Ecological Evaluation Report



Property Under Review: Saugatuck Harbor Natural Area

Location: Oval Dr, Saugatuck, MI 49453

Prepared for: City of Saugatuck

Prepared by: ODC Network (ODC Conservation Services)

Contact Information:

Project Background
The ODC Conservation Services team conducted an ecological evaluation of parcel #'s: 57-004-008-00, 57-004-010-00, 57-004-013-00, and 57-004-008-10, located on Oval Dr in Saugatuck, MI. The field survey portion of the project took place between April – August of the 2026 growing season. The ecological evaluation process involved the identification of distinct natural communities on the site, along with outlining the following criteria for each unit:

- General ecological site description and inventory of natural features
- Description of each natural community including:
  - Landscape context and natural processes
  - General inventory of native plant communities including canopy, understory, and forb/graminoid layer
  - Documentation of high-quality native plant species (coefficient of conservatism rankings between 7-10)
  - Documentation of observed (and potential) wildlife including: state threatened (T), endangered (E), and species of special concern (SC)
  - Documentation of invasive species, pests, and ecological threats
  - Identification of potential ecological restoration and outdoor education opportunities

Executive Summary
The Saugatuck Harbor Natural Area (SHNA) is an approximately 173-acre coastal preserve owned and managed by the City of Saugatuck that protects an ecologically significant dune system along the southeastern shore of Lake Michigan. Permanently protected through a partnership with the Land Conservancy of West Michigan (LCWM), the property contains an exceptional diversity of natural communities, including open dunes, interdunal wetlands, Great Lakes marsh, and a fragment of mesic northern forest. These habitats support numerous rare plant and wildlife species while providing opportunities for low-impact recreation, education, and scientific research.

The original management plan from 2010 established a clear vision of balancing public access with long-term preservation of the site's ecological integrity. More than a decade later, natural dune processes continue to function properly and most native plant communities remain in good to excellent condition, indicating the property continues to retain exceptionally high ecological value. SHNA undoubtedly remains a high-quality coastal natural area in southwest Michigan and continues to serve as a critical component of a larger protected landscape extending from Oval Beach and Mount Baldhead to Saugatuck Dunes State Park.

Despite the overall health of the preserve, several emerging threats warrant proactive management. The highest ecological priority is the control of invasive phragmites (*Phragmites australis* subsp. *australis*) within the Great Lakes marsh and interdunal wetland communities, where relatively small infestations present an opportunity for successful eradication before widespread expansion occurs. Japanese barberry (*Berberis thunbergii*) is becoming established within shaded dune and forest habitats and requires continued treatment to prevent long-term degradation of native plant communities. Excessive deer browse is limiting forest regeneration and reducing understory diversity, particularly within the mesic northern forest. Additionally, localized off-trail recreation near Oval Beach has contributed to vegetation loss, trail proliferation, accelerated dune erosion, and small infestations of the invasive spotted knapweed (*Centaurea stoebe*).

The interdunal wetlands remain in good ecological condition overall and currently require little active management beyond invasive species management, continued monitoring, and support for ongoing scientific research. Likewise, the open dune system continues to benefit from allowing natural erosion and deposition processes to occur without artificial stabilization, preserving the dynamic landscape that supports native dune species and ecosystem function.

This ecological evaluation supports a management approach focused on early intervention, targeted restoration, and adaptive stewardship rather than large-scale ecological reconstruction. Primary recommendations include aggressive invasive species management and consistent surveying, evaluation of long-term deer population management strategies, improved trail management to concentrate visitor use and reduce habitat impacts (developed through a separate trail assessment), continued monitoring of ecological conditions, and preservation of natural coastal processes. Equally important is maintaining the philosophy established in the original management plan, providing high-quality public access while ensuring that recreation remains secondary to the protection of SHNA's natural resources.

By implementing these recommendations, the City of Saugatuck can preserve the ecological integrity of the Saugatuck Harbor Natural Area while enhancing visitor experiences and ensuring this significant coastal landscape continues to support rare species, natural ecological processes, and scientific research for generations to come.

Site Description

The Saugatuck Harbor Natural Area (SHNA) is a 173-acre coastal preserve located along the southeastern shoreline of Lake Michigan, immediately south of the Kalamazoo River mouth in the City of Saugatuck, Michigan. The property encompasses an ecologically significant dune landscape in southwest Michigan and forms the centerpiece of a larger protected natural corridor that includes Saugatuck Dunes State Park, Mount Baldhead Park, Oval Beach, and the Ox-Bow Art School property.

The site contains a remarkable diversity of native natural communities, including open dunes, interdunal wetlands, Great Lakes marsh, and mesic northern forest. These interconnected habitats support numerous rare plant and wildlife species while preserving dynamic ecological processes driven by fluctuating Lake Michigan water levels, natural sand movement, and coastal hydrology. Overall, the property remains in excellent ecological condition aside from invasive species pressure, with many natural systems functioning with minimal human disturbance.

Human impacts are primarily concentrated around trail corridors and areas adjacent to Oval Beach, where unauthorized social trails have resulted in localized vegetation loss, some dune destabilization, and soil erosion. Invasive plant species, including Japanese barberry, spotted knapweed, and phragmites, are present within portions of the property and represent the most significant long-term ecological threat if left unmanaged. Excessive deer browse is limiting natural forest regeneration and reducing understory diversity within the forested sections. Moreover, with eastern hemlocks (*Tsuga canadensis*) present in the southernmost forested section, hemlock woolly adelgid (HWA) threatens to take these trees down and affect the ecological integrity of heavily sloped backdunes where these hemlocks serve as canopy trees.

Despite these localized stressors, SHNA continues to support high-quality native plant communities and serves as an important refuge for rare species, providing suitable habitat for the state-threatened pitcher’s thistle (*Cirsium pitcheri*), the state-threatened Blanchard's cricket frog (*Acris blanchardi*), and the endangered prairie warbler (*Setophaga discolor*). The property's ecological integrity, combined with its role in protecting rare interdunal wetlands and intact Great Lakes coastal ecosystems, underscores the importance of continued stewardship. Targeted invasive species management, strategic trail improvements, passive interpretation and signage installation, routine ecological monitoring, and preservation of natural dune and wetland processes will be essential to maintaining the long-term health and resilience of this exceptional coastal landscape.

Site Location

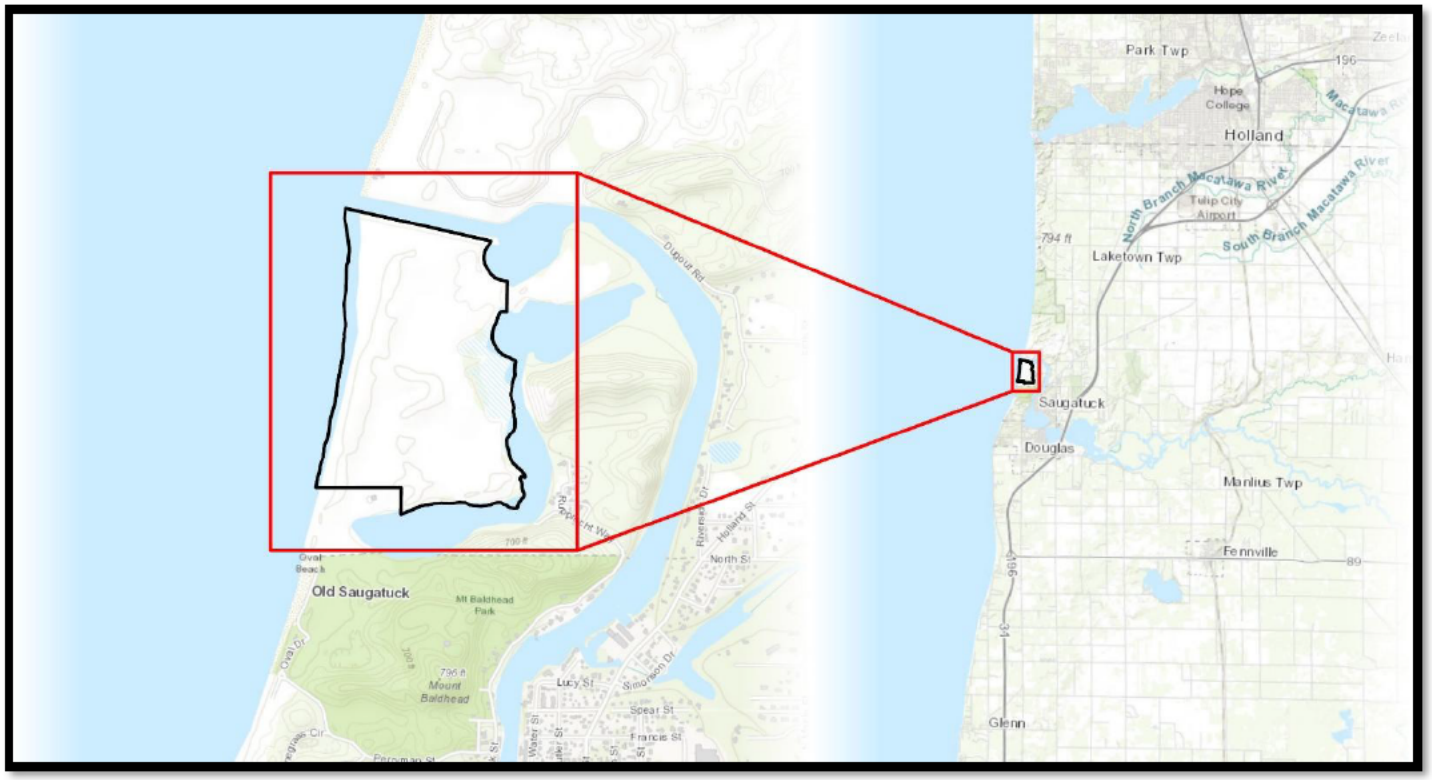


Figure 1: *Aerial image of the location of the property showing its broader context within the coastline of Lake Michigan in connection with other natural areas, forming a critical wildlife corridor.*

Site Information

Parcel(s):

57-004-008-00, 57-004-010-00, 57-004-008-10, 57-004-013-00

Property Size:

173 acres

Topography:

Dynamic coastal dune system characterized by active foredunes, open dunes, interdunal swales, wooded dunes, and Great Lakes marsh, with elevations ranging from approximately 580 to 620 feet above sea level.

Soil Types:

Primarily Plainfield Sand and dune sands, with some hydric organic soils occurring within interdunal wetlands and Great Lakes marsh communities.

Watershed:

Kalamazoo River Watershed (Lake Michigan Basin)

Corridor Component:

A core component of approximately 1,700 acres of contiguous protected coastal habitat, connected to Saugatuck Dunes State Park, Oval Beach, Mount Baldhead Park, and the Ox-Bow art school.

Historical Land Use:

Historically an undeveloped coastal dune landscape associated with the original mouth of the Kalamazoo River. The most significant anthropogenic alteration occurred in 1906 when the U.S. Army Corps of Engineers constructed the current Kalamazoo River channel, creating the Oxbow Lagoon and separating the property from lands to the north. Aside from foot traffic due to trail development and passive recreation, the site has remained largely undisturbed and retains a high degree of ecological integrity.

Disturbance Comments:

Several natural disturbance processes, including wind, sand movement, fluctuating Lake Michigan water levels, and periodic shoreline erosion, are essential drivers of ecosystem function across the

property. Human disturbance is primarily associated with concentrated recreational use near Oval Beach, including unauthorized social trails, localized vegetation trampling, and dune erosion. Additional ecological pressures include invasive plant species, particularly phragmites and Japanese barberry, along with excessive deer browse within forested communities.

Ecological Community Information

Pre-settlement Cover Types:

Coastal Sand Dune Complex (Open Dunes, Interdunal Wetland, Great Lakes Marsh, and Forested Dune Communities)

Present Natural Communities:

Open Dune, Interdunal Wetland, Great Lakes Marsh, Mesic Northern Forest

Ecological Condition:

Overall ecological condition is excellent, with natural dune processes largely intact and native plant communities exhibiting high ecological integrity. Recent fluctuations in water levels have resulted in localized canopy mortality within portions of the Great Lakes marsh, accelerating the natural transition toward herbaceous wetland vegetation. Mature forest structure is present within the mesic northern forest, although regeneration is limited by heavy deer browse. Active sand movement continues to shape the open dune communities, maintaining the dynamic conditions necessary for long-term ecosystem function.

Total Plant Species Recorded:

191

Floristic Quality Index (Adjusted FQI):

45.3 (adjusted FQI for entire property – see *Appendix E for full details*)
(**General FQI Interpretation**: 1-19 = low quality, 20-35 high quality, 35+ = exceptional)
*This number is an index that serves to indicate the general condition of the vegetation found in a natural area. A *Coefficient of Conservatism* value (or CC) is a numerical ranking (0–10) assigned to native plant species in each state based on their tolerance to disturbance and fidelity to pre-settlement natural communities. The adjusted FQI number is calculated using a complex equation that accounts for the proportion of native versus non-native species, which makes this index number easier to compare to other sites, no matter the size or number of species surveyed.

Notable Elements:

- **38** plants with a coefficient of conservatism (CC) values of **7 or higher**
- Globally rare interdunal wetland communities
- High-quality Great Lakes coastal dune ecosystem
- Suitable habitat for multiple rare species, including the state-threatened pitcher’s thistle, the state-threatened Blanchard's cricket frog, and the endangered prairie warbler
- Natural shoreline, dune, and hydrologic processes remain largely intact across the property

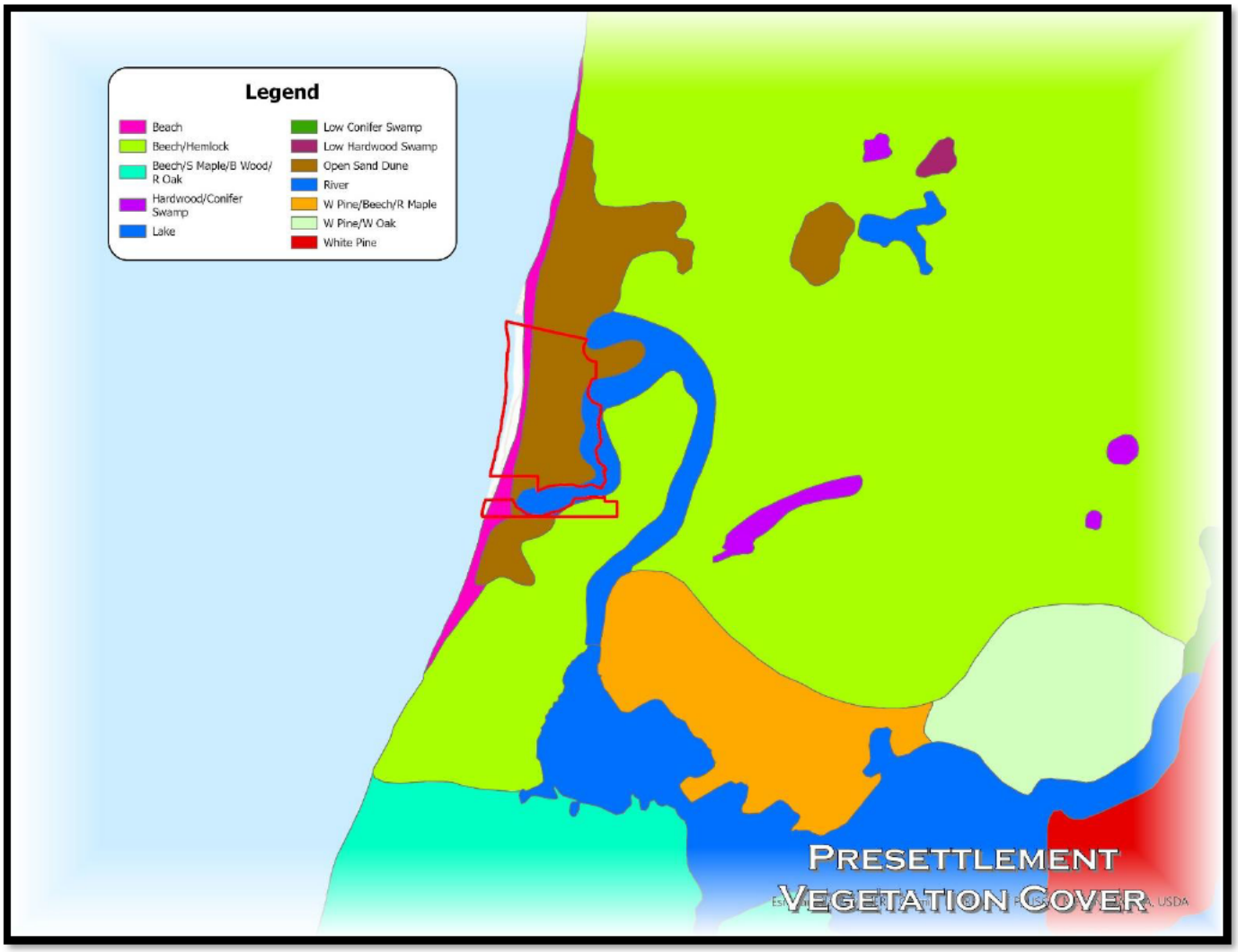


Figure 2: *Map of pre-settlement vegetation cover (via Michigan Natural Features Inventory "Vegetation circa 1800")*

Ecological Site Description and Natural Features

1. **Topography**
   The property is characterized by a dynamic coastal dune landscape with elevations ranging from approximately 580 to 620 feet above mean sea level. Topography consists of active foredunes, rolling open dunes, interdunal swales, wooded dunes, Lake Michigan shoreline, and low-lying marshes associated with the Oxbow Lagoon. Natural sand movement continues to shape the landscape, creating a diverse mosaic of ridges, depressions, and wetland basins.

2. **Hydrology**
   The Saugatuck Harbor Natural Area contains approximately 3,700 linear feet of Lake Michigan shoreline and is bordered by the Kalamazoo River channel and Oxbow Lagoon. Hydrology is strongly influenced by fluctuating Lake Michigan water levels, groundwater discharge, and natural coastal processes. Multiple interdunal wetlands occur throughout the dune complex, while a biodiverse Great Lakes marsh occupies the transition between the open dunes and Oxbow Lagoon. Seasonal and long-term changes in water levels drive shifts in vegetation composition and provide critical habitat for a wide variety of native plants and wildlife.



Figure 3: *Aerial image of the property highlighting its key hydrological features and drainage patterns.*

3. **Ecological Communities**
   The property supports an exceptional diversity of native communities, including:
   - Open Dune
   - Interdunal Wetland
   - Great Lakes Marsh
   - Mesic Northern Forest

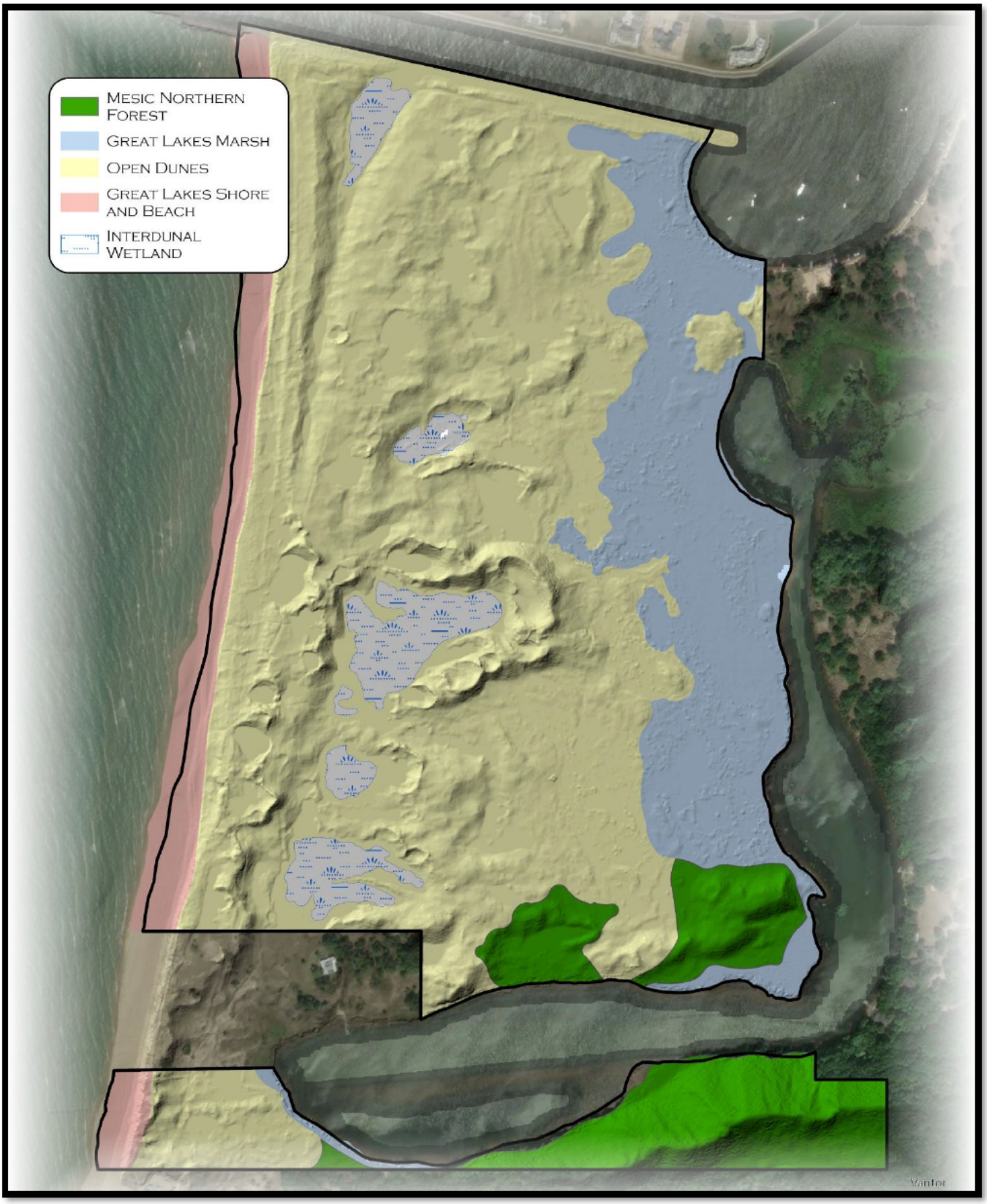


Figure 4: *Relative locations of the different natural communities observed on the property.*

4. **High Quality Plant Species**
   A *Coefficient of Conservatism* value (or CC) is a numerical ranking (0–10) assigned to native plant species based on their tolerance to disturbance and fidelity to pre-settlement natural communities. Species with high CC-values (7–10) are habitat specialists that are typically only present in high quality, relatively undisturbed ecosystems and serve as strong indicators of ecological integrity.

The floristic inventory documented **38** native species with CC values of **7 or greater**, reflecting the **high ecological quality** of the SHNA. Representative high-quality species include:

- **CC = 10**: Marram grass (*Ammophila breviligulata*), sand reed (*Calamovilfa longifolia*), twig-rush (*Cladium mariscoides*), frostweed (*Crocanthemum bicknellii*), beach-heath (*Hudsonia tomentosa*), Kalm's St. John's-wort (*Hypericum kalmianum*), creeping juniper (*Juniperus horizontalis*), beach pea (*Lathyrus japonicus*), hoary puccoon (*Lithospermum canescens*), plains puccoon (*Lithospermum caroliniense*), bog lobelia (*Lobelia kalmii*), beak-rush (*Rhynchospora capillacea*), and Gillman's goldenrod (*Solidago simplex*).
- **CC = 9**: Short-fruited rush (*Juncus brachycarpus*), black-gum (*Nyssa sylvatica*), blueleaf willow (*Salix myricoides*), and birdfoot violet (*Viola pedata*).
- **CC = 8**: Spotted wintergreen (*Chimaphila maculata*), flowering dogwood (*Cornus florida*), leatherwood (*Dirca palustris*), blue toadflax (*Nuttallanthus canadensis*), common polypody (*Polypodium virginianum*), pickerel-weed (*Pontederia cordata*), sand cherry (*Prunus pumila*), and pin oak (*Quercus palustris*).
- **CC = 7**: Purple false foxglove (*Agalinis purpurea*), sand cress (*Arabidopsis lyrata*), marsh bellflower (*Campanula aparinoides*), sedge (*Carex muehlenbergii*), buttonbush (*Cephalanthus occidentalis*), wood reed (*Cinna arundinacea*), marsh cinquefoil (*Comarum palustre*), swamp loosestrife (*Decodon verticillatus*), rush (*Juncus brachycephalus*), marsh pea (*Lathyrus palustris*), spicebush (*Lindera benzoin*), sycamore (*Platanus occidentalis*), and bushy aster (*Symphyotrichum dumosum*).

5. **Invasive Species**

Although the site remains in excellent ecological condition overall, several invasive plant species are present and represent the primary long-term threat to the health of the ecosystem. The most significant management priority is phragmites (*Phragmites australis* subsp. *australis*), which has become established within portions of the Great Lakes marsh and has the potential to rapidly displace native wetland vegetation if left untreated. Japanese barberry (*Berberis thunbergii*) is scattered throughout forested and shaded dune habitats, while additional invasive shrubs and herbaceous species occur in localized areas of the property.

Observed invasive species of highest concern include (See *Appendix D* for map):

- Garlic mustard (*Alliaria petiolata*)
- Japanese barberry (*Berberis thunbergii*)
- Spotted knapweed (*Centaurea stoebe*)
- Autumn olive (*Elaeagnus umbellata*)
- Glossy buckthorn (Frangula alnus)
- Bush honeysuckles (*Lonicera spp*.)
- Purple loosestrife (*Lythrum salicaria*)
- Reed canary grass (*Phalaris arundinacea*)
- Phragmites (*Phragmites australis* subsp. *australis*)
- Black locust (*Robinia pseudoacacia*)
- Multiflora rose (*Rosa multiflora*)

Description of Natural Communities

Open Dune

- **Landscape Context/Natural Features:** Open Dune is the dominant natural community at the Saugatuck Harbor Natural Area and represents an excellent model of what a healthy coastal dune ecosystem historically looked like in this area. These dynamic systems are maintained by continual wind-driven sand movement, shoreline erosion, and periodic deposition associated with fluctuating Lake Michigan water levels. Unlike many dune systems that have been stabilized through development or vegetation plantings, much of the dune landscape at SHNA continues to function under natural disturbance regimes, allowing ecological succession and sand movement to occur largely unimpeded.

  The open dunes form a complex mosaic with the interdunal wetland, Great Lakes marsh, and wooded dune communities, creating exceptional habitat diversity across the property. This constantly shifting landscape supports specialized native vegetation adapted to drought, nutrient-poor soils, burial by sand, and periodic disturbance while providing critical habitat for numerous insects, reptiles, migratory birds, and rare coastal species.

- **Plant Community:** The open dune community is dominated by native dune grasses and forbs adapted to excessively drained sandy soils and harsh environmental conditions characterized by wind, drought, and shifting substrates. American beachgrass (*Ammophila breviligulata*) is the dominant stabilizing grass on foredunes and active dune slopes, while little bluestem (*Schizachyrium scoparium*), occasional broom sedge (*Andropogon virginicus*), sand reed (*Calamovilfa longifolia*), and scattered patches of switchgrass (*Panicum virgatum*) and various panic grasses (*Dichanthelium* spp.) occupy more stabilized areas.

  Common representative native wildflowers include horse mint (*Monarda punctata*), common milkweed (*Asclepias syriaca*), sand cress (*Arabidopsis lyrata*), plains puccoon (*Lithospermum caroliniense*), beach pea (*Lathyrus japonicus*), pearly everlasting (*Anaphalis margaritacea*), and Gillman's goldenrod (*Solidago simplex*). Scattered shrubs and small trees become more frequent on stabilized dunes and transition zones, including beach heath (*Hudsonia tomentosa*), eastern red cedar and creeping juniper (*Juniperus spp.*), bearberry (*Arctostaphylos uva-ursi*), serviceberry (*Amelanchier spp*.), chokecherry (*Prunus virginiana*), and sand cherry (*Prunus pumila*), as well as jack, Scot's, Austrian, and white pine (*Pinus spp.*). The habitat is also suitable for the state-threatened pitcher's thistle (*Cirsium pitcheri*), which, while not observed directly on the property under review, was observed by the ODC Conservation team on the city-owned parcels directly south of the SHNA.

  Overall, the native vegetation remains in excellent condition, with invasive species occurring only in localized patches. Japanese barberry (*Berberis thunbergii*) represents the primary invasive shrub within shaded dune margins, while spotted knapweed (*Centaurea stoebe*) and other disturbance-adapted species should continue to be monitored along trail corridors and disturbed areas.



Figure 5: *Biodiverse section of Open Dune habitat pictured, showing a matrix of species including American beech grass, puccoon, and occasional prairie sand reed dotting the slopes.*

- **High Quality Plant Species:**
  Representative high-quality species associated with the open dune community include:
  - Marram grass *(Ammophila breviligulata) — CC = 10*
  - Sand reed grass *(Calamovilfa longifolia) — CC = 10*
  - Frostweed *(Crocanthemum bicknellii) — CC = 10*
  - Beach-heath *(Hudsonia tomentosa) — CC = 10*
  - Creeping juniper *(Juniperus horizontalis) — CC = 10*
  - Beach pea *(Lathyrus japonicus) — CC = 10*
  - Hoary puccoon *(Lithospermum canescens) — CC = 10*
  - Plains puccoon *(Lithospermum caroliniense) — CC = 10*
  - Gillman's goldenrod *(Solidago simplex) — CC = 10*
  - Birdfoot violet *(Viola pedata) — CC = 9*
  - Blue toadflax *(Nuttallanthus canadensis) — CC = 8*
  - Sand cherry *(Prunus pumila) — CC = 8*
  - Sand cress *(Arabidopsis lyrata) — CC = 7*



Figure 6: *American Beachgrass and eastern cottonwood shown as entering from the proposed trailhead kiosk location off of the Lake Michigan shoreline.*

- **Potential Wildlife:**
  - The open dune complex provides important habitat for a wide variety of native wildlife, including migratory songbirds, raptors, small mammals, reptiles, and pollinating insects. The dune-wetland interface also supports amphibians and provides movement corridors between adjacent habitats.
  - This habitat is suitable for a variety of potential rare wildlife including:
    - Piping plover (*Charadrius melodus*) — Federal/State Endangered
    - Dune cutworm (*Euxoa aurulenta*) — State Special Concern
    - Prairie warbler (*Setophaga discolor*) — State Endangered
    - Caspian tern (*Sterna caspia*) — State Threatened
    - Common tern (*Sterna hirundo*) — State Threatened
    - Lake Huron locust (*Trimerotropis huroniana*) — State Threatened

- **Potential Invasive Species, Pests, & Ecological Threats:**
  - Japanese barberry is becoming established beneath scattered tree cover and should be controlled while populations remain localized.
  - Unauthorized social trails have resulted in localized vegetation loss, soil compaction, and accelerated dune erosion, particularly near Oval Beach.
  - Heavy white-tailed deer browse is reducing native shrub diversity and recruitment in transitional dune communities.

- With the combination of Japanese barberry harboring foliage with ideal humidity and white-tailed deer being highly prevalent, ticks are much more likely to be found in this area than they would be otherwise.
- Monitoring for the introduction of additional invasive species such as spotted knapweed, baby's breath, or Lyme grass remains an ongoing concern in disturbed areas.
- Artificial stabilization of dunes through unnecessary plantings or structural erosion controls could disrupt the natural sand movement processes that maintain this ecosystem.

- **Ecological Restoration & Outdoor Education Opportunities:**
  - Continue early detection and rapid response efforts for invasive species, particularly Japanese barberry and other newly established species.
  - Close and restore unnecessary social trails using natural barriers, signage, and native vegetation where appropriate.
  - Maintain natural sand movement and avoid stabilization measures except where needed to repair human-caused erosion.
  - Continue monitoring dune vegetation, shoreline change, and rare species populations to guide adaptive management.
  - The extensive dune landscape provides outstanding opportunities for interpretive signage and field-based environmental education focused on Great Lakes coastal ecology, dune formation, ecological succession, rare plant communities, shoreline dynamics, and conservation of interdunal wetland systems.



Figure 7: *Section of more diverse open dune habitat pictured with little bluestem, broom sedge, and other graminoids being prevalent throughout.*

Interdunal Wetland

- **Landscape Context/Natural Features:** Interdunal wetlands are unique Great Lakes coastal wetland communities that occur within the swales and depressions between dune ridges. These systems are shaped by the interaction of wind-blown sand movement, fluctuating groundwater levels, precipitation, and seasonal lake influence. Unlike many inland wetlands that develop in organic muck soils, interdunal wetlands typically occur on sandy substrates where groundwater is near the surface, creating conditions ranging from seasonally saturated to permanently inundated throughout the year.

  At the SHNA, the interdunal wetland occupies several distinct, low-lying depressions within the dune complex where groundwater accumulates between higher-elevation dune ridges. These areas contain a mosaic of open wetland pools, emergent vegetation, and scattered shrubs that reflect subtle changes in elevation and hydrologic conditions. Seasonal water level fluctuations are a primary ecological driver, maintaining open wetland conditions by limiting woody species encroachment and creating a diversity of microhabitats.

  The dynamic nature of this habitat is closely tied to natural coastal processes, including wind disturbance, sand movement, fluctuating water tables, and periodic flooding. These processes prevent succession toward a closed-canopy forest and allow specialized wetland and dune species to persist. The close proximity to Lake Michigan also contributes to the unique species composition, with the site supporting a blend of coastal, wetland, and northern plant communities.

- **Plant Community:** The interdunal wetland community at SHNA is diverse due to the variation in hydrologic conditions across short distances. Sedges and rushes in open marshland areas dominate the vegetation structure, with some wetter shrubs dotting the matrix as well.

  The canopy layer is generally non-existent due to saturated conditions and periodic disturbance. Smaller snags and woody debris are common features and provide important habitat structure for birds, amphibians, reptiles, and invertebrates.

  The shrub layer varies throughout the different interdunal wetland units and consists mainly of various willow species (*Salix spp*.). These shrubs provide important nesting habitat and contribute structural diversity within the mostly flat wetland mosaic. Steeplebush (*Spiraea tomentosa*) also fills in gaps as a shorter shrubby species, making a matrix with the graminoids.

  The herbaceous layer is typically the most diverse component of these communities. Dominant graminoids include lake sedge (*Carex lacustris*), tussock sedge (*Carex stricta*), woolgrass (*Scirpus cyperinus*), bulrush (*Schoenoplectus spp.*), and bluejoint grass (*Calamagrostis canadensis*). Open pools and shallow-water areas support species such as pickerelweed (*Pontederia cordata*), water horehound (*Lycopus uniflorus*), and pondweeds *(Potamogeton spp*.).

  The presence of coastal wetland specialists and high-quality native species highlights the ecological significance of this community. Maintaining the natural hydrologic regime and minimizing disturbance are critical for preserving the unique plant assemblages associated with interdunal wetlands.

  Invasive species pose a significant concern within portions of this community type. Phragmites (*Phragmites australis* subsp. *australis*) is particularly problematic in disturbed wetland openings, where it can rapidly form dense monocultures that reduce native plant

diversity and alter habitat structure. Additional invasive species concerns include purple loosestrife (*Lythrum salicaria*), narrowleaf cattail (*Typha angustifolia*), and reed canary grass (*Phalaris arundinacea*), which can all readily displace native plants in these wetlands. Invasive shrubs such as glossy buckthorn (*Frangula alnus*) and autumn olive (*Elaeagnus umbellata*) can also encroach on the wetland borders. Early detection and rapid response are essential to prevent these species from altering the ecological function of the wetland.



Figure 8: *Section of interdunal wetland pictured with a backdrop of open dune habitat.*

- **High Quality Plant Species:**
  High-quality species documented within the interdunal wetland habitats include:
  - Twig-rush *(Cladium mariscoides) — CC = 10*
  - Kalm's St. John's-wort *(Hypericum kalmianum) — CC = 10*
  - Bog lobelia *(Lobelia kalmii) — CC = 10*
  - Beak-rush *(Rhynchospora capillacea) — CC = 10*
  - Short-fruited rush *(Juncus brachycarpus) — CC = 9*
  - Blueleaf willow *(Salix myricoides) — CC = 9*
  - Purple false foxglove *(Agalinis purpurea) — CC = 7*
  - Marsh bellflower *(Campanula aparinoides) — CC = 7*
  - Marsh cinquefoil *(Comarum palustre) — CC = 7*
  - Swamp loosestrife *(Decodon verticillatus) — CC = 7*
  - Rush *(Juncus brachycephalus) — CC = 7*
  - Marsh pea *(Lathyrus palustris) — CC = 7*

- **Potential Wildlife:**
  - Interdunal wetlands provide critical habitat for a wide variety of wildlife due to their combination of shallow water, dense vegetation, and isolated wetland pockets within the dune landscape.
  - This community supports habitat for:
    - Waterfowl, herons, rails, shorebirds, and other wetland-associated birds
    - Songbirds including warblers and marsh-associated species
    - Amphibians including frogs, salamanders, and cricket frogs that rely on seasonal pools for breeding
    - Turtles and snakes that use wetland openings for basking and foraging
    - Small mammals including muskrat, mink, raccoon, and white-footed mice
    - A diverse assemblage of aquatic and terrestrial insects, including rare coastal specialists
  - Including potential rare species such as:
    - Blanchard's cricket frog (*Acris crepitans blanchardi*) — State Special Concern
    - Great blue heron (*Ardea herodias*) — Protected by the Migratory Bird Treaty Act of 1918
    - Land snail (*Catinella exile*) — State Special Concern
    - Spotted turtle (*Clemmys guttata*) — State Threatened
    - Blanding's turtle (*Emydoidea blandingii*) — State Special Concern
    - Three-striped oncocnemi (*Oncocnemis piffardi*) — State Special Concern
    - Delicate meadow katydid (*Orchelimum delicatum*) — State Special Concern
    - Aweme borer (*Papaipema aweme*) — State Special Concern
    - Hine's emerald (*Somatochlora hineana*) — Federal/State Endangered
    - Land snail (*Vallonia albula*) — State Special Concern



Figure 9: *Large section of interdunal wetland pictured early in the growing season.*

- **Potential Invasive Species, Pests, & Ecological Threats:**
  The primary ecological threats to interdunal wetlands are invasive species, altered hydrology, and physical disturbance. Because these communities depend on specific groundwater conditions and seasonal flooding patterns, even minor changes to drainage patterns or surface disturbance can significantly alter vegetation composition.
    - Phragmites (*Phragmites australis* subsp. *australis*) is the greatest invasive threat, particularly in open wetland areas where it can form dense stands, reduce native plant diversity, and eliminate open-water habitat important for amphibian breeding.
    - Purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), and invasive or hybrid cattails (*Typha spp.*) can similarly displace native wetland vegetation.
    - Autumn olive (*Elaeagnus umbellata*), glossy buckthorn (*Frangula alnus*), and other invasive shrubs may establish along disturbed wetland margins and elevated dune edges.
    - Hydrologic alteration from drainage, groundwater changes, trail construction, or nearby development can disrupt the seasonal flooding patterns required to maintain this habitat.
    - Off-trail recreation, soil compaction, and dune disturbance can damage sensitive vegetation communities and accelerate invasive species establishment.

- **Ecological Restoration & Outdoor Education Opportunities:**
  Interdunal wetlands are among the most ecologically significant and sensitive habitats within the Great Lakes coastal landscape. Restoration priorities should focus on maintaining natural hydrology, protecting native vegetation, and preventing invasive species expansion.
    - Regular monitoring and early detection of invasive species should remain a primary management priority, especially for phragmites and other aggressive wetland invaders.
    - Targeted invasive species treatments should be conducted carefully to minimize impacts to sensitive wetland vegetation and wildlife.
    - Maintaining natural dune processes and minimizing unnecessary disturbance are essential for preserving the long-term ecological function of this habitat. Limiting artificial stabilization will help to maintain conditions that support this community.
    - Interpretive or educational signage to provide low-impact education opportunities.



Figure 10: *Invasive phragmites pictured invading the northernmost interdunal wetland on the property. If left unmanaged, this risks eventual displacement sensitive plants like Kalm's lobelia and steeplebush.*

Great Lakes Marsh

- **Landscape Context/Natural Features:** The Great Lakes Marsh occupies the low-lying transition between the open dune complex and the Oxbow Lagoon, forming one of the most biologically productive habitats within the Saugatuck Harbor Natural Area. Classified as a Great Lakes coastal marsh, this community is driven by the natural fluctuations of Lake Michigan water levels, which periodically inundate the marsh and influence vegetation composition, wildlife use, and ecological succession. These hydrologic cycles create a diverse mosaic of emergent vegetation, shallow open water, and elevated hummocks that support exceptional biodiversity and provide critical habitat for amphibians, reptiles, migratory birds, fish, and aquatic invertebrates.

  Recent periods of elevated Lake Michigan water levels have resulted in the mortality of many mature trees throughout portions of the marsh. This natural disturbance shifted the community toward a more open, herbaceous wetland and increased habitat diversity. While these changes are consistent with the natural dynamics of Great Lakes coastal wetlands, the newly opened canopy has also created favorable conditions for the establishment of invasive species such as phragmites, which now represents the greatest ecological threat to this community.

- **Plant Community:** The marsh is characterized by a diverse assemblage of native emergent and wet meadow vegetation adapted to seasonally fluctuating water levels and saturated organic soils. Dominant vegetation includes marsh fern (*Thelypteris palustris*), steeplebush (*Spiraea tomentosa*), bluejoint grass (*Calamagrostis canadensis*), and tussock sedge (*Carex stricta*), which collectively make up the majority of the biomass in this community. Sprinkled throughout are patches of bulrushes (*Schoenoplectus spp.*),

woolgrass (*Scirpus cyperinus*), spikerush (*Eleocharis palustris*), sedges (*Carex* spp.), and rushes (*Juncus* spp.). Generally, bulrushes, spikerushes, and rushes are more common and consistent closer to the inland open water to the east.

Buttonbush (*Cephalanthus* occidentalis) acts as the main shrub cover in lowland portions of this habitat. Elevated hummocks support scattered shrubs and trees including red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), jack pine (*Pinus banksiana*), willow (*Salix spp.*), and a number of standing dead European white birch (*Betula pendula)*.

The marsh supports numerous high quality wetland species, reflecting its high ecological quality. The interface between the marsh, open dunes, and interdunal wetlands further enhances plant diversity by creating gradual transitions between upland and aquatic habitats.

Localized infestations of invasive phragmites (*Phragmites australis* subsp. *australis*) occur within portions of the marsh and have the potential to rapidly dominate native vegetation if left unmanaged. Japanese barberry (*Berberis thunbergii*) and scattered black locust (*Robinia pseudoacacia*) are also present on higher-situated hummocks. Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*) are both dotted throughout the marsh in disturbed and upland areas as well.



Figure 11: *Several standing dead trees, Canada bluejoint grass, and steeplebush pictured on the margin of the Great Lakes Marsh ecological community.*

- **High Quality Plant Species:**
  Representative conservative wetland species documented within this community include:
  - Black-gum *(Nyssa sylvatica) — CC = 9*
  - Pickerel-weed *(Pontederia cordata) — CC = 8*
  - Pin oak *(Quercus palustris) — CC = 8*
  - Sedge *(Carex muehlenbergii) — CC = 7*
  - Buttonbush *(Cephalanthus occidentalis) — CC = 7*
  - Wood reedgrass *(Cinna arundinacea) — CC = 7*
  - Sycamore *(Platanus occidentalis) — CC = 7*

- **Potential Wildlife:**
  - The Great Lakes Marsh provides critical breeding, nesting, foraging, and migration habitat for a wide variety of wildlife. Amphibians, reptiles, waterfowl, marsh birds, wading birds, mammals, fish, and countless aquatic macroinvertebrates depend on this community throughout the year.
  - This community supports potential habitat for several rare and sensitive species, including:
    - American bittern (*Botaurus lentiginosus*) — State Special Concern
    - Black tern (*Chlidonias niger*) — State Special Concern
    - Northern harrier (*Circus cyaneus*) — State Special Concern
    - Marsh wren (*Cistothorus palustris*) — State Special Concern
    - Eastern fox snake (*Elaphe vulpina gloydi*) — State Threatened
    - Blanding's turtle (*Emydoidea blandingii*) — State Special Concern
    - Merlin (*Falco columbarius*) — State Threatened
    - Least bittern (*Ixobrychus exilis*) — State Threatened
    - Black-crowned night-heron (*Nycticorax nycticorax*) — State Special Concern
    - King rail (*Rallus elegans*) — State Endangered
    - Hine's emerald (*Somatochlora hineana*) — Federal/State Endangered
    - Forster's tern (*Sterna forsteri*) — State Special Concern
    - Yellow-headed blackbird (*Xanthocephalus xanthocephalus*) — State Special Concern

- **Potential Invasive Species, Pests, & Ecological Threats:**
  - Phragmites (*Phragmites australis* subsp. *australis*) represents the highest management priority on the property due to its ability to rapidly form dense monocultures that displace native wetland vegetation and reduce wildlife habitat.
  - Purple loosestrife (*Lythrum salicaria*) and reed canary grass (Phalaris arundinacea) have the potential to expand if left unmanaged.
  - Japanese barberry (*Berberis thunbergii*) and black locust (*Robinia pseudoacacia*) occur on elevated hummocks and should be removed before populations increase.
  - Alterations to natural hydrology or shoreline processes could negatively impact vegetation composition and wetland function.
  - Recreational trampling along unauthorized shoreline access routes may damage sensitive marsh vegetation and wildlife habitat.

- **Ecological Restoration & Outdoor Education Opportunities:**
  - Aggressively manage phragmites through a long-term integrated treatment program.
  - Remove invasive woody species from marsh hummocks to preserve native shrub and tree diversity.
  - Ensure limited artificial stabilization occurs and continue allowing natural lake level fluctuations and hydrologic processes to shape marsh succession.
  - Monitor rare species populations and vegetation response following invasive species treatments.

- The marsh provides exceptional opportunities for interpretive signage and field-based environmental education focused on Great Lakes coastal wetlands, fluctuating lake levels, amphibian ecology, migratory birds, wetland hydrology, invasive species management, and climate resilience within coastal ecosystems.



Figure 12: *Spikerush along with an assemblage of other graminoids pictured on the Oxbow shoreline and Great Lakes Marsh interface.*

Mesic Northern Forest

- **Landscape Context/Natural Features:** The Mesic Northern Forest occupies a relatively small portion of the Saugatuck Harbor Natural Area in the southeastern corner of the property, with portions both north and south of Oxbow Lagoon (See Figure 4 for map). Although limited in extent, this community is ecologically significant because it appears to represent a remnant of the larger forested dune system that existed prior to the relocation of the Kalamazoo River by the U.S. Army Corps of Engineers in 1906. Today, the northern portion of the forest exhibits characteristics of both a Mesic Northern Forest and a Wooded Dune and Swale Complex, preserving an important connection to the historic coastal landscape while providing valuable habitat continuity within the greater Saugatuck dune complex. The southern portion is a heavily sloped woodlot that descends to the lagoon from Mount Baldhead Park.

  The northern portion of this forest, situated on stabilized dune ridges and sheltered slopes, contrasts sharply with the surrounding open dune communities. Mature canopy trees moderate temperature, wind, and moisture, creating cool, shaded conditions that support a diverse woodland flora and fauna. Low-lying swales and an isolated wetland pocket introduce localized hydrologic variation, increasing habitat diversity and providing important

breeding habitat for amphibians and other wetland-dependent wildlife. Natural disturbance processes including canopy gap formation due to windthrow and occasional tree mortality continue to shape the forest structure. However, chronic white-tailed deer browse has substantially reduced understory density and limited natural regeneration throughout much of the community.

The southern portion of the woodlot includes a steep decline, with a footpath atop the ridge marking the upper edge and the hillside bottoming out into the lagoon. This results in an interesting matrix at the bottom of the slope, with aquatic species present that are more akin to the marsh community species list. The hillside has a thick canopy with a much-reduced shrub layer still due to deer browse. The strong trees that make up the canopy help to stabilize this steep slope to prevent large amounts of sediment from eroding into the lagoon. Overall, this woodlot is more mature than the northern portion with taller mature trees and with its proximity to the more forested backdune complex of Mount Baldhead Park.

- **Plant Community:** The northern portion's canopy is composed primarily of mature northern hardwoods and conifers, including northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), white pine (*Pinus strobus*), and scattered American beech (*Fagus grandifolia*). Sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*), cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and occasional black gum (*Nyssa sylvatica*) occur in localized areas, reflecting transitions between upland dune forests and adjacent swales. White pine, eastern red cedar (*Juniperus virginiana*), and scattered jack pine (*Pinus banksiana*) further emphasize the influence of the surrounding coastal dune system.

  The shrub layer is relatively open as a result of prolonged deer browse but includes serviceberry (*Amelanchier spp*.), witch-hazel (*Hamamelis virginiana*), leatherwood (*Dirca palustris*), spicebush (*Lindera benzoin*), and scattered grapevine (*Vitis riparia*). The herbaceous layer supports numerous high-quality woodland species including wild columbine (*Aquilegia canadensis*), bottlebrush grass (*Elymus hystrix*), spotted wintergreen (*Chimaphila maculata*), and Pennsylvania sedge (*Carex pensylvanica*).

  The isolated wetland pocket contains coarse woody debris, sedges, blue flag iris (*Iris virginica*), nettles (*Urtica spp.*), marsh fern (*Thelypteris palustris*), and scattered buttonbush (*Cephalanthus occidentalis*), providing structural diversity and valuable habitat for amphibians and invertebrates. Japanese barberry (*Berberis thunbergii*) and garlic mustard (*Alliaria petiolata*) represent the primary invasive threats to this community.

  As for the southern portion of this community, most of the canopy trees are very similar to the northern portion. Jack pines are not present here due to the intense slope and heavier shade cover. Eastern hemlock (*Tsuga canadensis*) is a common tree of these sandy, heavily sloped forests and makes up a portion of the canopy. A few different species of cherry dot the canopy and understory including black cherry, choke cherry (*Prunus virginiana*), and sand cherry (*Prunus pumila*). The shrub layer is dominated by witch hazel and leatherwood, and the herbaceous layer includes the species mentioned in the northern portion along with common polypody (*Polypodium virginianum*) being common along the slope. Pennsylvania sedge acts as the main herbaceous matrix species. Additionally, Japanese barberry is not found on the slope but is at the top of the ridge in this section.

  Overall, both sections of this forest retain a mature canopy, diverse native flora, and high ecological integrity. Despite localized invasive species and heavy deer browse limiting regeneration, these remnant woodlots continue to function as important ecological links between the coastal dune communities of SHNA and the adjacent forested landscapes surrounding Mount Baldhead and Oxbow Lagoon.



Figure 13: *Section of Mesic Northern Forest Pictured. Note the structural diversity and mature canopy compared to the rest of the property.*

- **High Quality Plant Species:**
  Representative high quality woodland species documented within this community include:
  - Spotted wintergreen *(Chimaphila maculata) — CC = 8*
  - Flowering dogwood *(Cornus florida) — CC = 8*
  - Leatherwood *(Dirca palustris) — CC = 8*
  - Common polypody *(Polypodium virginianum) — CC = 8*
  - Spicebush *(Lindera benzoin) — CC = 7*

- **Potential Wildlife:**
  - The mature forest provides important nesting, foraging, and shelter sites for numerous woodland birds, mammals, reptiles, amphibians, and invertebrates. Large canopy trees, coarse woody debris, and abundant leaf litter contribute to habitat complexity and nutrient cycling.
  - This community supports habitat for several rare and sensitive species, including:
    - Prairie warbler (*Setophaga discolor*) — State Endangered (adjacent wooded dune/jack pine habitat)
    - Red-shouldered hawk (*Buteo lineatus*) — State Threatened
    - Cooper's hawk (*Accipiter cooperii*) — State Special Concern
    - Hooded warbler (*Setophaga citrina*) — State Special Concern
    - Numerous woodland salamanders, migratory songbirds, woodpeckers, and small mammals.

- **Potential Invasive Species, Pests, & Ecological Threats:**
  - Heavy white-tailed deer browse is limiting natural regeneration of canopy trees and reducing understory diversity.
  - Japanese barberry poses the primary invasive plant threat and should continue to be managed before populations expand.
  - Eastern hemlock remains vulnerable to the invasive insect Hemlock Woolly Adelgid (*Adelges tsugae*), making continued monitoring and treatment essential for preserving this important canopy species.
  - Habitat fragmentation from unauthorized trails should be minimized to maintain interior forest conditions and reduce pathways for invasive species establishment.
  - Oak wilt is found in Allegan County and could affect the many red oak individuals in this natural community via insect vectors on injured oaks.

- **Ecological Restoration & Outdoor Education Opportunities:**
  - Continue treatment and monitoring for Hemlock Woolly Adelgid to preserve eastern hemlock within the canopy.
  - Implement long-term invasive shrub management, focusing on Japanese barberry before widespread establishment occurs.
  - Evaluate regional deer management strategies to promote regeneration of native trees and browse-sensitive understory plants.
  - Monitor long-term forest health, regeneration, and species composition to guide adaptive management.
  - This remnant forest provides an excellent opportunity to interpret the historical landscape of the Saugatuck Harbor Natural Area, illustrating how portions of the original forested dune system persisted following the 1906 relocation of the Kalamazoo River. It also offers opportunities for education on mature dune forests, forest succession, oak wilt prevention, hemlock conservation, and the ecological importance of habitat connectivity within the greater Lake Michigan coastal landscape.



Figure 14: *Dense colony of sassafras pictured on the outskirts of the Mesic Northern Forest habitat where it adjoins the Oxbow. The more established section of this community type can be observed in the background to the right.*

Conservation Priorities

Overall, the Saugatuck Harbor Natural Area remains in exceptional ecological condition, with an adjusted Floristic Quality Index of **45.3** and numerous high quality plant species indicative of an intact ecosystem. While the property requires relatively little ecological restoration compared to many coastal preserves in southwest Michigan, proactive stewardship is essential to maintain its ecological integrity.

Based on field observations, the highest management priorities include:

1. Eradication and long-term management of invasive phragmites within the Great Lakes Marsh and interdunal wetland communities.
2. Continued removal of Japanese barberry and other invasive woody shrubs.
3. Reduction of off-trail recreation and dune erosion through improved trail management.
4. Long-term management of excessive deer browse and continued treatment for Hemlock Woolly Adelgid.
5. Continued ecological monitoring of rare natural communities, vegetation change, and invasive species.

Stewardship Recommendations

Long-term stewardship will be essential to maintaining the exceptional ecological integrity of the Saugatuck Harbor Natural Area. While the property currently supports high-quality natural communities and relatively low levels of ecological degradation, continued monitoring will allow land managers to evaluate the effectiveness of management actions, detect emerging threats before they become widespread, and document ecological change over time. A consistent monitoring program will also provide valuable baseline data to guide future management decisions and adaptive stewardship.

Recommended stewardship activities include:

- **Annual invasive species monitoring** to identify and rapidly respond to new infestations of priority species such as phragmites, Japanese barberry, garlic mustard, black locust, and other invasive plants before they become well established.
- **Floristic Quality Assessment (FQA/FQI) monitoring roughly every five years** to evaluate long-term changes in plant community composition, ecological integrity, and restoration success.
- **Rare species and high-quality habitat monitoring** to document populations of high-quality plant species and evaluate the condition of globally rare interdunal wetlands and other sensitive natural communities.
- **Permanent photo monitoring points** established throughout representative management units to visually document vegetation change, shoreline dynamics, invasive species treatments, trail restoration efforts, and natural succession over time.
- **Visitor use monitoring** to determine the effectiveness of wayfinding and interpretive signage and to limit social trail development.
- **Trail condition monitoring** to evaluate trail wear, erosion, and vegetation trampling.
- **Deer browse assessments** conducted periodically to evaluate browsing pressure on native vegetation, canopy regeneration, and understory diversity, helping inform future deer management discussions with regional partners.
- **Forest health inspections**, including continued monitoring and treatment of Hemlock Woolly Adelgid, as well as surveillance for other emerging forest pests and diseases that could threaten canopy composition, such as oak wilt.
- **Hydrologic and shoreline observations** following periods of unusually high or low Lake Michigan water levels to document changes in natural community stability, shoreline erosion, and natural dune dynamics.
- **Annual stewardship reporting** to summarize monitoring results, completed management activities, emerging concerns, and recommendations for future work. Maintaining a consistent record of annual observations will support adaptive management and improve long-term decision-making.

Visitor Experience
The long-term ecological integrity of the Saugatuck Harbor Natural Area depends on balancing the protection of sensitive natural communities with opportunities for passive recreation and environmental education. As visitation continues to increase, concentrating use along a clearly defined and well-maintained trail network will help minimize habitat degradation while enhancing the overall visitor experience.

The accompanying Trail Assessment identified several opportunities to improve visitor circulation and reduce ecological impacts through strategic trail management. Recommendations include formalizing appropriate, well-established social trails that provide sustainable access; decommissioning unnecessary or environmentally damaging user-created trails; and restoring affected areas with natural barriers such as woody debris, brush piles, or native vegetation. These measures will help reduce vegetation trampling, minimize dune erosion, and discourage access of sensitive habitats and adjacent private properties.

Improved trail infrastructure should be complemented by a comprehensive wayfinding and interpretive signage program. Clearly marked trail routes and updated trail maps will improve navigation and encourage visitors to remain on designated pathways, reducing confusion and off-trail travel. Interpretive signage should highlight the ecological significance of SHNA's interdunal wetlands, Great Lakes marshes, remnant coastal forests, and dynamic coastal dune processes while explaining ongoing stewardship activities such as invasive species management, habitat restoration, and the importance of protecting sensitive vegetation. By connecting visitors to the natural and cultural history of the preserve, these educational elements can foster a greater appreciation for the landscape and encourage responsible recreation.

Collectively, these trail and signage improvements represent an important conservation strategy. Rather than expanding recreational opportunities, they are intended to concentrate visitor use, protect ecologically sensitive areas, and support the long-term preservation of a high-quality coastal dune ecosystem.

Conclusion
Unlike many restoration projects that seek to reconstruct degraded ecosystems, stewardship at the Saugatuck Harbor Natural Area should focus primarily on protecting and sustaining the natural ecological processes that continue to shape this dynamic coastal landscape. Wind, fluctuating Lake Michigan water levels, groundwater hydrology, natural shoreline migration, and periodic disturbance have created and maintained these globally significant natural communities for thousands of years. Management should therefore prioritize preserving these natural processes while addressing anthropogenic stressors such as invasive species, excessive deer browse, habitat fragmentation, and unmanaged recreational impacts.

Although the property has experienced localized disturbances associated with historic hydrologic modifications and increased public use, the vast majority of SHNA remains remarkably intact. The preserve supports exceptional examples of open dune, Great Lakes marsh, interdunal wetland, and coastal forest communities that collectively provide habitat for a diverse assemblage of native plants and wildlife, including numerous high quality plant species indicative of outstanding ecological integrity. With an adjusted Floristic Quality Index of 45.3 and 38 plant species possessing Coefficients of Conservatism of seven or greater, SHNA represents an important high-quality natural community along the southern Lake Michigan shoreline.

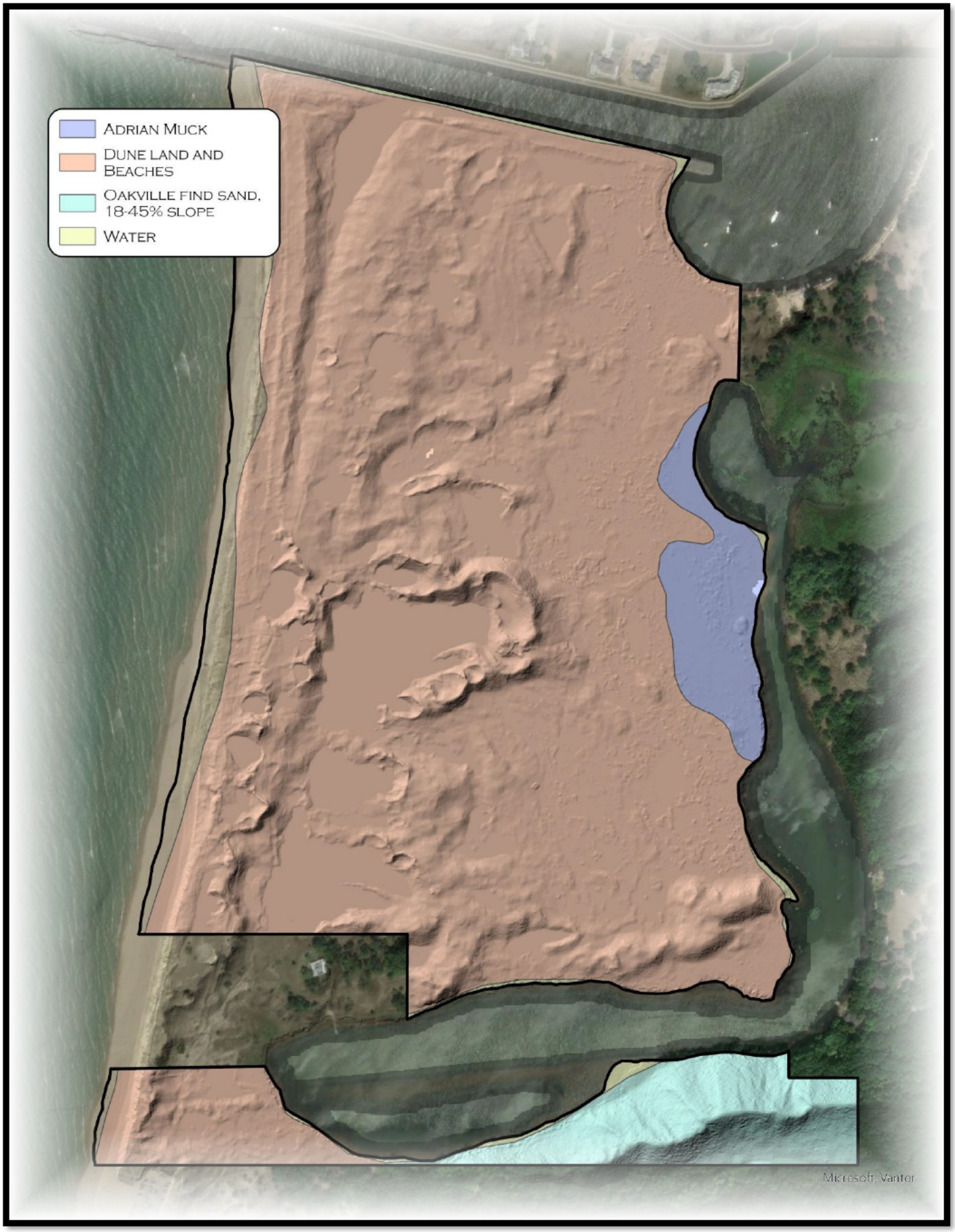
The management recommendations presented in this evaluation emphasize proactive stewardship rather than large-scale restoration. Continued invasive species control, long-term ecological monitoring, protection of natural hydrologic and geomorphic processes, and strategic forest and wildlife management will help ensure these natural communities remain resilient in the face of future environmental change.

Equally important is the thoughtful management of public access. The recommended trail improvements, wayfinding enhancements, and interpretive signage outlined in the accompanying Trail Assessment will

help concentrate visitor use within a sustainable trail network while reducing impacts to sensitive habitats. By pairing resource protection with meaningful opportunities for recreation and environmental education, SHNA can continue to provide an exceptional visitor experience while safeguarding the ecological features that make the preserve unique.

As one of Michigan's premier coastal preserves, the Saugatuck Harbor Natural Area represents an irreplaceable component of the Lake Michigan dune ecosystem. Through continued collaboration between the City of Saugatuck, conservation partners, researchers, and the community, the property can remain a model for balancing ecological stewardship, scientific research, and low-impact public recreation, ensuring its exceptional natural and cultural resources are preserved for generations to come.

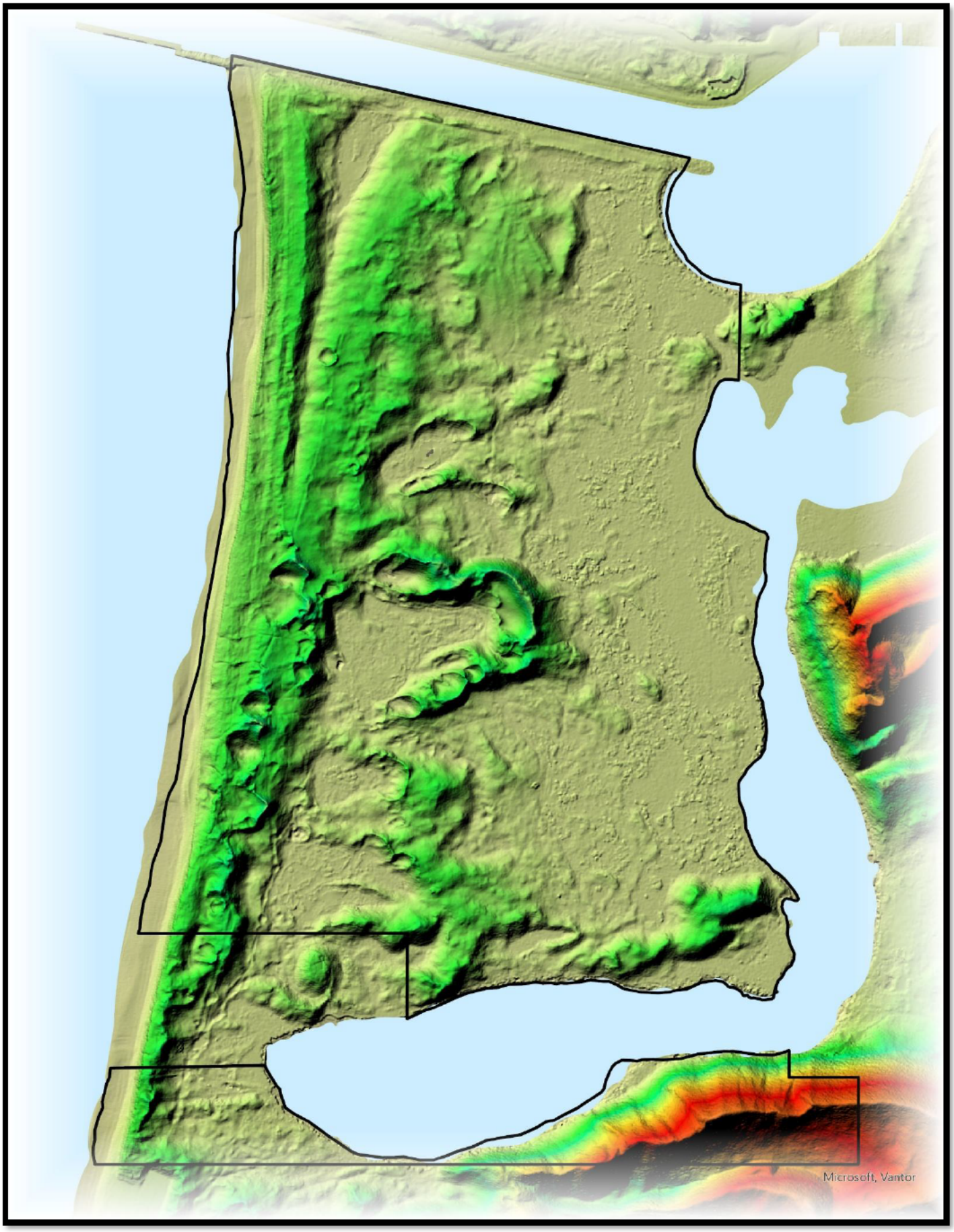
Appendix A: Soil Types Map



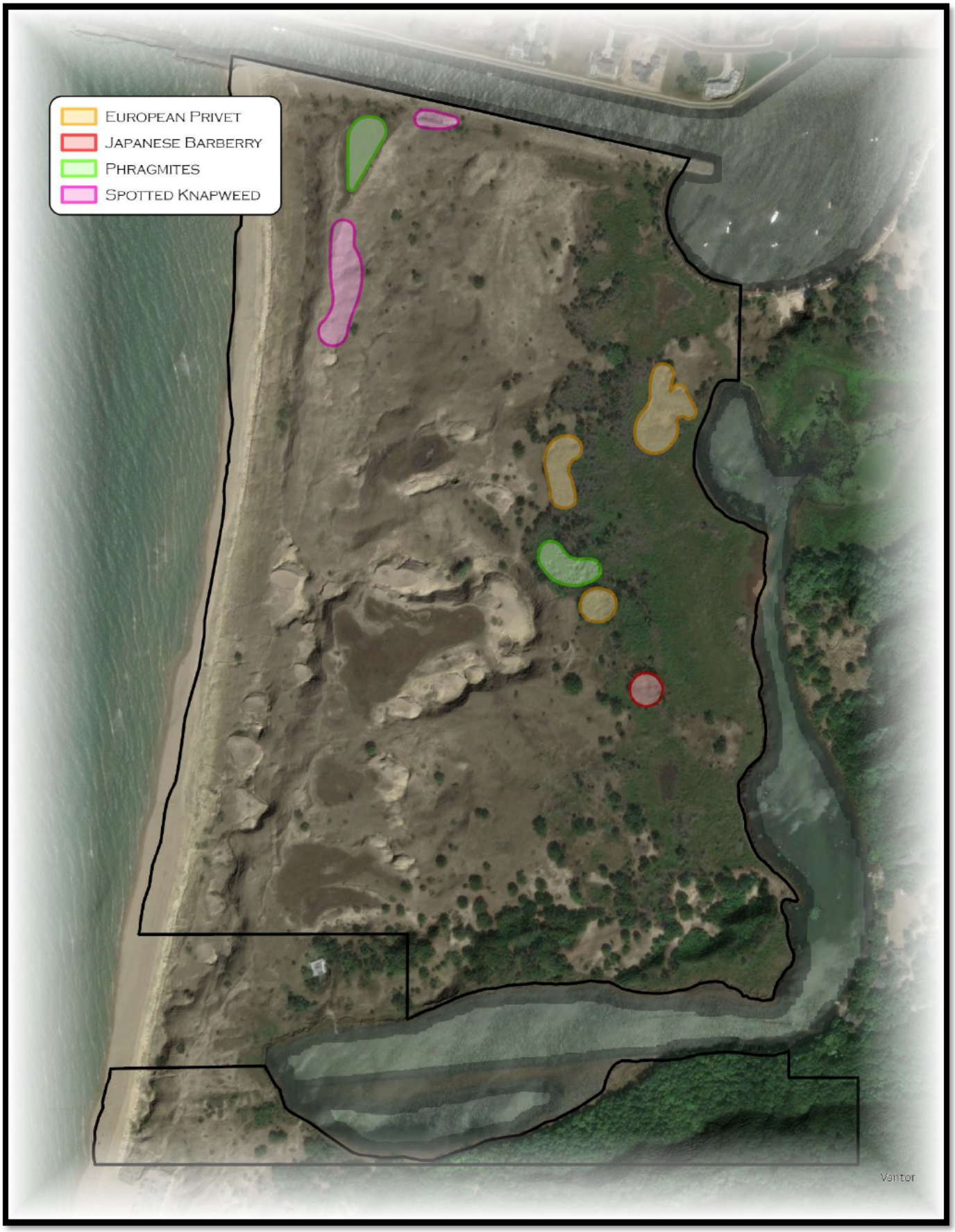
Appendix B: Topographic Map



Appendix C: Digital Elevation Model



Appendix D: Invasive Species of Highest Concern



Appendix E: Floristic Quality Index (FQI)

Property:	Saugatuck Harbor Natural Area		
Survey Date(s):	4/7/2026, 5/22/2026, 8/24/2026		
Practioner(s):	ODC Network		
Notes:	3 different survey periods conducted to capture the entire growing season		
Native FQI:	62.6	**Total Mean C:**	4.2
Adjusted FQI:	45.3	**Native Mean C:**	4.9
Species Richness:	191	**Total Mean W:**	0.1
Native Species Richness:	163	**Native Mean W:**	-0.5

Scientific Name	Common Name	CC	CW	Origin	Duration
Acer nigrum	black maple	4	3	native	perennial
Acer saccharinum	silver maple	2	-3	native	perennial
Acer saccharum	sugar maple	5	3	native	perennial
Agalinis purpurea	purple false foxglove	7	-3	native	annual
Agrostis hyemalis	ticklegrass	4	0	native	perennial
Agrostis perennans	autumn bent	5	3	native	perennial
Alliaria petiolata	garlic mustard	0	3	non-native	biennial
Alnus incana	speckled alder	5	-3	native	perennial
Amelanchier arborea	juneberry	4	3	native	perennial
Ammophila breviligulata	marram grass	10	5	native	perennial
Anaphalis margaritacea	pearly everlasting	3	5	native	perennial
Andropogon virginicus	broom-sedge	4	3	native	perennial
Apocynum cannabinum	indian-hemp	3	0	native	perennial
Aquilegia canadensis	wild columbine	5	3	native	perennial
Arabidopsis lyrata	sand cress	7	3	native	biennial
Asclepias syriaca	common milkweed	1	5	native	perennial
Berberis aquifolium	oregon-grape	0	5	non-native	perennial
Berberis thunbergii	japanese barberry	0	3	non-native	perennial
Betula pendula	european white birch	0	3	non-native	perennial
Bidens frondosa	common beggar-ticks	1	-3	native	annual
Brasenia schreberi	water-shield	6	-5	native	perennial
Cakile edentula	sea-rocket	5	3	native	annual
Calamagrostis canadensis	blue-joint grass	3	-5	native	perennial
Calamovilfa longifolia	sand reed grass	10	5	native	perennial
Campanula aparinoides	marsh bellflower	7	-5	native	perennial
Carex albicans	sedge	3	5	native	perennial
Carex blanda	sedge	1	0	native	perennial
Carex comosa	sedge	5	-5	native	perennial
Carex frankii	franks sedge	4	-5	native	perennial
Carex hystericina	sedge	2	-5	native	perennial
Carex lacustris	sedge	6	-5	native	perennial
Carex muehlenbergii	sedge	7	5	native	perennial

Carex pensylvanica	sedge	4	5	native	perennial
Carex stricta	sedge	4	-5	native	perennial
Carex sylvatica	sedge	0	3	non-native	perennial
Carex viridula	sedge	4	-5	native	perennial
Carya cordiformis	bitternut hickory	5	0	native	perennial
Celtis occidentalis	hackberry	5	0	native	perennial
Centaurea stoebe	spotted knapweed	0	5	non-native	biennial
Centaurium erythraea	forking centaury	0	0	non-native	biennial
Centaurium pulchellum	branching centaury	0	0	non-native	annual
Cephalanthus occidentalis	buttonbush	7	-5	native	perennial
Chamerion angustifolium	fireweed	3	0	native	perennial
Chimaphila maculata	spotted wintergreen	8	5	native	perennial
Cinna arundinacea	wood reedgrass	7	-3	native	perennial
Circaea canadensis	enchanters-nightshade	2	3	native	perennial
Cirsium arvense	canada thistle	0	3	non-native	perennial
Cirsium vulgare	bull thistle	0	3	non-native	biennial
Cladium mariscoides	twig-rush	10	-5	native	perennial
Comarum palustre	marsh cinquefoil	7	-5	native	perennial
Convolvulus arvensis	field bindweed	0	5	non-native	perennial
Conyza canadensis	horseweed	0	3	native	annual
Corispermum pallasii	bugseed	3	5	native	annual
Cornus amomum	silky dogwood	2	-3	native	perennial
Cornus canadensis	bunchberry	6	0	native	perennial
Cornus florida	flowering dogwood	8	3	native	perennial
Crocanthemum bicknellii	frostweed	10	5	native	perennial
Cycloloma atriplicifolium	winged pigweed	0	3	non-native	annual
Cynoglossum officinale	hounds-tongue	0	5	non-native	biennial
Cyperus acuminatus	umbrella sedge	6	-5	native	annual
Cyperus bipartitus	brook nut sedge	3	-3	native	annual
Cyperus erythrorhizos	umbrella sedge	6	-5	native	annual
Cyperus esculentus	yellow nutsedge	1	-3	native	perennial
Decodon verticillatus	swamp loosestrife	7	-5	native	perennial
Dichanthelium clandestinum	panic grass	3	-3	native	perennial
Dichanthelium commonsianum	panic grass	6	3	native	perennial
Dichanthelium oligosanthes	panic grass	5	3	native	perennial
Dirca palustris	leatherwood	8	0	native	perennial
Dryopteris marginalis	marginal woodfern	5	3	native	perennial
Eleocharis elliptica	golden-seeded spike rush	6	-5	native	perennial
Eleocharis palustris	spike-rush	5	-5	native	perennial
Elymus canadensis	canada wild rye	5	3	native	perennial
Elymus hystrix	bottlebrush grass	5	3	native	perennial
Elymus virginicus	virginia wild-rye	4	-3	native	perennial
Equisetum arvense	common horsetail	0	0	native	perennial
Equisetum hyemale	scouring rush	2	0	native	perennial
Eragrostis spectabilis	purple love grass	3	5	native	perennial
Erechtites hieraciifolius	fireweed	2	3	native	annual
Eupatorium perfoliatum	boneset	4	-3	native	perennial

Euphorbia corollata	flowering spurge	4	5	native	perennial
Fagus grandifolia	american beech	6	3	native	perennial
Fraxinus americana	white ash	5	3	native	perennial
Fraxinus pennsylvanica	red ash	2	-3	native	perennial
Galium palustre	marsh bedstraw	3	-5	native	perennial
Galium tinctorium	stiff bedstraw	5	-5	native	perennial
Geum canadense	white avens	1	0	native	perennial
Hamamelis virginiana	witch-hazel	5	3	native	perennial
Hieracium caespitosum	king devil	0	5	non-native	perennial
Hudsonia tomentosa	beach-heath	10	5	native	perennial
Hypericum kalmianum	kalms st. johns-wort	10	-3	native	perennial
Ilex opaca	american holly	0	3	non-native	perennial
Iris pseudacorus	yellow flag	0	-5	non-native	perennial
Iris versicolor	wild blue flag	5	-5	native	perennial
Iris virginica	southern blue flag	5	-5	native	perennial
Juncus balticus	rush	4	-5	native	perennial
Juncus brachycarpus	short-fruited rush	9	-3	native	perennial
Juncus brachycephalus	rush	7	-5	native	perennial
Juncus canadensis	canadian rush	6	-5	native	perennial
Juncus dudleyi	dudleys rush	1	-3	native	perennial
Juncus effusus	soft-stemmed rush	3	-5	native	perennial
Juncus nodosus	joint rush	5	-5	native	perennial
Juncus tenuis	path rush	1	0	native	perennial
Juniperus communis	ground juniper	4	3	native	perennial
Juniperus horizontalis	creeping juniper	10	3	native	perennial
Juniperus virginiana	red-cedar	3	3	native	perennial
Lathyrus japonicus	beach pea	10	3	native	perennial
Lathyrus palustris	marsh pea	7	-3	native	perennial
Leersia virginica	white grass	5	-3	native	perennial
Ligustrum vulgare	common privet	0	3	non-native	perennial
Linaria vulgaris	butter-and-eggs	0	5	non-native	perennial
Lindera benzoin	spicebush	7	-3	native	perennial
Lithospermum canescens	hoary puccoon	10	5	native	perennial
Lithospermum caroliniense	plains puccoon	10	5	native	perennial
Lobelia kalmii	bog lobelia	10	-5	native	perennial
Lonicera maackii	amur honeysuckle	0	5	non-native	perennial
Lonicera morrowii	morrow honeysuckle	0	3	non-native	perennial
Lycopus americanus	water horehound	2	-5	native	perennial
Lycopus uniflorus	northern bugle weed	2	-5	native	perennial
Lysimachia ciliata	fringed loosestrife	4	-3	native	perennial
Maianthemum canadense	canada mayflower	4	3	native	perennial
Malus pumila	apple	0	5	non-native	perennial
Mentha canadensis	wild mint	3	-3	native	perennial
Monarda punctata	horse mint	4	5	native	perennial
Myrica gale	sweet gale	6	-5	native	perennial
Nuttallanthus canadensis	blue toadflax	8	5	native	annual
Nyssa sylvatica	black-gum	9	-3	native	perennial

Ostrya virginiana	hop-hornbeam	5	3	native	perennial
Panicum virgatum	switch grass	4	0	native	perennial
Persicaria amphibia	water smartweed	6	-5	native	perennial
Persicaria lapathifolia	nodding smartweed	0	-3	native	annual
Persicaria pensylvanica	bigseed smartweed	0	-3	native	annual
Persicaria punctata	smartweed	5	-5	native	annual
Phragmites australis subsp. *australis*	reed	0	-3	native	perennial
Physalis virginiana	virginia ground-cherry	4	5	native	perennial
Pinus banksiana	jack pine	5	3	native	perennial
Pinus nigra	austrian pine	0	5	non-native	perennial
Pinus strobus	white pine	3	3	native	perennial
Pinus sylvestris	scotch pine	0	3	non-native	perennial
Platanus occidentalis	sycamore	7	-3	native	perennial
Poa compressa	canada bluegrass	0	3	non-native	perennial
Poa pratensis	kentucky bluegrass	0	3	non-native	perennial
Polypodium virginianum	common polypody	8	5	native	perennial
Pontederia cordata	pickerel-weed	8	-5	native	perennial
Populus deltoides	cottonwood	1	0	native	perennial
Populus tremuloides	quaking aspen	1	0	native	perennial
Potamogeton natans	pondweed	5	-5	native	perennial
Potentilla anserina	silverweed	5	-3	native	perennial
Prunus pumila	sand cherry	8	5	native	perennial
Prunus serotina	wild black cherry	2	3	native	perennial
Prunus virginiana	choke cherry	2	3	native	perennial
Pseudognaphalium obtusifolium	old-field balsam	2	5	native	biennial
Ptelea trifoliata	hop-tree	4	3	native	perennial
Quercus alba	white oak	5	3	native	perennial
Quercus palustris	pin oak	8	-3	native	perennial
Quercus rubra	red oak	5	3	native	perennial
Quercus velutina	black oak	6	5	native	perennial
Rhynchospora capillacea	beak-rush	10	-5	native	perennial
Robinia pseudoacacia	black locust	0	3	non-native	perennial
Rosa palustris	swamp rose	5	-5	native	perennial
Rubus hispidus	swamp dewberry	4	-3	native	perennial
Salix amygdaloides	peach-leaved willow	3	-3	native	perennial
Salix lucida	shining willow	3	-3	native	perennial
Salix myricoides	blueleaf willow	9	-3	native	perennial
Sassafras albidum	sassafras	5	3	native	perennial
Schizachyrium scoparium	little bluestem	5	3	native	perennial
Schoenoplectus acutus	hardstem bulrush	5	-5	native	perennial
Schoenoplectus pungens	threesquare	5	-5	native	perennial
Schoenoplectus tabernaemontani	softstem bulrush	4	-5	native	perennial
Scirpus atrovirens	bulrush	3	-5	native	perennial
Scirpus cyperinus	wool-grass	5	-5	native	perennial
Scutellaria galericulata	marsh skullcap	5	-5	native	perennial
Smilax rotundifolia	common greenbrier	6	0	native	perennial

Solidago caesia	bluestem goldenrod	6	3	native	perennial
Solidago canadensis	canada goldenrod	1	3	native	perennial
Solidago simplex	gillmans goldenrod	10	3	native	perennial
Sonchus asper	prickly sow-thistle	0	3	non-native	annual
Spiraea alba	meadowsweet	4	-3	native	perennial
Spiraea tomentosa	steeplebush	5	-3	native	perennial
Symphyotrichum dumosum	bushy aster	7	0	native	perennial
Teucrium canadense	wood-sage	4	-3	native	perennial
Thelypteris palustris	marsh fern	2	-3	native	perennial
Thuja occidentalis	arbor vitae	4	-3	native	perennial
Tilia americana	basswood	5	3	native	perennial
Triadenum fraseri	marsh st. johns-wort	6	-5	native	perennial
Trillium grandiflorum	common trillium	5	3	native	perennial
Tsuga canadensis	Eastern hemlock	5	3	native	perennial
Urtica dioica	stinging nettle	1	0	native	perennial
Verbascum thapsus	common mullein	0	5	non-native	biennial
Viola pedata	birdfoot violet	9	5	native	perennial
Vitis riparia	river-bank grape	3	0	native	perennial

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