vossii*) has ***big ray flowers too, but **longer *involucres (7-9 mm)***. It occurs inland and is not included here.

Butterwort *(Pinguicula vulgaris)* – Interdunal Wetland, Limestone Cobble Shore, Sand and Gravel Beach. *State Special Concern (SC); Global Secure, State Vulnerable (G5, S3)*



Natural Communities: Butterwort occurs in Interdunal Wetland on Beaver Island, but can extend into Limestone Cobble Shore, and Sand and Gravel Beach. Elsewhere, it also occurs in fens, and marshy soils near bogs, and on alkaline bedrock.

Known Locations on Beaver Island: Butterwort has been found at Donegal Bay and Little Sand Bay.

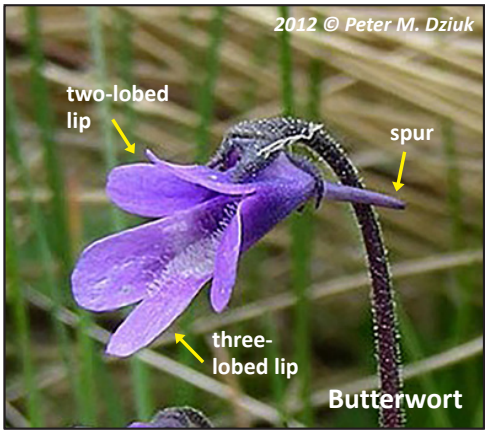
Leaves: It has ***buttery yellow, basal rosettes of leaves*** with ***sticky*** upper surfaces that ***trap small insects***, and secrete enzymes to ***digest them for nutrients***.

Flowers: Spurred, ***blue-purple flowers*** with ***lobed lips*** and a ***white mouth***, are ***borne singly*** at the ***tips of leafless stalks***. Rosettes often produce multiple stalks.

Reproduction: Small ***capsules*** with ***several seeds*** form in July and August. It also ***overwinters as a small resting bud*** and ***new leaves emerge in spring***.

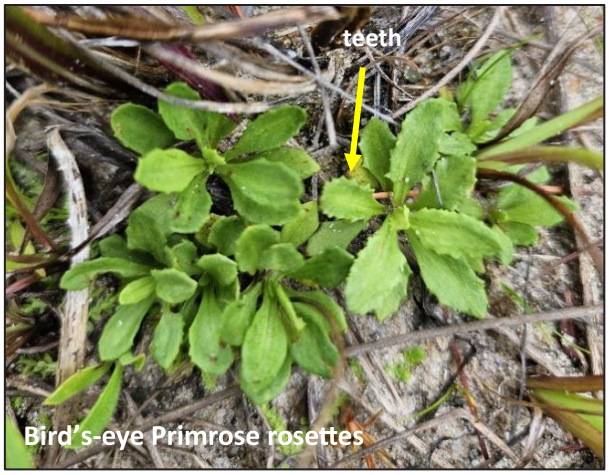
Best Survey Time: Basal leaves can be detected throughout the growing season, but it is a delight to see the flowers from ***late May through June***.

Protection: This tiny plant is easily over-looked, and is vulnerable to trampling and modification of its wetland habitat.



Try to find this species in late May to early June and be sure to protect its habitat.

- Consider raised boardwalks to cross over it.
- Maintain the natural shoreline vegetation.
- Monitor and control invasive species.

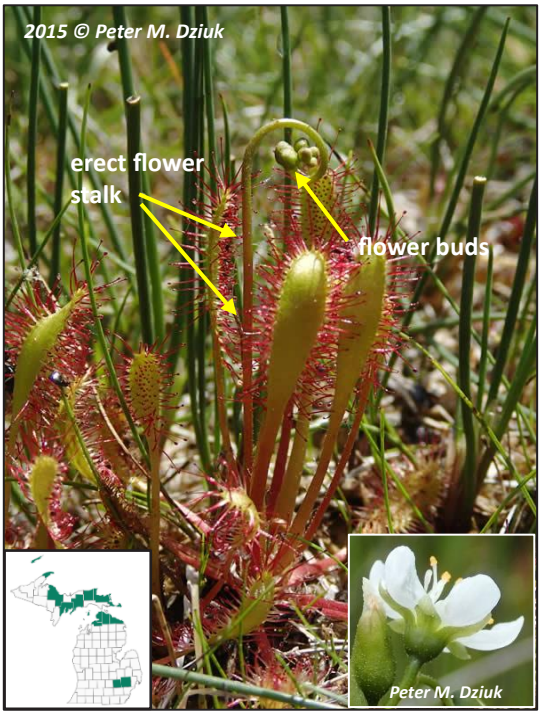


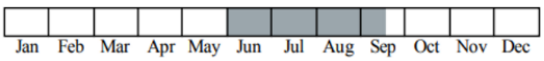
Similar Species: The basal rosettes of **Bird's-eye Primrose** (*Primula mistassinaca*) can have a similar yellowish cast, but the:

- ***leaves are smaller*** with ***teeth*** on the ***margin***,
- ***leaves*** *aren't* ***sticky***,
- ***flowers are symmetrical*** with five equal (notched) lobes, and
- ***flowers*** range from ***nearly white to bright pink***.

English Sundew (*Drosera anglica*) – Interdunal Wetland, Poor Fen, Bog

State Special Concern (SC); Global Secure, State Vulnerable (G5, S3)





Natural Communities: English Sundew is found in Interdunal Wetlands, Poor Fens, and Bogs.

Known Locations on Beaver Island: It has been found at Donegal Bay.

Stems and Leaves: It has ***paddle-shaped*** leaves on long, ***sparsely hairy stalks***. Red hairs with ***glands*** on the ***upper side*** of the blades ***produce a sticky liquid*** that ***traps insects to extract nutrients***.

Flowers: Leafless ***flower stalks arise straight up*** from the center of the rosette, and multiple ***tiny, white flowers*** emerge with ***five petals***.

Reproduction: It produces ***seeds*** and ***new shoots from leaf buds***.

Best Survey Time: The leaves can be observed as early as late May; but it is ***easier to distinguish*** from other sundews ***after it matures***, from ***June to early September***. It is best to inspect the flower stalk to identify this species and check with an expert for confirmation.

Protection: It is vulnerable to over-collection and alteration of hydrology. Avoid habitat destruction, maintain hydrology, keep a large natural buffer around its habitat, and monitor and control invasive species.

Similar Species: Three other sundews are known from Michigan and are much more common than English Sundew:

The most similar **Spatulate-leaved Sundew** (*Drosera intermedia*) has:

- ***smaller leaf blades ~2-4 mm*** wide,
- ***flower stalks*** that ***arise laterally before curving upward***, and
- ***leaf stalks*** that ***lack hairs***.

Linear-leaved Sundew (*Drosera linearis*) has leaf blades that are:

- ***parallel-sided***, and
- ***7-20 times as long as wide.***

The common **Round-leaved Sundew** (*Drosera rotundifolia*) has:

- ***round leaf blades***, and
- ***hairs on its leaf stalks.***

Dwarf Lake Iris (*Iris lacustris*) – Boreal Forest, Mesic Northern Forest, Rich Conifer Swamp

Federal and State Threatened (LT, T); Global and State Vulnerable (G3, S3)

Dwarf Lake Iris is ***Michigan's State Flower,*** known ***only*** from the ***shores*** of ***northern Lakes Michigan and Huron*** and ***nowhere else in the world!***

Natural Communities: It occurs mostly at the edges of Boreal Forest, extending into Limestone Cobble Shore and Sand and Gravel Beach. It also occurs in thin soil over limestone bedrock (Alvar) in Upper Michigan.

Known Occurrences on Beaver Island: Several large populations have been documented on the southern shores of the Island, as well as along road and trail sides so step and drive with care!

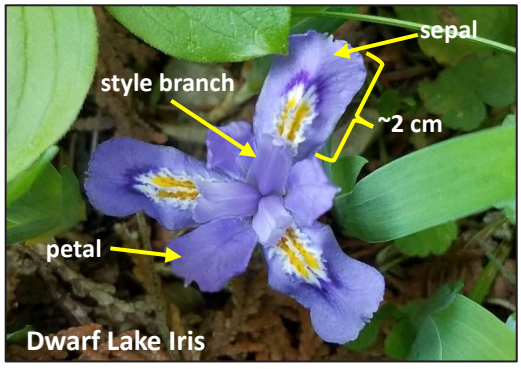
Leaves and Stems: Fans of ***flat, narrow leaves*** emerge from ***slender, underground stems*** (rhizomes), with ***enlarged nodes*** where older leaves used to be. ***Leaves*** are ***up to 15 cm tall*** and about ***1-2 cm wide***.

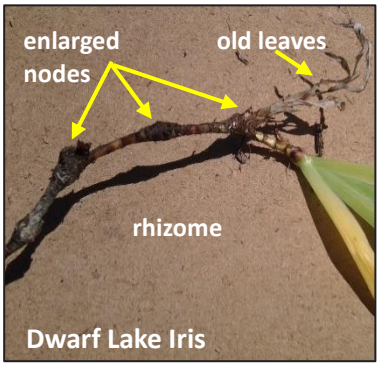
Flowers: The ***miniature, deep blue flowers*** are only ***4 cm wide*** and ***6.5 cm tall*** and lie ***close to the ground***. They have ***three orange-crested, sepals*** and ***three smaller blue-purple petals*** between them. The three petal-like structures directly above the orange crests are a ***branched style***—the pollen receptors (stigmas) are on the underside of these.

Reproduction: It spreads by ***forking of the rhizome*** and ***occasionally produces seeds*** that are dispersed by ants.

Best Survey Time: It is one of the earliest plants to flower in Spring, from ***mid-May through June***. Each flower lasts about three days.

Protection: Shoreline use and development is its biggest threat.





- Avoid trampling,
- post informational signs, and
- monitor and control invasive species.

Similar Species:

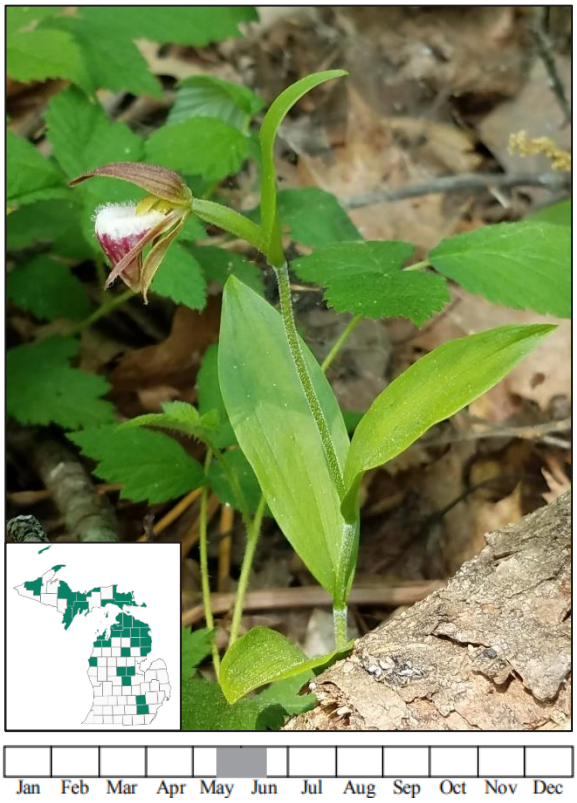
False Asphodel (*Triantha glutinosa*) can be confused with Dwarf Lake Iris prior to flowering as its ***leaves are flattened at the base.*** However, it:

- ***does not have slender rhizomes***
- has ***sticky stalks*** with clusters of ***white flowers***, and ***bright red fruits***.

Native ***Wild Blue Flag*** (*Iris versicolor*):

- is much ***larger and taller***, and
- ***lacks slender rhizomes***.

Ram's Head Lady-slipper (*Cypripedium arietinum*) – Dry-mesic Northern Forest, Boreal Forest, Rich Conifer Swamp. *State Special Concern (SC); Global and State Vulnerable (G3, S3)*



Natural Communities: Ram's Head Lady-slipper can occur in Boreal Forest, Rich Conifer Swamp, and Dry-mesic Northern Forest, and occasionally it extends into Limestone Cobble Shore.

Known Locations on Beaver Island: It has been reported at various sites around the Island but specific locations are kept confidential due to its sensitivity.

Stem and Leaves: It is ***Michigan's smallest lady-slipper orchid,*** only reaching ***0.7-3 dm*** in height, and has ***2-5 bluish green, elliptic stem-leaves*** with ***fine hairs*** on the ***margins***.

Flowers: The colorful pouched lower lip is ***purple, crimson, or green-streaked***, and has a ***downward cone-like projection*** at the bottom.

Reproduction: It produces a ***small upright capsule*** with ***abundant, minute seeds,*** and also produces ***offshoots***.

Best Survey Time: Surveys are most effective during the flowering period in ***late May to early June***. It is notoriously difficult to find.

Protection: This orchid is vulnerable to trampling, too much shade, and very high light levels.

- Avoid excessive canopy-cutting and maintain a wooded buffer.
- Sustain natural disturbances, including wind throw.
- Monitor and control invasive species.

Similar Species: Prior to flowering**, False Mayflower** (*Maianthemum trifolium*) can be mistaken for Ram's Head Lady-slipper.

- It has ***similar leaves***, but they ***lack hairs*** on the margin, and are typically ***wider*** and ***smoother***.
- It has a ***spike of symmetrical white flowers*** with five petals.

Similar Species:
Ram's Head Lady-slipper differs from **other lady-slipper orchids** in northern Michigan by its:

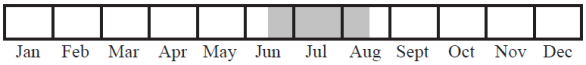
- tiny ***½ - ¾ inch flowers***,
- ***conical pouch*** shape, and
- smaller, ***narrower leaves***.

Calypso (*Calypso bulbosa):*

- is ***slightly larger***,
- ***lacks stem leaves***, and
- has ***yellow hairs*** at the mouth of its pouch.

Michigan Monkey-flower (*Mimulus michiganensis*) – Rich Conifer Swamp, Emergent Marsh

Federal and State Endangered (LE, E); Global and State Critically Imperiled (G1, S1)



This species is the ***only plant known to occur solely in Michigan!***

Natural Communities: It is known from cold springs, seeps, and streams often in Rich Conifer Swamp and shaded Emergent Marsh. It can extend into Limestone Cobble Shore and Sand and Gravel Beach, but not far from the shaded forest edge.

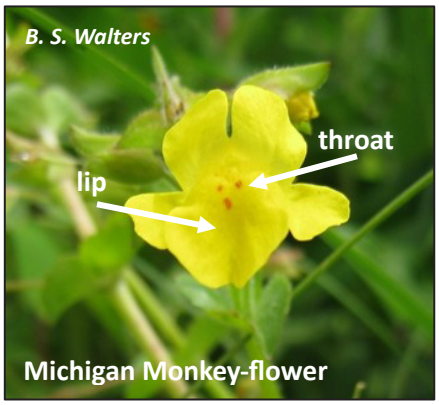
Known Locations on Beaver Island: It has been documented at Little Sand Bay and other locations along the northeast shoreline.

Stems and Leaves: Stems are ***prostrate*** and ***mat-forming,*** and have ***roundish***, ***opposite leaves*** with ***coarse teeth*** along the margin.

Flowers: Bright ***yellow, snapdragon-like flowers*** extend on short, slender stalks and have a ***red-spotted lower lip and throat***. Flowers are ***16-27 mm long***. The ***styles*** that hold the sticky stigmas (pollen receivers) are ***8.1-9.1 mm long***—this is the most consistant character to distinguish it from James' Monkey-flower.

Reproduction: It spreads primarily by ***above-ground stems*** that root at the nodes. To date, ***fertile seed*** has been ***documented at only one site*** in Michigan in 1986.

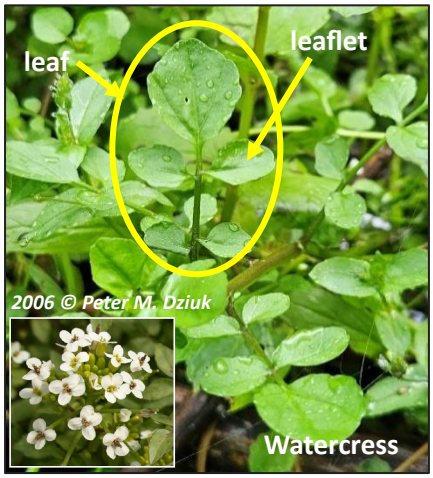
Best Survey Time: The size of flowers and leaves are useful in distiguishing this from James' Monkey-flower, but flowers are necessary to confirm it. Blooming typically occurs from ***mid-June to mid-August***.



Protection: This monkey-flower thrives in cool, clear, and well oxygenated water. Small-scale windthrow of trees creates openings for sunlight, providing optimal conditions for flowering

To help sustain populations:

- Avoid trampling.
- Maintain the cold-water source.
- Prevent disruptions to water flow, oxygenation, and turbidity (cloudiness).
- Monitor and control invasive species.



Similar Species: James' Monkey-flower (*Mimulus glabratus*) is **smaller,** with:

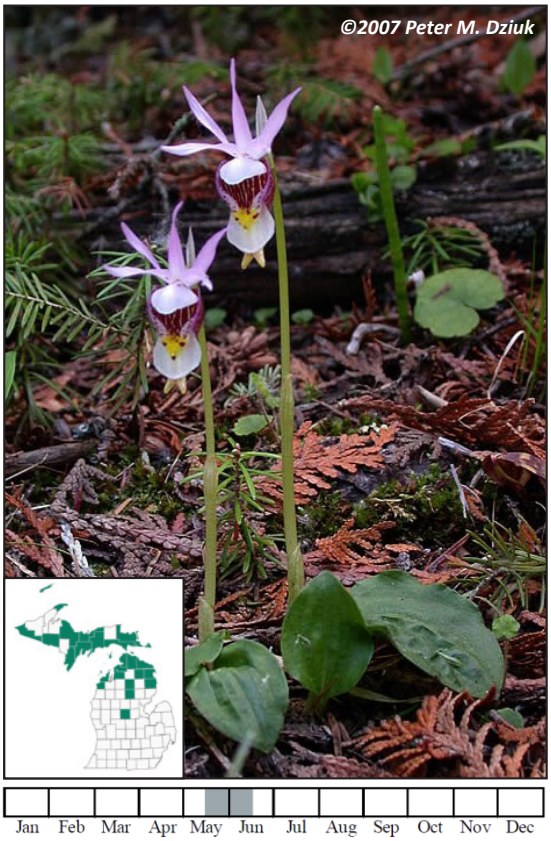
- ***flowers 8-18 mm long,***
- ***less coarsely toothed leaves,***
- ***red spots in the throat only,*** and
- ***smaller styles (2.8-4.6 mm long).***

Watercress (*Nasturtium* spp.) commonly occurs with Michigan Monkey-flower. The Watercress can be distinguished by its:

- ***leaves*** with ***multiple leaflets*** and
- ***four-petaled white flowers.***

Calypso (*Calypso bulbosa*) – Rich Conifer Swamp, Boreal Forest, Dry-mesic Northern Forest

State Threatened (T); Global Secure, State Imperiled (G5, S2)



Natural Communities: Calypso occurs in Boreal Forest, Dry-mesic Northern Forest, and Rich Conifer Swamp.

Known Locations on Beaver Island: It has been reported historically in wet coniferous woods near the Lake Michigan shoreline.

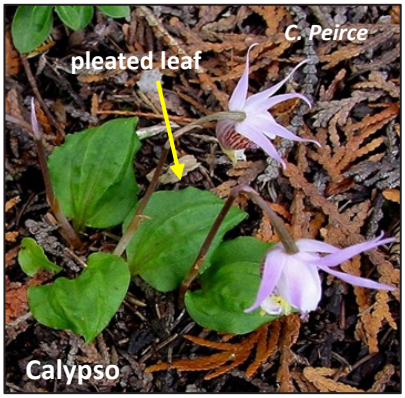
Leaves: Each plant produces a ***single, roundish, and pleated basal, leaf*** that is dark green and ***lays flat to the ground***. The leaf ***fades after flowering*** and in late summer a ***new leaf emerges that overwinters*** and lasts until flowering the next year.

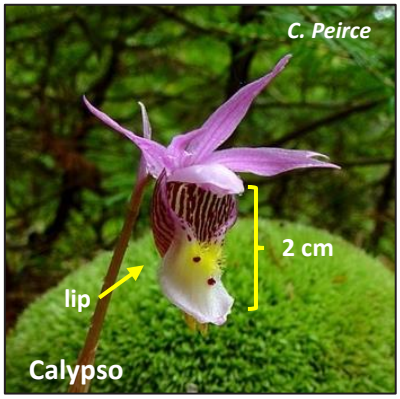
Flowers: ***Pouched flowers*** emerge singly on ***leafless stalks*** only ***10-20 cm tall.*** The ***lower lip is white with deep purple lines***, and ***crested with yellow hairs*** and ***purple dots***. The ***lip is tiny***—only ***2 cm long***.

Reproduction: Calypso has a thick ***underground stem that forms a bud*** that ***produces the overwintering leaf*** noted above. It also produces a ***capsule with many tiny seeds***.

Best Survey Time: This species is best surveyed when in flower, which is typically in ***late May through early June***. Fruits are rarely seen, but develop in June and July.

Protection: Calypso lies deep in the shade of cedar swamps and other moist coniferous forests with cool soils.





- It is highly vulnerable to disturbance; keep your eye out for it so you don't inadvertently crush it.
- Look for it especially on old, forested beach ridges adjacent to Lake Michigan.
- Maintain the forest canopy to keep the moist, cool, and dark conditions that it requires.
- Monitor and control invasive species

Similar Species: The tiny **Ram's Head Lady-slipper** (*Cypripedium arietinum*) differs by:

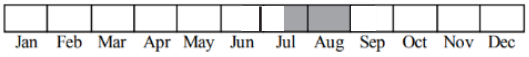
- the ***downward projection of its pouch*** and
- its **leaves** that occur **along the stem**.

The basal leaves of **Pyrolas** such as **Shinleaf** (*Pyrola elliptica*) and **Pink Pyrola** (*P. asarifolium*) are similar, but they:

- ***lack parallel, pleated veins.***

American Shore-grass (*Littorella uniflora*) – Submergent and Emergent Marsh

State Special Concern (SC); Global Secure; State Imperiled (G5, S2)



Natural Communities: American Shore-grass occurs in Submergent and Emergent Marshes of lakes with low-nutrients.

Known Locations on Beaver Island: Its occurence at Fox Lake is the ***southernmost location in Michigan***; all other documented occurrences are in the Upper Peninsula.

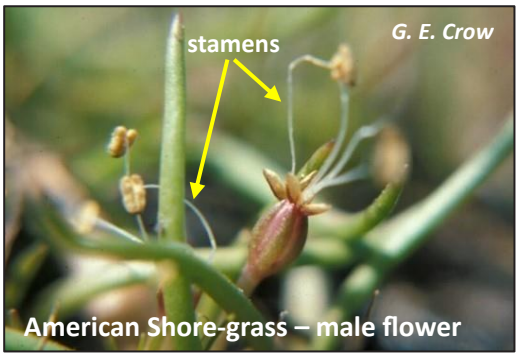
Leaves: It ***grows under water*** as a tiny ***basal rosette*** of grass-like ***leaves*** that are ***round in circumference*** and ***up to 5 cm long***. They are ***thickest in the middle*** and ***taper to their tips***.

Flowers: It has ***tiny urn-shaped flowers*** on separate male and female plants. ***Male flowers produce conspicuous stamens (anther-stalks) ~2.5 cm long***. ***Female flowers are hidden at the base*** of the rosette

Reproduction: Flowers emerge and produce ***seed*** only when the lake water recedes. It also spreads by ***above-*** and ***below-ground stems***.

Best Survey Time: While flowering can occur as early as June and fruiting can extend into September, the optimal detection window for this species is ***late July through late August.***

Protection: Shore-grass is adapted to lakes with low nutrients and water level fluctuations. It is important to sustain the water quality and natural fluctuations.



- Ensure there is no seepage of nutrients from the septic system into the lake.
- Avoid fertilizers running off into the lake.
- Do not alter the hydrology in and around the lake.
- Monitor and control invasive species.

Similar Species: American Shore-grass is easily confused with several other tiny aquatic species with basal rosettes:

Spiny Quillwort (*Isoetes echinospora*):

- has ***leaves that flatten*** towards the tip, and
- ***bulbous leaf bases*** at the base of the rosettes – these ***produce spores, not flowers with seeds.***

Aquatic Pipewort (*Eriocaulon septangulare*) has:

- thin ***leaves*** that are ***triangular in cross section,*** and
- **clusters of tiny white flowers** at the ***tip of the flower stalk***.

So, what's the big deal about natural features?

No species is an island…

Imagine walking through a forest and spotting Dutchman's Breeches for the first time, hearing the haunting call of a Loon on a lake, or stumbling across of a carpet of Dwarf Lake Iris, so teeny-tiny and intensely purple that it stuns you. None of these species exist all on their own; rather, they occur within a web of interdependent interactions with other species and their environment. ***These assemblages provide ecosystem services that sustain life on earth!*** They produce food, filter our water and purify our air; they provide flood control and minimize erosion, and they provide food and nectar for pollinators of our food crops.

If we disassemble them by breaking them into smaller fragments, suppressing their natural processes, or removing certain species, we are changing the conditions of life for species that are part of these webs. This usually has negative consequences for these species, and ultimately the ecosystem services they provide. These functional webs of interacting species evolved together over thousands of years. The more we degrade them, the more vulnerable and less resilient they become.

Consider New York City, as described by Douglas Tallamy in his book Bringing Nature Home[18]:

> *If New York City were an isolated entity without connections to other parts of the country, it would collapse—in less than a week…it requires the influx of ecological resources generated from healthy systems elsewhere…It is not by itself a sustainable system… It has been destroyed by blacktop, exhaust, and skyscrapers…The water that quenches the thirst of millions of New Yorkers comes entirely from an ecosystem that remains functional: the forested Catskill Mountains north of the city.*

Islanders, already isolated from mainland resources, must heed the warning calls. We can and we must protect the natural features of the Island to the best of our ability and we need to remain vigilant for new information that can improve our understanding of them. *We cannot control nature—we must live in better collaboration with it*.

What are the key threats to the natural features on Beaver Island?

The natural features of Beaver Island are as vulnerable as any in Michigan. They can easily become spoiled by:

- ***Direct or indirect destruction*** by housing, businesses, and other development projects. This removes habitat for native species and pushes them into smaller and smaller areas.
- ***Fragmentation of habitat*** by power lines, roads, or obstruction of waterways, increases road-kill and limits the movement of species that is essential for sheltering, foraging for food, and breeding.
- ***Alteration of hydrology and suppression of other natural processes*** (p. 2) can stop a natural community dead in its tracks, by disrupting the ability of its component species to regenerate.
- ***Pollution and nutrient run-off*** from fertilization, pesticide application, or leaking septic systems can kill species directly or provide advantages to less desirable species, including non-native, invasive species.
- ***Light pollution*** due to more and brighter lights that extend into the wee hours of the night can disorient birds, bats, bees, and others, leading to their demise or disrupting their foraging, migrating, and/or breeding cycles.
- ***Invasive species*** are those that are introduced from somewhere else *and* cause harm to the environment, people, or economy[19]. They can alter and simplify natural communities by spreading rapidly and taking resources away from native species that have been there for a long, long time. Some, like the Emerald Ash Borer, kill species directly.
- ***Climate change***—we are still learning what the full impacts and consequences will be, but the Island has already experienced changes in storm-intensity, warmer winters, erosion of coastal areas, and changes in prevailing winds.

Many of these threats can be managed by sound planning, zoning, and enforcement practices, along with education of landowners, recreationists, and business operators. Island visitors should be targeted for education too, as they are often less likely to be aware of the local natural features and how they can be harmed.

Invasive species and climate change are probably the most challenging threats since we can't simply shut them off or prohibit them from occurring—they have a mind of their own! But Islanders are working hard to understand and mitigate these threats too.

Cleared Forested Dune invaded by Spotted Knapweed and Bull Thistle

What can you do to help sustain Beaver Island's natural features and your property values?

The natural features of Beaver Island are its strength! The best defense to the threats they face are to sustain as much of the natural environment as possible. When natural communities are simplified by carving them up, taking species out, or adding new species into long-established webs of interactions, they are less able to respond to other changes on the landscape. *Sustaining the basic building blocks and interconnections of the natural environment makes sense and can provide a buffer against severe or catastrophic events.*

Generally, people do not set out purposely to degrade or destroy natural features; they are more likely simply unaware of them and how their actions can impact them. Here are some of the things that you, as a landowner, can do to help sustain the natural features of Beaver Island.

- **Explore your property – what natural features are on your land?**
  - ✓ You may not know what you have and exploring to find out can be intensely satisfying!
  - ✓ Contact the township offices for assistance with identifying natural features on your land.
- **Review local zoning ordinances and state and federal laws.**
  - ✓ It is your responsibility as a landowner to learn the rules and etiquette of the Island, and it will help you avoid permitting issues, fines, or other headaches later.
- **Select your house footprint so that it minimizes disturbance to Natural Communities and any rare species on your property and keeps your home out of harm's way.**
  - ✓ A permit is likely to be required if your property is in a Critical Dune Area, or if it has rare species or wetlands.
  - ✓ Building too close to the shoreline, on unstable soils, or on steep slopes, especially in dynamic shoreline natural communities, can put your home at risk.
- **Maintain and minimize disturbance to the native vegetation on your property.**
  - ✓ Minimize pathways to avoid crushing plants, increasing erosion, and creating 'highways' for invasive species.
  - ✓ Install appropriate boardwalks over wetlands or even uplands that will be crossed frequently.
  - ✓ If planting, use native seeds, plugs, and soils from the Island that are suitable for your property.
    - *There is a high risk of undesirable species or other contaminants coming along with off-Island plants.*
  - ✓ Not all areas need plantings; beautiful native plants are already there to enjoy on most properties.
  - ✓ Sometimes, too much planting actually inhibits the regeneration of native species.
  - ✓ Have fun finding native substitutes to plant instead of what you may be used to planting.
- **Maintain buffers of Natural Communities around your property and maintain natural connections between one community to another.**
  - ✓ This reduces the likelihood of establishment and spread of invasive species.
  - ✓ It also reduces less visible threats such as changes in the hydrology or the amount of exposure to sunlight.
  - ✓ These buffers or Transition Zones, also allow animals to move across the landscape more easily and safely.

- **Maintain natural water level fluctuations, winds, and currents in inland lakes and streams.**
  - ✓ Native plants of these communities are adapted to, and require, these natural processes for regeneration.
  - ✓ Hardening shorelines or putting up structures in or near the water are likely to alter these processes.
- **Avoid fertilizers and pesticides and maintain your septic systems.**
  - ✓ The goal is to keep nutrients and toxins from running-off into lakes and streams.
  - ✓ This invisible threat has consequences for healthy ecosystems by changing conditions and interactions amongst species.
  - ✓ Toxins can kill species directly and increased nutrients can result in algae blooms and facilitate invasive species establishment.
- **Support the Beaver Island Dark Sky Sanctuary.**
  - ✓ Most of the south end of Beaver Island is designated by the International Dark Sky Association[20] as a Dark Sky Sanctuary[21].
  - ✓ Research suggests that artificial light at night can negatively affect human health in many ways, including obesity, depression, sleep disorders, diabetes, and breast cancer[22].
  - ✓ Artificial light disrupts wildlife as well as the natural relationship between plants and pollinators[23].
- **Do not bring untreated wood, logs, lumber, or pallets to Beaver Island, or move firewood between islands.**
  - ✓ This is a major pathway for spreading of the devastating Emerald Ash Borer and Elm Bark Beetles.
  - ✓ St. James and Peaine Townships have passed a Wood Movement Ordinance[24] stating no person shall move to the Beaver Island Archipelago whether by ship, yacht, boat, air or any other means, firewood other than firewood certified as heat-treated, logs other than those that are entirely free of bark, lumber other than that which is treated and/or processed in such a manner that it is free of insects and wood diseases or wood pallets other than pallets that are entirely bark free.
- **Create a brochure or laminated information sheet for your home.**
  - ✓ Highlight the natural features of your property, the Island, and/or interesting areas to visit on the Island.
  - ✓ Provide bullets about Island etiquette and safety, e.g., respect for natural features, respect for neighbors, quiet hours, time for lights out, garbage and recycling practices, fire safety, etc.
  - ✓ This personalizes your property and sensitizes guests to the things that are important to Islanders.
- **Volunteer!**
  - ✓ Create a local landowner invasive species patrol with nearby property owners.
  - ✓ Establish and/or contribute to native seed collection on the Island.
  - ✓ Lead or assist with hikes that show off the Island's natural features.
  - ✓ Assist with maintenance and enhancement of hiking, birding, and kayaking trails.
  - ✓ Participate in island committees.
- **Participate in the Beaver Island Archipelago's Terrestrial Invasive Species Program!**
  - ✓ One of the most important and urgent things you can do is to learn how to identify, report, and control invasive species (p. 40) on your property.
    - Beaver Island Invasive Species Reporting Forms can be found at the Community Center or on the Township webpages.
  - ✓ Invasive species disrupt long-established, co-evolved relationships between native species, with consequences for the ecosystem services (p. 40) that all living beings need to survive.
  - ✓ They ruin property aesthetics and reduce property values.
  - ✓ The earlier an invasion is detected the more likely control will be successful and the lower the costs will be.
  - ✓ Invasive species don't recognize property boundaries, so everyone must share in detecting and controlling them.
    - If an invasive species is not on your property today, it could be next week, next month, or next year.
  - ✓ *Non-native, including invasive plant species are toxic*[25,26] to many of our native insect caterpillars—caterpillars that are essential food for baby birds and many other animal species[27,28].

- *"A typical nestling… eats a full meal 30-40 times a day"! The parents must gather thousands of caterpillars to rear one clutch—that means as many as 150 or more trips a day to find and gather these caterpillars from their native host plants, for a nest of five chicks*[29].
- The more non-native plants on the landscape, the further the parents must travel to find caterpillars, the fewer birds that fledge, the fewer bird predators that survive, and so on up and throughout the food web.
- ***Plants are not optional in our world***—they form the base of the food chain by transforming energy from the sun into food—but, as Tallamy reminds us ***"neither are our six-legged friends"***—*the herbivorous insects that eat plants and pass that energy up the food chain*[30]. We must maintain native plants to keep these insects around.

✓ The goals of the TIS program[31] are to:

- Provide education and outreach to increase awareness and engagement in protecting rare and declining species and high quality natural communities.
- Monitor and manage invasive species at priority locations and protect rare and declining species.

✓ Contact your TIS Coordinator via phone, email or post!

- (231) 330-0422
- invasivespadm.bi@gmail.com
- ATTN: TIS Coordinator PO Box 85, Beaver Island, MI 49782


Point LaPar Dry-mesic Northern Forest

A few success stories…

Early detection and control of non-native Phragmites on Beaver Island – a model for the state!

Non-native Phragmites began appearing along the coast of Beaver Island around 2000, and by 2007 was a noticeable concern. An education campaign was initiated, including the development of a video about invasive Phragmites and what property owners can do to help control it. Working with landowners, the Michigan Department of Natural Resources (MDNR), and the Michigan Natural Features Inventory (MNFI), non-native Phragmites was mapped around the entire perimeter of the Island. A map of the known rare plant and animal occurrences was overlaid on the Phragmites map. Grants were written, funds were obtained, and invasive species professionals were hired and permitted. They treated non-native Phragmites throughout the entire coastal zone, while ensuring no impacts to the rare coastal species.


Non-native Phragmites on Beaver Island 2014

Twenty-eight acres of Phragmites were treated in 2008, and the following year showed a 95% reduction with only approximately one acre of non-native Phragmites over the entire treatment area remaining[32]—a remarkable success and community effort! Today, the Island is in maintenance mode with only small patches of non-native Phragmites popping up and requiring retreatment. Not only did this initial effort save the Island lots of money by catching the Phragmites early and keeping the invasion low, but *it serves as a model for early detection and response to invasive species statewide*. Until more effective long-term control techniques are discovered, it will require constant vigilance to keep this species in check, by catching it early. If every landowner monitors for this species on their land, we have the best chance of preventing devastating and costly invasions of non-native Phragmites in the future.

Note that **native Phragmites*[33] *also occurs on the Island and should not be treated.*

Collaboration with the Charlevoix-Beaver Island Road Commission helps keep invasive Japanese Knotweed from spreading!

Invasive Japanese Knotweed was first detected on the Island in 2013. It is famous for creating large, dense infestations that spread outward by underground stems called rhizomes. The rhizomes can work their way through cracks in asphalt, concrete, foundations, and septic systems, and the plant is exceedingly difficult to control[34]. Long-established plants have deep, thick, and tenacious roots and rhizomes that will keep growing as long as the leaves have sunlight to photosynthesize. Often, the first reaction to a Japanese Knotweed infestation is to yank it up, cut it down, or mow it—but beware, the roots left behind will resprout and many rhizome and plant fragments will generate more plants!


Japanese Knotweed in 2013

While early treatment knocked the invasion back considerably, the Japanese Knotweed has not yet been eradicated. The TIS Coordinator has been monitoring additional experimental treatments at the one known Island site for three years. The invasive knotweed was noticed spreading off the private property onto the ROW along East Side Dr. which historically has been mowed regularly. Working with the Beaver Island Road Crew, signs now mark the area of concern in the ROW, and no mowing occurs there unless it is coordinated with the TIS Coordinator.

Early detection and response in action once again!


Note the flat leaf bases

Japanese Knotweed is legally prohibited in Michigan and it is illegal to possess or introduce without a permit from the Michigan Department of Agriculture and Rural Development, except to have it identified or if it is in conjunction with control efforts. The State of Michigan Invasive Species Program provides information on Best Control Practices[35] through their website, but if found or suspected to be found on Beaver Island, please contact your Township offices or your TIS Coordinator for further actions to be taken.

It is imperative that we keep Japanese Knotweed from establishing on Beaver Island!

Piping Plover recovery continues successfully in the Great Lakes Region


Highland Island spit

Teams of dedicated bird enthusiasts and land stewards coordinated by the Great Lakes Piping Plover Recovery Team have increased the number of breeding pairs of the tiny Piping Plover shorebird, from 13 breeding pairs in 1990, to a record high of 80 pairs in 2023[36,37]. This is the result of small teams patrolling nesting sites to protect them from natural predators, pets, and people who may be unaware of these shoreline nesting birds. If the breeding adults die from predation or other reasons, rescue operations are undertaken to collect their eggs for captive rearing by zookeepers across the county, coordinated by the Detroit Zoo. These numbers provide a benchmark for future comparisons.

High Island contributed 18 chicks to the total of 128 for the region in 2023! Seven pairs of Piping Plovers nested on High Island's northeastern sand spit and were monitored by the Little Bay Bands of Odawa Indians. Eight chicks fledged in the wild and ten chicks were fledged from captive rearing[38].

Parasitoids introduced to help save the Island's extraordinary Ash Trees from the Emerald Ash Borer!

David Cappaert, Bugwood.org

The non-native Emerald Ash Borer (EAB) was first detected in the U.S. in 2002. This little green, metallic-looking beetle lays its eggs on Ash Trees and the hatching larvae feed on the inner bark, which disrupts the flow of water and nutrients and kills the tree. EAB has killed hundreds of millions of Ash Trees in North America[39]. EAB traps were installed in the Island in 2011 and one EAB was detected in one of the twenty traps installed in 2018 and 2019. Due to early detection and rapid response, forestry experts think that it may be possible to preserve Ash Trees on the Beaver Island Archipelago.

As an alternative to pesticides which harm native insects and have to be repeatedly applied, it was decided to release parasitoid wasps on Beaver Island. These are tiny stingless wasps that are natural enemies of EAB in its native range in China and Russia. The larvae of these wasps feast on the EAB larvae, thereby reducing the numbers of Ash Trees killed by them[40,41].

In 2019, Pam Grassmick and Beth and Ed Leuck began releasing the parasitoid eggs in tiny medicine bottles, plastic cups, and inoculated ash bolts supplied by the Animal Plant Inspection Health Service of the USDA. The job didn't end there! Follow-up trips were necessary to ensure the wasps had hatched successfully and dispersed. Three species of EAB parasitoids were released into the wild and two species have been successfully recovered[42] on the island. This indicates they are establishing self-sustaining populations that will continue munching EABs, serving as a *biocontrol*[43] for the species.

Releasing parasitoids can be a thankless job when mosquitos are out, and identification of tiny wasp species is not quite as simple as it seems! Countless hours have gone into this effort. Keep your fingers crossed for our Beaver Archipelago Ash Trees!

Note:

The threat the Emerald Ash Borer poses, coupled with the chance of sustaining Ash Trees on the Beaver Archipelago through the parasitoid wasp biocontrol effort, led both St. James and Peaine Townships to pass the Wood Movement Ordinance (p. 42) and develop the signage shown to the right.

It is essential that no wood bearing the EAB is brought over to any of the Beaver Archipelago islands. The primary dispersal mechanism is via wood that is already infected by the EAB. Keep an eye open for those who may not know about the ordinance and explain why it is important. Contact the Townships, local authorities, or the DNR if you learn of any off-island wood that has been transported to the Island. Thank you!

The Take Home Message!

As these examples above show, *small groups of passionate stewards and landowners can accomplish amazing things!* Further, it has become increasingly clear that *it will require such groups across all land ownerships* to respond to the on-going degradation of our natural features across the world. No one entity can see what threats are occurring where, nor can any one entity respond everywhere they occur. Everyone must do their part, however, big or small. *Your observations and stewardship activities on your land really do make a difference and are necessary* to keep Beaver's natural features healthy and to improve stewardship practices across the Island.

People protect what they know and love. Take your friends and family out on the land with you as you explore so they can get to know and love the natural features too. We will all protect what we know and love if we are provided encouragement and information about how to do so—especially when we come to fully understand that healthy natural communities are essential to life on earth. Islanders are working hard to nurture this and we hope that you will join in our efforts to sustain a resilient Beaver Island.

Finally, here is an inspirational poem created by the 2022 Beaver Island Community School Model UN Students[44], a High School sponsored event. This is the students' expression of how they would like visitors to use the Island sustainably.

Our Island Pledge

Keep this Island in good health
Our lakes and forests are our wealth
There are a couple things to do
In order to follow through
To keep our island looking new:

We've got to make sure to take care of our trash
Don't want to hurt nature with plastic and glass

Please follow the rules to keep our animals thriving
Only hunt when allowed and be safe while driving

Let's avoid the usage of disruptive transportation
To decrease the harm to important populations

Lastly remember to respect the land
Cultural property is part of our brand
We hope you have been listening
Let's keep this island glistening

We appreciate your help while you enjoy your stay
Remember to have fun but keep pollution at bay

Mnaadendimowin- Respect - Act without harm
Anishinaabe Language

meas a léiriú agus a chothú – Respect and sustain
Gaelic Language

American Ash

Appendix A.
Natural Communities and Rare Plant and Animal Species on Beaver Island

Significant Natural Communities on Beaver Island		
Bog	Global vulnerable to secure, State apparently secure	G3G5, S4
Boreal Forest	Global status unrankable, State vulnerable	GU, S3
Dry-mesic northern forest	Global apparently secure, State vulnerable	G4, S3
Emergent marsh	Global unrankable, State apparently secure	GU, S4
Hardwood-conifer swamp	Global apparently secure, State vulnerable	G4, S3
Interdunal wetland	Global imperiled [inexact], State imperiled	G2?, S2
Limestone cobble shore	Global imperiled to vulnerable, State vulnerable	G2G3, S3
Mesic northern forest	Global apparently secure, State vulnerable	G4, S3
Open dunes	Global vulnerable, State vulnerable	G3, S3
Poor conifer Swamp	Global apparently secure, State apparently secure	G4, S4
Poor Fen	Global vulnerable, State Vulnerable	G3, S3
Rich Conifer Swamp	Global apparently secure, State vulnerable	G4, S3
Sand and gravel beach	Global vulnerable [inexact], State vulnerable	G3?, S3
Submergent marsh	Global unrankable, State apparently secure	GU, S4

Rare Plant Species on Beaver Island		
Pumpelly's bromegrass	*Bromus pumpellianus*	State threatened (T)
calypso or fairy-slipper	*Calypso bulbosa*	State threatened (T)
Pitcher's thistle	*Cirsium pitcheri*	Federal and State threatened (LT, T)
ram's head lady-slipper	*Cypripedium arietinum*	State special concern (SC)
English sundew	*Drosera anglica*	State special concern (SC)
dwarf lake iris	*Iris lacustris*	Federal and State threatened (LT, T)
American shore-grass	*Littorella uniflora*	State special concern (SC)
Michigan monkey flower	*Mimulus michiganensis*	Federal and State endangered (LE, E)
clustered broomrape	*Orobanche fasciculata*	State threatened (T)
butterwort	*Pinguicula vulgaris*	State special concern (SC)
seaside crowfoot	*Halerpestes cymbalaria*	State extirpated (X)
Houghton's goldenrod	*Solidago houghtonii*	Federal and State threatened (LT, T)
Lake Huron tansy	*Tanacetum bipinnatum*	State special concern (SC)

Rare Animal Species on Beaver Island		
American bittern	*Botaurus lentiginosus*	State special concern (SC)
Aweme borer	*Papaipema aweme*	State special concern (SC)
Bald eagle	*Haliaeetus leucocephalus*	State special concern (SC)
Campeloma spire snail	*Cincinnatia cincinnatiensis*	State special concern (SC)
Coldwater pondsnail	*Stagnicola woodruffi*	State special concern (SC)
Common gallinule	*Gallinula galeata*	State threatened (T)
Common loon	*Gavia immer*	State threatened (T)
Giant northern pea clam	*Pisidium idahoense*	State special concern (SC)
Great Lakes physa	*Physella magnalacustris*	State special concern (SC)
Lake floater	*Pyganodon lacustris*	State special concern (SC)
Lake Huron locust	*Trimerotropis huroniana*	State threatened (T)
Little brown bat	*Myotis lucifugus*	State threatened (T)
Merlin	*Falco columbarius*	State special concern (SC)
Northern goshawk	*Accipiter gentilis*	State threatened (T)
Piping plover	*Charadrius melodus*	Federal and State endangered (LE, E)
Smooth green snake	*Opheodrys vernalis*	State special concern (SC)
Yellow banded bumble bee	*Bombus terricola*	State special concern (SC)

Appendix B.
Definitions of Natural Community and Rare Species Ranking and Listing Categories

NatureServe's Global and State Ranks

NatureServe is Michigan Natural Features Inventory's parent organization. They work with over 60 organizations and over 1,000 conservation scientists to collect, analyze, and deliver biodiversity knowledge to inform conservation action. They assign ranks to natural communities and rare and declining species at global and state scales based upon survey data collected over many years, and from on-going surveys. These ranks are defined below.

Global Rank	Definition
GX	**Presumed Extinct** (species): Not located despite intensive searches and virtually no likelihood of rediscovery. **Presumed Eliminated** (ecosystems, i.e., ecological communities and systems: Eliminated throughout its range, due to loss of key dominant and characteristic taxa and/or elimination of the sites and ecological processes on which the type depends.
GH	**Possibly Extinct** (species) or **Possibly Eliminated** (ecosystems): Known from only historical occurrences but still some hope of rediscovery. Examples of evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is extinct or eliminated throughout its range.
G1	**Critically Imperiled**: At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
G2	**Imperiled:** At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3	**Vulnerable:** At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4	**Apparently Secure:** At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	**Secure:** At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

State Rank	Definition
SX	**Presumed Extirpated:** Species or ecosystem is believed to be extirpated from the jurisdiction (state). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. [equivalent to "Regionally Extinct" in IUCN Red List terminology]
SH	**Possibly Extirpated:** Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
S1	**Critically Imperiled**: At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2	**Imperiled:** At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3	**Vulnerable:** At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4	**Apparently Secure:** At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5	**Secure:** At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

The USFWS Definitions of Federal Endangered and Threatened Species

Under the Endangered Species Act (ESA), plant and animal species may be listed as either endangered or threatened. These categories are defined below. Species with these designations have legal protection on federal land.

Federal Status	Abbr.	Definition
Endangered	LE	A species is in danger of extinction throughout all or a significant portion of its entire range.
Threatened	LT	A species is likely to become endangered within the foreseeable future.

The State of Michigan Definitions of State Endangered, Threatened, and Special Concern Species

The state of Michigan lists rare and declining species as endangered or threatened based on survey data and expert knowledge. These categories are defined below. The special concern status is designated by the State Technical Committee for species thought to be in decline and at risk of becoming threatened or endangered. Only endangered and threatened species have legal protection.

State Status	Abbr.	Definition
Endangered	E	A species in danger of extinction throughout all or a significant portion of its range in Michigan.
Threatened	T	A species likely to become endangered in Michigan within the foreseeable future.
Special Concern	SC	A declining or relict species in Michigan.

Appendix C.
Crosswalk of Scientific Names to Common Names and Typical Flowering or Fruiting Period

The list below provides a crosswalk from common name to scientific name for plants featured in this booklet. It is not an exhaustive list of all plants on Beaver Island. Common names for plants are not standardized like scientific names are, and usage of common names may differ regionally or from person to person. The common names used below are from the Michigan Flora Online (p. 57). The typical flowering periods (wildflowers, shrubs, and deciduous trees), or fruiting period (grasses, sedges, coniferous trees, and clubmosses) are also provided. *Be aware that the actual timing of flowering and fruiting is influenced by short and long-term differences in climate, amount of sunlight, temperature, and other abiotic (physical) conditions, and may differ from those shown here for any particular year.*

Native Plants Noted in Booklet				
Form	**Common Name**	**Scientific Name**	**Status***	**Flowering or fruiting period ****
wildflower	American shore-grass	*Littorella uniflora*	SC	mid-July-August
wildflower	balsam ragwort	*Packera paupercula*		May-August
wildflower	beach pea	*Lathyrus japonicus*		June-August
wildflower	beech drops	*Epifagus virginiana*		September
wildflower	bird's-eye primrose	*Primula mistassinica*		May-June
wildflower	black-eyed Susan	*Rudbeckia hirta*		June-October
wildflower	bloodroot	*Sanguinaria canadensis*		April-May
wildflower	bluebead-lily	*Clintonia borealis*		May-June
wildflower	buckbean	*Menyanthes trifoliata*		May-July
wildflower	bog goldenrod	*Solidago uliginosa*		August-September
wildflower	boneset	*Eupatorium perfoliatum*		July-October
wildflower	clustered broomrape	*Orobanche fasciculata*	T	mid-June-August
wildflower	bunchberry	*Cornus canadensis*		May-July
wildflower	butterwort	*Pinguicula vulgaris*	SC	late-May-July
wildflower	calypso	*Calypso bulbosa*	T	late May-early June
wildflower	cancer root	*Orobanche uniflora*		June-August

wildflower	Canada mayflower	*Maianthemum canadense*		May-June
wildflower	Carolina spring-beauty	*Claytonia caroliniana*		April-May
wildflower	common arrowhead	*Sagittaria latifolia*		July-September
wildflower	common milkweed	*Asclepias syriaca*		June-August
wildflower	common trillium	*Trillium grandiflorum*		May-June
wildflower	common waterweed	*Elodea canadensis*		July-August
wildflower	downy Solomon-seal	*Polygonatum pubescens*		May-June
wildflower	dragon's mouth	*Arethusa bulbosa*		early June-mid-July
wildflower	Dutchman's-breeches	*Dicentra cucullaria*		May
wildflower	dwarf lake iris	*Iris lacustris*	LT, T	mid-May-mid-June
wildflower	dwarf raspberry	*Rubus pubescens*		May-July
wildflower	English sundew	*Drosera anglica*	SC	June-mid-September
wildflower	false asphodel	*Triantha glutinosa*		July-August
wildflower	false mayflower	*Maianthemum trifolium*		May-June
wildflower	false violet	*Dalibarda repens*	T	late July-late August
wildflower	flat-leaved bladderwort	*Utricularia intermedia*		June-August
wildflower	fringed polygala	*Polygala paucifolia*		May-June
wildflower	ghost pipe	*Monotropa uniflora*		June-September
wildflower	goldthread	*Coptis trifolia*		May-June
wildflower	grass-leaved goldenrod	*Euthamia graminifolia*		July-September
wildflower	grass-of-Parnassus	*Parnassia glauca*		August-September
wildflower	grass-pink	*Calopogon tuberosus*		June-July
wildflower	green-fruited bur-reed	*Sparganium emersum*		June-August
wildflower	hairy puccoon	*Lithospermum caroliniana*		May-July
wildflower	harebell	*Campanula rotundifolia*		June-October
wildflower	horned bladderwort	*Utricularia cornuta*		July-August
wildflower	Houghton's goldenrod	*Solidago houghtonii*	LT, T	late August-early October
wildflower	Indian paintbrush	*Castilleja coccinea*		May-August
wildflower	Jack-in-the-pulpit	*Arisaema triphyllum*		April-June
wildflower	jewelweed	*Impatiens capensis*		July-September
wildflower	Joe-Pye-weed	*Eutrochium maculatum*		July-September
wildflower	Kalm's lobelia	*Lobelia kalmii*		July September
wildflower	Kalm's St. John's-wort	*Hypericum kalmianum*		July-August
wildflower	Lake Huron tansy	*Tanacetum bipinnatum*	SC	late-June-July
wildflower	limestone calamint	*Clinopodium arkansanum*		May-August
wildflower	linear-leaved sundew	*Drosera linearis*		June-August
wildflower	mad-dog skullcap	*Scutellaria lateriflora*		July-September
wildflower	marsh cinquefoil	*Comarum palustre*		June-August
wildflower	Michigan monkey-flower	*Mimulus michiganensis*	LE, E	mid-June-mid-August
wildflower	naked miterwort	*Mitella nuda*		April-June
wildflower	Ohio goldenrod	*Solidago ohioensis*		August-September
wildflower	panicled aster	*Symphyotrichum lanceolatum*		August-October
wildflower	partridge-berry	*Mitchella repens*		June-July
wildflower	pickerel-weed	*Pontederia cordata*		June-September
wildflower	pine drops	*Pterospora andromedea*		June-August
wildflower	pink lady-slipper	*Cypripedium acaule*		May-June
wildflower	aquatic pipewort	*Eriocaulon septangulare*		July-September
wildflower	pitcher plant	*Sarracenia purpurea*		May-August
wildflower	Pitcher's thistle	*Cirsium pitcheri*	T	mid-June-mid-September
wildflower	purple false foxglove	*Agalinis purpurea*		July-September
wildflower	ram's head lady-slipper	*Cypripedium arietinum*	SC	late May-June
wildflower	Richardson's pondweed	*Potamogeton richardsonii*		August-September
wildflower	rose pogonia	*Pogonia ophioglossoides*		June-July
wildflower	round-leaved sundew	*Drosera rotundifolia*		July-August
wildflower	round-lobed hepatica	*Hepatica americana*		April-May

wildflower	rush aster	*Symphyotrichum boreale*		August-October
wildflower	sand coreopsis	*Coreopsis lanceolata*		May-July
wildflower	sea-rocket	*Cakile edentula*		May-October
wildflower	shinleaf	*Pyrola elliptica*		June-August
wildflower	showy lady-slipper	*Cypripedium reginae*		early June-mid-July
wildflower	silverweed	*Potentilla anserina*		June-September
wildflower	skunk-cabbage	*Symplocarpus foetidus*		March-May
wildflower	small fringed gentian	*Gentianopsis virgata*		August-September
wildflower	spatulate-leaved sundew	*Drosera intermedia*		July-August
wildflower	spiny quillwort	*Isoetes echinospora*		July-August
wildflower	star-flower	*Trientalis borealis*		May-June
wildflower	starry false Solomon-seal	*Maianthemum stellatum*		May-June
wildflower	swamp milkweed	*Asclepias incarnata*		June-August
wildflower	sweet-scented water-lily	*Nymphaea odorata*		June-August
wildflower	tufted loosestrife	*Lysimachia thyrsiflora*		June-July
wildflower	twinflower	*Linnaea borealis*		June-August
wildflower	water smartweed	*Persicaria amphibia*		June-September
wildflower	water-shield	*Brasenia schreberi*		June-August
wildflower	white camus	*Anticlea (Zygadenus) glauca*		June-August
wildflower	wild blue flag	*Iris versicolor*		June-July
wildflower	wild columbine	*Aquilegia canadensis*		May-June
wildflower	wild leek	*Allium tricoccum*		June-July
wildflower	wild sarsaparilla	*Aralia nudicaulis*		May-June
wildflower	wood lily	*Lilium philadelphicum*		June-August
wildflower	wormwood	*Artemisia campestris*		July-September
wildflower	yarrow	*Achillea millefolium*		June-September
wildflower	yellow lady-slipper	*Cypripedium parviflorum*		May-June
wildflower	yellow pond-lily	*Nuphar variegata*		June-August
wildflower	yellow trout lily	*Erythronium americana*		April-May
wildflower	yellow violet	*Viola pubescens*		April-June
grass	beach grass	*Ammophila breviligulata*		August-September (fruit)
grass	Canada wild rye	*Elymus canadensis*		July-August (fruit)
grass	sand reed grass	*Calamovilfa longifolia*		August-September (fruit)
sedge	Baltic rush	*Juncus balticus*		June-August (fruit)
sedge	bog sedge	*Carex limosa*		June-July (fruit)
sedge	few-seeded sedge	*Carex oligosperma*		June-August (fruit)
sedge	hardstem bulrush	*Schoenoplectus acutus*		July-September (fruit)
sedge	hop sedge	*Carex lupulina*		June-August (fruit)
sedge	little green sedge	*Carex viridula*		June-August (fruit)
sedge	northern green rush	*Juncus alpinoarticulatus*		June-September (fruit)
sedge	tawny cotton-grass	*Eriophorum virginicum*		July-September (fruit)
sedge	threesquare	*Schoenoplectus pungens*		June-September (fruit)
sedge	twig-rush	*Cladium mariscoides*		June-August (fruit)
sedge	wire-grass sedge	*Carex lasiocarpa*		June-July (fruit)
sedge	wool-grass	*Scirpus cyperinus*		July-September (fruit)
shrub	bearberry	*Arctostaphylos uva-ursi*		May-June
shrub	bog laurel	*Kalmia polifolia*		late May-June
shrub	bog rosemary	*Andromeda glaucophylla*		May-June
shrub	chokeberry	*Aronia prunifolia*		June
shrub	creeping juniper	*Juniperus horizontalis*		May-June
shrub	creeping snowberry	*Gaultheria hispidula*		May-June
shrub	huckleberry	*Gaylussacia baccata*		May-June
shrub	Kalm's St. John's-wort	*Hypericum kalmii*		July-September
shrub	Labrador tea	*Rhododendron groenlandicum*		May-June
shrub	leather leaf	*Chamaedaphne calyculata*		April-June

shrub	low sweet blueberry	*Vaccinium angustifolium*		June
shrub	mountain holly	*Ilex mucronata*		May-June
shrub	sand cherry	*Prunus pumila*		May-June
shrub	sand-dune willow	*Salix cordata*		May-June
shrub	shrubby cinquefoil	*Dasiphora fruticosa*		June-September
shrub	speckled alder	*Alnus incana*		March-May
shrub	Canada blueberry	*Vaccinium myrtilloides*		June-July
shrub	winterberry	*Ilex verticillata*		June-July
tree-conifer	balsam fir	*Abies balsamea*		September-November (cones)
tree-conifer	black spruce	*Picea mariana*		September-November (cones)
tree-conifer	hemlock	*Tsuga canadensis*		September-November (cones)
tree-conifer	northern white cedar	*Thuja occidentalis*		September-November (cones)
tree-conifer	red pine	*Pinus resinosa*		September-November (cones)
tree-conifer	tamarack	*Larix laricina*		September-November (cones)
tree-conifer	white pine	*Pinus strobus*		September-November (cones)
tree-conifer	white spruce	*Picea glauca*		September-November (cones)
tree-deciduous	American beech	*Fagus grandifolia*		April-May
tree-deciduous	balsam poplar	*Populus balsamifera*		April-May
tree-deciduous	basswood	*Tilia americana*		June-July
tree-deciduous	ironwood	*Ostrya virginiana*		May
tree-deciduous	red oak	*Quercus rubra*		May-June
tree-deciduous	sugar maple	*Acer saccharum*		April-May
tree-deciduous	white ash	*Fraxinus americana*		May
tree-deciduous	yellow birch	*Betula alleghaniensis*		April-May
fern	bracken fern	*Pteridium aquilinum*		July-August (spores)
fern	bulblet fern	*Cystopteris bulbifera*		mid-summer (spores; bulblets)
fern	maidenhair fern	*Adiantum pedatum*		late summer (spores)
fern	ostrich fern	*Matteuccia struthiopteris*		mid-late summer (spores)
fern	royal fern	*Osmunda regalis*		summer (spores)
fern	sensitive fern	*Onoclea sensibilis*		late summer (spores)
clubmoss	stiff clubmoss	*Spinulum annotinum*		July-early October (spores)
moss	sphagnum	*Sphagnum spp*		May-September (vegetative)

*See USFWS and State of Michigan Designations in Appendix B above.

**Wildflowers, shrubs, deciduous trees - flowers; Grasses, sedges, rushes - fruits; Coniferous trees - cones; Ferns, clubmosses - spores; Mosses - vegetative

Invasive Plants Confirmed on Beaver Island as of 2023			
Form	**Common Name**	**Scientific Name**	**Flowering or fruiting period ****
wildflower	bull thistle	*Cirsium vulgare*	June-October
wildflower	Canada thistle	*Cirsium arvense*	June-October
wildflower	coltsfoot	*Tussilago farfara*	April-June
wildflower	common St. John's-wort	*Hypericum perforatum*	June-September
wildflower	crown vetch	*Coronilla varia*	May-September
wildflower	false baby's breath	*Galium mollugo*	June-September
wildflower	garlic mustard	*Alliaria petiolata*	May-June
wildflower	hound's-tongue	*Cynoglossum officinale*	May-July
wildflower	Japanese hedge-parsley	*Torilis japonica*	June-August
wildflower	Japanese knotweed	*Fallopia japonica*	August-September
wildflower	leafy spurge	*Euphorbia virgata*	May-September
wildflower	marsh thistle	*Cirsium palustre*	June-August
wildflower	narrow-leaved cat-tail	*Typha angustifolia*	May-July
wildflower	purple loosestrife	*Lythrum salicaria*	July-September
wildflower	spotted knapweed	*Centaurea stoebe*	June-October
wildflower	watercress (non-native)	*Nasturtium microphyllum*	April-July

wildflower	white sweet clover	*Melilotus alba*	June-October
wildflower	wild parsnip	*Pastinaca sativa*	June-July
grass	Canada bluegrass	*Poa compressa*	July-September
grass	Kentucky bluegrass	*Poa pratensis*	June-August
grass	phragmites (non-native)	*Phragmites australis* ssp. *australis*	September-November
grass	reed canary grass	*Phalaris arundinacea*	June-July
shrub	autumn olive	*Elaeagnus umbellata*	May-June
shrub	Belle's honeysuckle	*Lonicera ×bella*	May-June
shrub	Japanese barberry	*Berberis thunbergii*	April-May
shrub	multiflora rose	*Rosa multiflora*	June
shrub	Tartarian honeysuckle	*Lonicera tatarica*	May-June
vine	Oriental bittersweet	*Celastrus orbiculatus*	May-June
tree-conifer	Scotch pine	*Pinus sylvestris*	September-November (cones)
tree-deciduous	black locust	*Robina pseudoacacia*	June
tree-deciduous	Lombardy poplar	*Populus nigra var. italica*	May

**Wildflowers, shrubs, deciduous trees - flowers; Grasses, sedges, rushes - fruits; Coniferous trees - cones; Ferns, clubmosses - spores; Mosses - vegetative

Animals noted in Booklet								
	Common Name	**Scientific Name**	**Status***	**Spring**	**Summer**	**Fall**	**Winter**	**B?**
insect (pest)	emerald ash borer	*Agrilus planipennis*	Prohibited invasive species; best surveyed through traps in summer.					
bird	bobolink	*Dolichonyx oryzivorus*		U	U			B
bird	dickcissel	*Spiza americana*	SC	R	R			
Bird	eastern meadowlark	*Sturnella magna*	SC	U	U	U		B
bird	eastern bluebird	*Sialia sialis*		C	C	U	R	B
bird	grasshopper sparrow	*Ammodramus savannarum*	SC	U	U	U		B?
bird	horned lark	*Eremophila alpestris*		C		R	C	
bird	Lapland longspur	*Calcarius lapponicus*		R		R		
bird	piping plover	*Charadrius melodus*	LE, E	R	R	R		
bird	savanna sparrow	*Passerculus sandwichensis*		U	U	U		B
bird	upland sandpiper	*Bartramia longicauda*	T	R	R	R		B

*See USFWS and State of Michigan Designations in Appendix B above.

Bird information is from the Beaver Archipelago Check List, modified in July 2018[45]. www.BeaverIslandBirdingTrail.org

Spring = March-May **Summer** = June-August **Fall** = September-November **Winter** = December-February

C - Common; likely to be seen in the appropriate habitat; **U** - Uncommon; not always seen even in appropriate habitat

O - Occasional; not usually present, but are records of occurrence; **R** - Rare; very few records

B - Breeds on Beaver Island; **B?** - may breed on Beaver Island but has not been confirmed

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Appendix D.
References, Additional Resources

References

[1] The Journal of Beaver Island History. Volume One. 1976. Essays on the History of Beaver Island. A Beaver Island Bicentennial Committee Publication. William Cashman, Project Director. The Beaver Island Historical Society, St. James Township, Michigan. Page 89: Notes on Island Logging by David Gladish.

[2] Land Information Access Association (LIAA). 2023. Beaver Island Master Plan. Available at St. James and Peaine's Websites and their Township Halls, the BI Community Center, and the District Library. https://stjamestwp.org/news_detail_T1_R53.php Accessed January 2024] https://www.peainetwp.org/planning_commission/2017_resilient_beaver_island_master_plan_final.php [Accessed February 2024]

[3] MDNR. 2022. 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. Jennifer Kleitch and Erin Victory. Edited and reviewed by the Northern Lake Michigan Islands Collaborative. https://www.michigan.gov/dnr/-/media/Project/Websites/dnr/Documents/Boards/NLMIC/beaver-island-implimentation-plan-may-2022.pdf?rev=31f4a3708f9543c78b9e537511369942 [Accessed March 2024]

[4] Farrand, W.R. 1988. The Glacial Lakes around Michigan. Bulletin 4, revised 1988. Michigan Department of Environmental Quality (now Environment, Great Lakes and Energy), Geological Survey Division. https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/OGMD/Catalog/03/GIMDL-BU04.PDF?rev=6ac620c532204df2b15406f595bffdf5 [Accessed January 2024]

[5] Kincaire, K., Goetz, S. L., Jones, T. M., and Kinnicutt, P. G. (2005). Geologic Mapping of Quaternary Glacial and Lacustrine Sediments on Beaver Island, MI. Central Michigan University (CMU). United States Geologic Survey (USGS). Abstract from 2005 North-Central Meeting. https://www.researchgate.net/publication/323846988_Quaternary_Geologic_Mapping_of_Beaver_Island_Michigan [Accessed February 2024]

[6] MNFI. Vegetation circa 1800 Map. https://mnfi.anr.msu.edu/resources/vegetation-circa-1800 [Accessed January 2024]

[7] MNFI. Vegetation circa 1800 Map. Zoom into Beaver Island. https://mnfi.maps.arcgis.com/apps/webappviewer/index.html?id=bbdca9029f184571bd0369cb4aa90cd2 [Accessed January 2024]MNFI. Michigan Natural Communities. https://mnfi.anr.msu.edu/communities [Accessed January 2024]

[8] Cohen, J. G., M.A. Kost, G.S. Slaughter, and D. A. Albert. A Field Guide to the Natural Communities of Michigan. https://mnfi.anr.msu.edu/publications/books [Accessed January 2024]

[9] Kost, M.S., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural Communities of Michigan: Classification and Description. Michigan Natural Features Inventory, Report Number 2007-21, Lansing, MI 314 pp. https://mnfi.anr.msu.edu/reports/MNFI-Report-2007-21.pdf [Accessed March 2024]

[10] MNFI. Michigan's Natural Communities. https://mnfi.anr.msu.edu/communities [Accessed January 2024]

[11] MNFI. Species and Natural Community Abstracts. https://mnfi.anr.msu.edu/publications/abstracts [Accessed January 2024]

[12] EGLE. Shifting Sands: Michigan's Critical Dune Areas. https://storymaps.arcgis.com/stories/90f92201d5994837a08b1efc39c801c1 [Accessed March 2024]

[13] Critical Dune Areas Program. https://www.michigan.gov/egle/about/organization/water-resources/sand-dunes/critical-dunes [Accessed January 2024]

[14] Natural Resources and Environmental Protection Act (excerpt); Act 451 of 1994. Part 353. San Dunes Protection and Management. https://www.legislature.mi.gov/(S(olthhienora4xrmnt2idb355))/documents/mcl/pdf/mcl-451-1994-III-1-LAND-HABITATS-353.pdf?20140125142338 [Accessed January 2024}

[15] MDNR Land and Water Management Division. 1989. Reprinted in 1993. Atlas of Critical Dunes. https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/Shoreland/Altas-Critical-Sand-Dune-Areas.pdf [Accessed January 2024]

[16] MiEnviro Portal: Site Map Explorer. https://www.michigan.gov/egle/about/organization/water-resources/sand-dunes/critical-dunes/maps [Accessed January 2024]

[17] Center for Biological Diversity. Monarch Butterfly. https://www.biologicaldiversity.org/species/invertebrates/monarch_butterfly/#:~:text=Yet%20these%20butterflies%2C%20once%20a,declined%2085%25%20in%20two%20decades. [Accessed January 2024.]

[18] Tallamy, D.W. 2007. Bringing Nature Home, Updated and Expanded: How You Can Sustain Wildlife with Native Plants. Timber Press, Portland, Oregon. Page 46.

[19] Executive Order 13112 – Invasive Species. https://www.invasivespeciesinfo.gov/executive-order-13112 [Accessed February 2024]

[20] International Dark Sky Association. https://darksky.org/ [Accessed March 2024]

[21] Harris, Shelby. March 6, 2024. Dark Sky designation and associated health concerns. Personal communication.

[22] Light pollution affects human health. https://darksky.org/resources/what-is-light-pollution/effects/human-health/ [Accessed March 2024]

[23] Light pollution harms wildlife and ecosystems. https://darksky.org/resources/what-is-light-pollution/effects/wildlife-ecosystems/

[24] St. James and Peaine Township Wood Ordinance Sign. https://webgen1files1.revize.com/peainetwpmi/WOOD%20MOVEMENT%20SIGN%20Final%20.pdf [Accessed February 2024

[25] Tallamy, D.W. 2009. Bringing Nature Home, Updated and Expanded: How You Can Sustain Wildlife with Native Plants. Timber Press, Portland, Oregon. Pages 9, 13-15, 234-285.

[26] Tallamy, D.W. 2019. Nature's Best Hope. A New Approach to Conservation That Starts in Your Yard. Timber Press, Portland, Oregon. Pages 99-106.

[27] Tallamy, D.W. 2009. Bringing Nature Home, Updated and Expanded: How You Can Sustain Wildlife with Native Plants. Timber Press, Portland, Oregon. Pages 15, 274.

[28] Tallamy, D.W. 2019. Nature's Best Hope. A New Approach to Conservation That Starts in Your Yard. Timber Press, Portland, Oregon. Pages 112-113, page 114 photo caption, Page 130-133.

[29] Tallamy, D.W. 2019. Nature's Best Hope. A New Approach to Conservation That Starts in Your Yard. Timber Press, Portland, Oregon. Pages 135-137.

[30] Tallamy, D.W. 2009. Bringing Nature Home, Updated and Expanded: How You Can Sustain Wildlife with Native Plants. Timber Press, Portland, Oregon. Page 15.

[31] The Beaver Island Archipelago Terrestrial Invasive Species Program. https://www.cakecisma.org/beaver-island

[32] Pam Grassmick. 2024. Islander. Personal communication.

[33] Phragmites—Native or Not? https://mnfi.anr.msu.edu/pdfs/phragmites-native-non-native.pdf [Accessed March 2024]

[34] Seal, Nic. 2018. Can Japanese knotweed grow through concrete? Environet Invasive Species Specialists. https://www.environetuk.com/blog/japanese-knotweed-grow-concrete#:~:text=%E2%80%9CIf%20left%20untreated%2C%20Japanese%20knotweed,and%20drains%2C%E2%80%9D%20says%20Nic [Accessed February 2024]

[35] EGLE. Invasive Species: Japanese Knotweed. https://www.michigan.gov/invasives/id-report/plants/shrubs/japanese-knotweed [Accessed February 2024]

[36] Saunders, Sarah. 2023. Piping Plovers are Flying High with a Second Record-breaking Breeding Season. Audubon Great Lakes. https://gl.audubon.org/news/great-lakes-piping-plovers-are-flying-high-second-record-breaking-breeding-season [Accessed February 2024]

[37] Great Lakes Piping Plovers. https://www.greatlakespipingplover.org/ [Accessed February 2024]

[38] Parsons, Bill. 2023. Little Bay Bands of Odawa Indians. Personal communication.

[39] Emerald Ash Borer Network. About the Emerald Ash Borer. http://www.emeraldashborer.info/about-eab [Accessed February 2024]

[40] Emerald Ash Borer Network. Biological Control. http://www.emeraldashborer.info/biological-control [Accessed February 2024]

[41] USDA–APHIS/ARS/FS. 2021. Emerald Ash Borer Biological Control Release and Recovery Guidelines. USDA–APHIS–ARS–FS, Riverdale, Maryland. https://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/downloads/eab-field-release-guidelines.pdf [Accessed February 2024]

[42] Leuck, Beth and Pam Grassmick. 2024. Personal Communication.

[43] Shelton, Anthony. Biological Control. A Guide to Natural Enemies in North America. Cornell University. https://biocontrol.entomology.cornell.edu/what.php [Accessed March 2024]

[44] Grassmick, Pam. 2024. Personal Communication.

[45] Beaver Archipelago Bird Check List. www.BeaverIslandBirdingTrail.org *Click on Birding logistics* – the *BIBT Checklist* is near the top for download. [Accessed February 2024]

Additional Resources

Beaver Island Trail Map. https://www.beaverisland.org/wp-content/uploads/2015/10/beaver-island-trails-map-revised2.pdf [Accessed February 2024]

Beaver Island Trails. https://webgen1files1.revize.com/peainetwpmi/Document%20Center/Campgrounds%20&%20Trails/All%20Trail%20descriptions.1.pdf [Accessed February 2024]

Borland, K., S. Campbell, R. Schillo, and P. Higman. 2015. A Field Identification Guide to Invasive Species in Michigan's Natural Communities. https://mnfi.anr.msu.edu/publications/books [Accessed January 2024]

Campbell, S., P. Higman, B. Slaughter, E. Schools. 2015. A Field Guide to Invasive Plants of Aquatic and Wetland Habitats for Michigan. https://mnfi.anr.msu.edu/publications/books [Accessed January 2024]

Cohen, J.G., 2017. Natural Community Surveys of Beaver Island Archipelago. Michigan Natural Features Inventory. Report Number 2017-11, Lansing MI. 162 pp. https://mnfi.anr.msu.edu/reports/MNFI-Report-2017-11.pdf

Environment, Great Lakes, and Energy; Water Resources Division. Shifting Sands: Michigan Critical Dune Areas: Ours to Protect and Preserve. A story map. https://storymaps.arcgis.com/stories/90f92201d5994837a08b1efc39c801c1 [Accessed February. 2024]

GEI Consulting Engineers and Scientists. 2017. Beaver Island Invasive Species Survey and Control. Beaver Island: Charlevoix County, Michigan. Submitted to Antrim Conservation District. GEI Project No. 1702835. 13 pp, plus Figures and Appendices.

Great Lakes Island Alliance (GLIA). https://glialliance.org/ [Accessed January 2024]

Go Beyond Beauty for wildlife, clean waters, and beautiful gardens. https://www.habitatmatters.org/go-beyond-beauty.html [Accessed February 2024]

Hyde, D. and S. Campbell. 2012. Agricultural Practices That Conserve Grassland Birds. Michigan Natural Features Inventory, Michigan State University. https://mnfi.anr.msu.edu/pdfs/ag-bird-booklet.pdf [Accessed Feb. 2024]

Kelly, R.S. A glacier passed this way. https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/OGMD/Catalog/10/NSAGLAC.pdf?rev=6a49f6592da34558b00451f0e0944686#:~:text=Prior%20to%20glaciation%2C%20the%20Michigan,that%20erosion%20was%20taking%20place [Accessed January 2024]

Henson, B.L., D.T. Kraus, M.J. McMurtry, and D. N. Ewert. 2010. Islands of Life: A biodiversity and Conservation Atlas of the Great Lakes Islands. Nature Conservancy of Canada. 154 pp.

Higman, P.J., H.D. Enander, D.A. Hyde, P.J Badra, L.A. May and K.M. Korroch. 2019. Preserving the Legacy of Michigan's Great Lakes Islands: A Planning Framework and Database for Invasive Species Action. Report to the USFWS Great Lakes Coastal Program. MNFI Report No, 2019-17.

Higman, P.J. and D.A. Hyde. 2013. Floristic Quality Assessments. Natural Features, Invasive Species and Breeding Bird Surveys. Little Traverse Conservancy Lands, Beaver Island MI. MNFI Report # 2013-08. 25 pp. +App. 101 pp.

Michigan Flora On-line: https://michiganflora.net/ [Accessed January 2024]

Michigan Natural Features Inventory (MNFI): https://mnfi.anr.msu.edu/ [Accessed January 2024]

Midwest Invasive Plant Network (MIPN). https://www.mipn.org/ {Accessed January 2024]

MIPN. Site Revegetation and Ecological Service Providers of the Midwest. https://www.mipn.org/cwma-resources/site-revegetation/site-revegetation-contractors/ [Accessed February 2024]

MIPN. Native Plant and Seed Sellers in the Midwest. https://www.mipn.org/cwma-resources/site-revegetation/native-plant-nurseries-of-the-midwest/ [Accessed February 2024]

MIPN. Landscape Alternatives for Invasive Trees, Shrubs, and Vines of the Great lakes Region https://bugwoodcloud.org/mura/mipn/assets/File/Landscape%20Alternatives%202023.pdf [Accessed Feb. 2024]

MNFI. Michigan's Rare Plants: https://mnfi.anr.msu.edu/species/plants [Accessed January 2024]

MNFI. Michigan's Rare Animals: https://mnfi.anr.msu.edu/species/animals [Accessed January 2024]

National Park System. 2023. Glaciers; Glacial Features. https://www.nps.gov/piro/learn/nature/glaciers.htm#:~:text=The%20Valders%20advance%2C%20one%20of,ago%20in%20northern%20Upper%20Michigan [Accessed January 2023]

NatureServe. https://www.natureserve.org/ [Accessed February 2024]

Northern Lake Michigan Island Collaborative. https://www.michigan.gov/dnr/about/boards/northern-lake-michigan-islands-collaborative [Accessed January 2024]

Peaine Township Five-Year Parks & Recreation Plan. (2024-2028). DRAFT November 27, 2023. Peane Township, Charlevoix County, Michigan. https://webgen1files1.revize.com/peainetwpmi/862080%20Peaine%20Twp%20Park%20and%20Rec%20Plan%20DRAFT%2011.27.23.pdf [Accessed February 2024]

Preserve the Dunes, Inc. 2012. Homes in the Dunes; Designed to Preserve. Charles F. Davis, III & Marcy Colclough. https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/Shoreland/Homes-in-the-Dunes.pdf [Accessed January 2024]

Shea, B., A. Bechle, G. Clark**.** Nature-based shoreline. Options for the Great Lakes Coast. University of Wisconsin Sea Grant Institute https://publications.aqua.wisc.edu/product/nature-based-shoreline-options-for-the-great-lakes-coasts/ [Accessed March 2024]

St. James Township Five-Year Park and Recreation Plan 2023-2027. St. James Township, Michigan Charlevoix Country. Fleis & Vandenbrink. https://webgen1files1.revize.com/stjamestwpmi/St.%20James%20Township%205-Year%20Harbor,%20Parks,%20and%20Recreation%20Plan%202023%20FINAL.pdf [Accessed February 2024]

Tavares, K., C.H. Fletcher, and T. R. Anderson. 2020. Risk of shoreline hardening and associated beach loss peaks before mid-center: O'ahu, Hawai'i. Scientific Reports. 12, August. https://www.nature.com/articles/s41598-020-70577-y [Accessed March 2024)

Tuffelmire. M. 2016. Prehistoric Michigan covered by ancient seas, tropical jungles before the Mitten formed. The Rapidian. https://www.therapidian.org/prehistoric-michigan-covered-ancient-seas-tropical-jungles#:~:text=However%2C%20the%20area%20that%20is,time%20from%20the%20state's%20history. [Accessed January 2024]

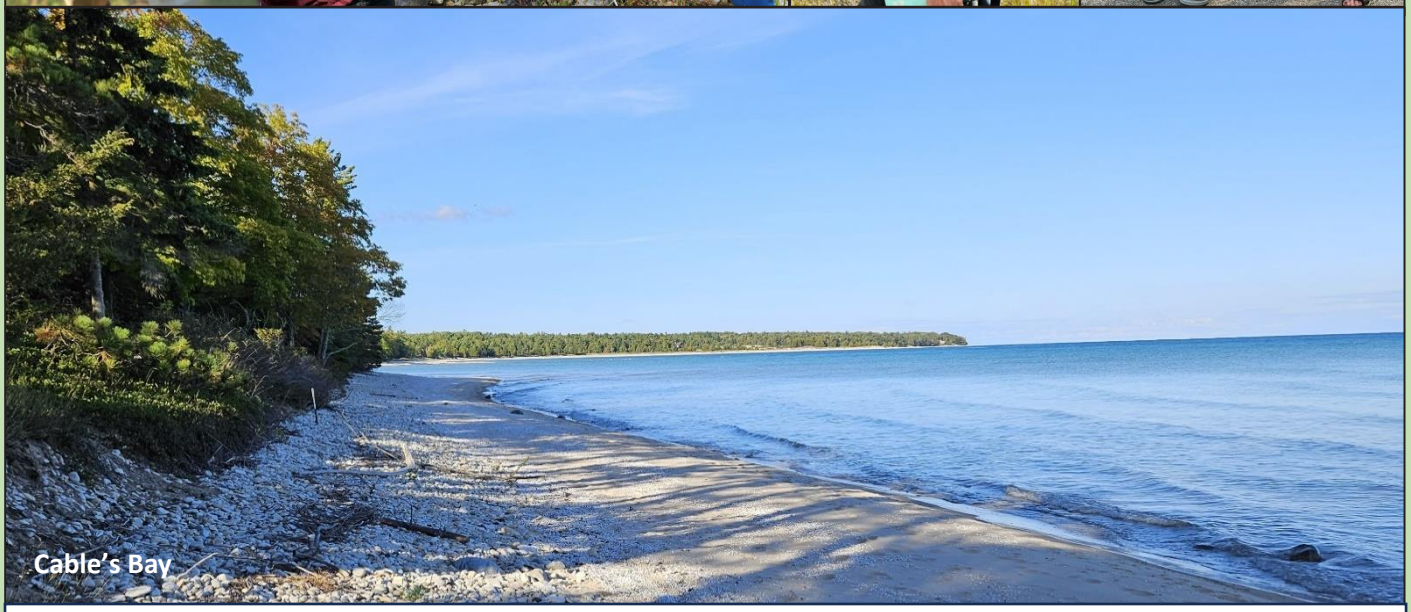
USFWS Dwarf Lake Iris Recovery Plan: https://www.fws.gov/node/68695 [Accessed March 2024]

USFWS Houghton's Goldenrod Recovery Plan: https://ecos.fws.gov/ecp/species/5219 [Accessed March 2024]

USFWS Michigan Monkey-flower Recovery Plan: https://ecos.fws.gov/ecp/species/5295#recovery [Accessed March 2024]

USFWS Pitcher's Thistle Recovery Plan: https://www.fws.gov/node/68077 [Accessed March 2024

Williams, E. G. 1962. The Great Lakes in Ancient Times and a Glimpse into the Future – Summer 1962. Inland Seas Online. https://nmgl.org/the-great-lakes-in-ancient-times-and-a-glimpse-into-the-future-summer-1962/



Cable's Bay

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