Natural Community Surveys and Stewardship Prioritization of Michigan's Coastal Zone

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Cover Photo: Coastal Fen, Monatou Bay, Garden Island. Photo by Joshua G. Cohen.

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Great Lakes marsh, Duck Bay, Marquette Island. Photo by Joshua G. Cohen.

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INTRODUCTION

The integration of natural resource conservation into a sustainable development strategy requires accurate, detailed, easily accessible natural resource information. Coastal areas currently face a variety of pressures associated with shoreline development and modification, the development of wind turbines and associated infrastructure, the establishment and spread of invasive plant and animal species, and climate change. Assessing the impacts of these developments on the integrity of coastal natural resources, including native ecosystems, requires accurate, up-to-date information on the location, identity, and condition of natural lands within the coastal zone.

The Michigan Natural Features Inventory (MNFI) database of high-quality occurrences of natural communities is a critical source of information on Michigan's terrestrial ecosystems (MNFI 2015). Natural communities are defined as assemblages of interacting plants, animals, and other organisms that repeatedly occur under similar environmental conditions across the landscape and are predominantly structured by natural processes rather than modern anthropogenic disturbances (Kost et al. 2007). Protecting and managing representative natural communities is critical to biodiversity conservation, since native organisms are best adapted to environmental and biotic forces with which they have survived and evolved over the millennia (Kost et al. 2007). Prior to the implementation of this project, 1,974 high-quality occurrences of natural communities had been documented throughout Michigan, including 604 occurrences (31%) within the Coastal Zone of the Great Lakes. These coastal occurrences represent 53 of the 77 natural community types described for Michigan by Cohen et al. (2014). Among the 604 natural community occurrences, 172 (28%) are represented by natural communities that are considered critically imperiled or imperiled at the global scale, including coastal fen, coastal plain marsh, Great Lakes marsh, interdunal wetland, alvar, lakeplain oak openings, lakeplain wet prairie, and lakeplain wet-mesic prairie (NatureServe 2010). In addition, 122 of the remaining occurrences represent natural communities that are critically imperiled or imperiled at the state level (MNFI 2015).

The Great Lakes coastal zone is critical for the conservation of these natural communities. Prior to this project, many of the natural community occurrences in the coastal zone had not been surveyed in over a decade, including 109 sites that had not been visited since 1990 or earlier. In addition, surveys to identify new occurrences of natural communities in Michigan's coastal zone are needed. A critical goal of this project was to collect updated and new data for coastal natural communities to provide natural resource managers and land use planners with accurate, detailed information on the current status of coastal ecosystems that can help guide activities ranging from biodiversity management and restoration to planning and zoning efforts.

The purpose of this project is to assist state and local governments and conservation agencies with land use planning and resource management by (1) updating known high-quality occurrences of natural communities within the coastal zone, (2) conducting surveys for new occurrences of natural communities within the coastal zone, and (3) synthesizing survey results and information in MNFI's conservation database to propose biodiversity stewardship priorities. During the 2015 field season, surveys focused primarily on occurrences of the rarest natural community types that lacked recent survey data and lands identified as needing surveys by our project partners, including numerous land conservancies and state and local agencies.

Project partners included The Nature Conservancy, Little Traverse Conservancy, Southwest Michigan Land Conservancy, Little Traverse Bay Bands of Odawa Indians, Michigan Department of Natural Resources (DNR) Wildlife Division, DNR Forest Resources Division, DNR Parks and Recreation Division, United States Fish and Wildlife Service, Detroit River International Wildlife Refuge, Michigan Nature Association, Chikaming Open Lands, Leelanau Conservancy, and Grand Traverse Land Conservancy.

Surveys were conducted during the 2015 field season. MNFI conducted surveys of 49 previously known element occurrences and documented 42 new natural community element occurrences in Michigan's coastal zone. Twenty-seven different natural community types are represented in the 91 element occurrences surveyed (Table 1). The majority of surveys occurred on state and conservancy lands with 52 sites occurring on state lands and 31 sites occurring on conservancy lands. The remainder of the sites were on private land (3 sites), city-owned land (2 sites), county-owned land (2 sites), and township-owned lands (Table 1). Following this survey effort, 695 natural community element occurrences have been documented in the coastal zone (Figure 1).

Surveys assessed the element occurrence ranking, classification, and delineation of these occurrences and detailed the vegetative structure and composition, ecological boundaries, landscape and abiotic context, threats, management needs, and restoration opportunities associated with each site. The primary goal of this survey effort is to provide resource managers and planners with standardized, baseline information on each

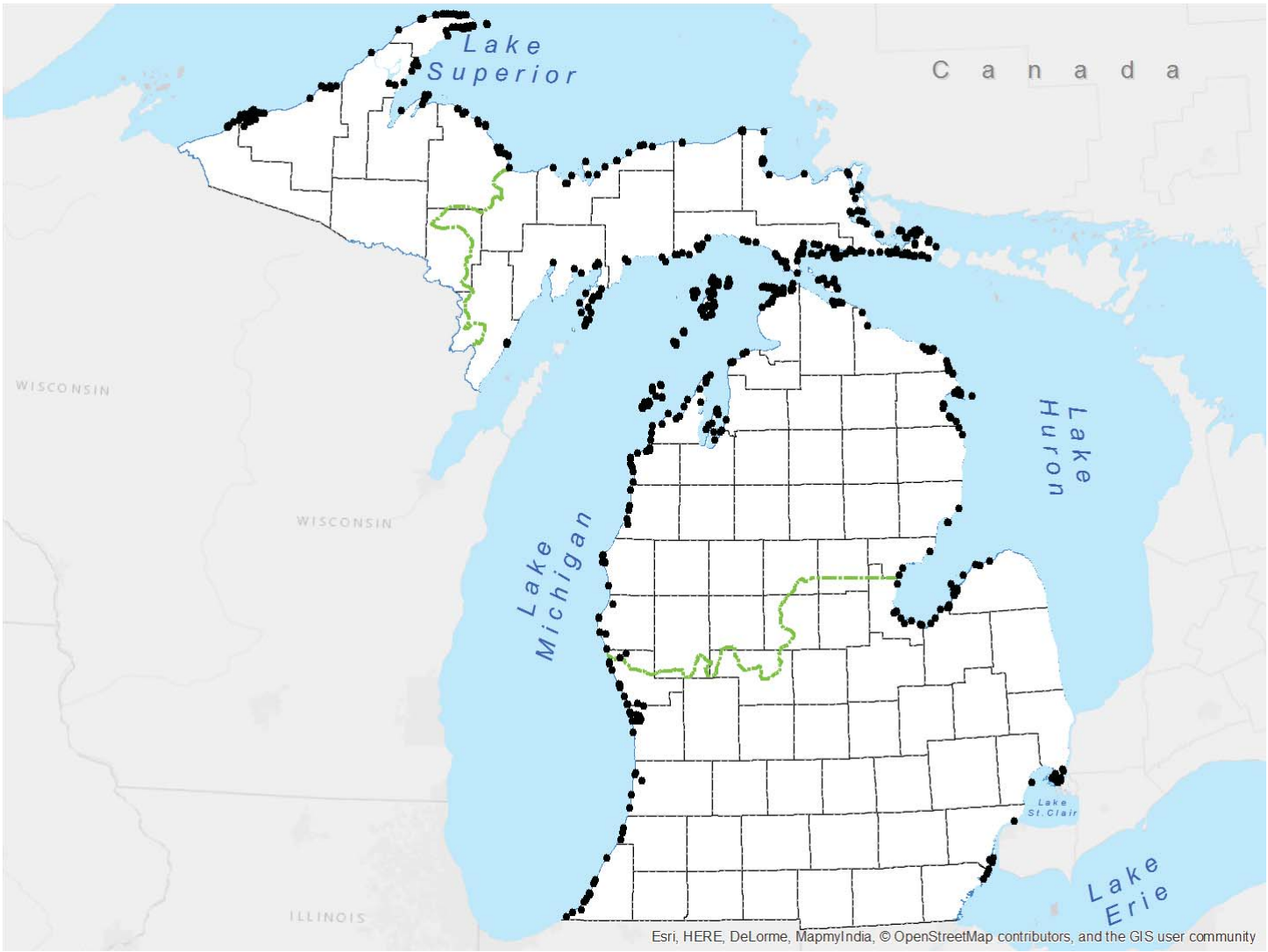


Figure 1. Natural community element occurrences within the Michigan coastal zone.

natural community element occurrence. This baseline information is critical for facilitating site-level decisions about biodiversity stewardship, prioritizing protection, management and restoration, monitoring the success of management and restoration, and informing landscape-level biodiversity planning efforts. This report summarizes the findings of MNFI's ecological surveys and also includes proposed regional stewardship priorities.

METHODS

Field Survey Prioritization

To focus surveys within the coastal zone, MNFI scientists developed a prioritization scheme for existing natural community element occurrences. Known element occurrences within the coastal zone were scored based on the following criteria: date since last survey (with higher scores for older records), state and global ranking (with higher scores for rarer natural communities), and element occurrence ranking (with higher scores for higher quality sites). MNFI scientists used these scoring matrices to focus survey efforts. Targets for de novo survey were identified during previous conservation planning efforts (i.e., the Biodiversity Planning Process and the development of Focal Areas for the revision of the DNR's Wildlife Action Plan), using aerial photographic interpretation focusing on rare coastal ecosystems, and through site leads and recommendations from project partners. In addition, MNFI scientists opportunistically surveyed sites throughout the coastal zone taking advantage of travel routes and work requirements for other projects.

Field Survey

A total of 91 high-quality natural communities were surveyed in 26 different counties (Table 1). Each natural community was evaluated employing Natural Heritage and MNFI methodology, which considers three factors to assess a natural community's ecological integrity or quality: size, landscape context, and condition (Faber-Langendoen et al. 2008). If a site meets defined requirements for these three criteria (MNFI 1988) it is categorized as a high-quality example of that specific natural community type, entered into MNFI's database as an element occurrence, and given a rank based on the consideration of its size, landscape context, and condition. Ecological field surveys were conducted during the 2015 growing season to evaluate the condition and classification of the sites. To assess natural community size and landscape context, a combination of field surveys, aerial photographic interpretation, and Geographic Information System (GIS) analysis was employed. Typically, a minimum of a half day was dedicated to each site, depending on the size and complexity of the site.

The ecological field surveys typically involved:

a) compiling comprehensive plant species lists and noting dominant and representative species

b) describing site-specific structural attributes and ecological processes

c) measuring tree diameter at breast height (DBH) of representative canopy trees and aging canopy dominants (where appropriate)

d) analyzing soils and hydrology

e) noting current and historical anthropogenic disturbances

f) evaluating potential threats

g) ground-truthing aerial photographic interpretation using GPS (Garmin, HP iPAQ, Ashtech Mobile Mapper 10, and Android tablet units were utilized)

h) taking digital photos and GPS points at significant locations

i) surveying adjacent lands when possible to assess landscape context

j) evaluating the natural community classification and mapped ecological boundaries

k) assigning or updating element occurrence ranks

l) noting management needs and restoration opportunities or evaluating past and current restoration activities and noting additional management needs and restoration opportunities

Following completion of the field surveys, the collected data were analyzed and transcribed to update or create element occurrence records in MNFI's statewide biodiversity conservation database (MNFI 2015). Natural community boundaries were mapped or re-mapped. Information from these surveys and prior surveys, if available, was used to produce threat assessments and management recommendations for each natural community occurrence, which appear within the following Survey Results section.

Natural Community Stewardship Prioritization

Following the 2015 field season, we conducted an intersection of the natural community element occurrences and the coastal zone as defined by DEQ. A total of 645 natural community element occurrences are found within the coastal zone as of December 2015 (Figure 1). We developed a scoring matrix for all of these natural community element occurrences to provide a framework for the prioritization of stewardship. For this scoring matrix, we developed the following three indices: an ecological integrity index, a rarity index, and a threat severity index. We used the element occurrence rank to develop the ecological integrity rank, with higher scores for higher-ranked EOs. The rarity index was developed by assigning a score for each natural community type's state rank and global rank and averaging the two scores. For both state and global ranks, higher scores were assigned

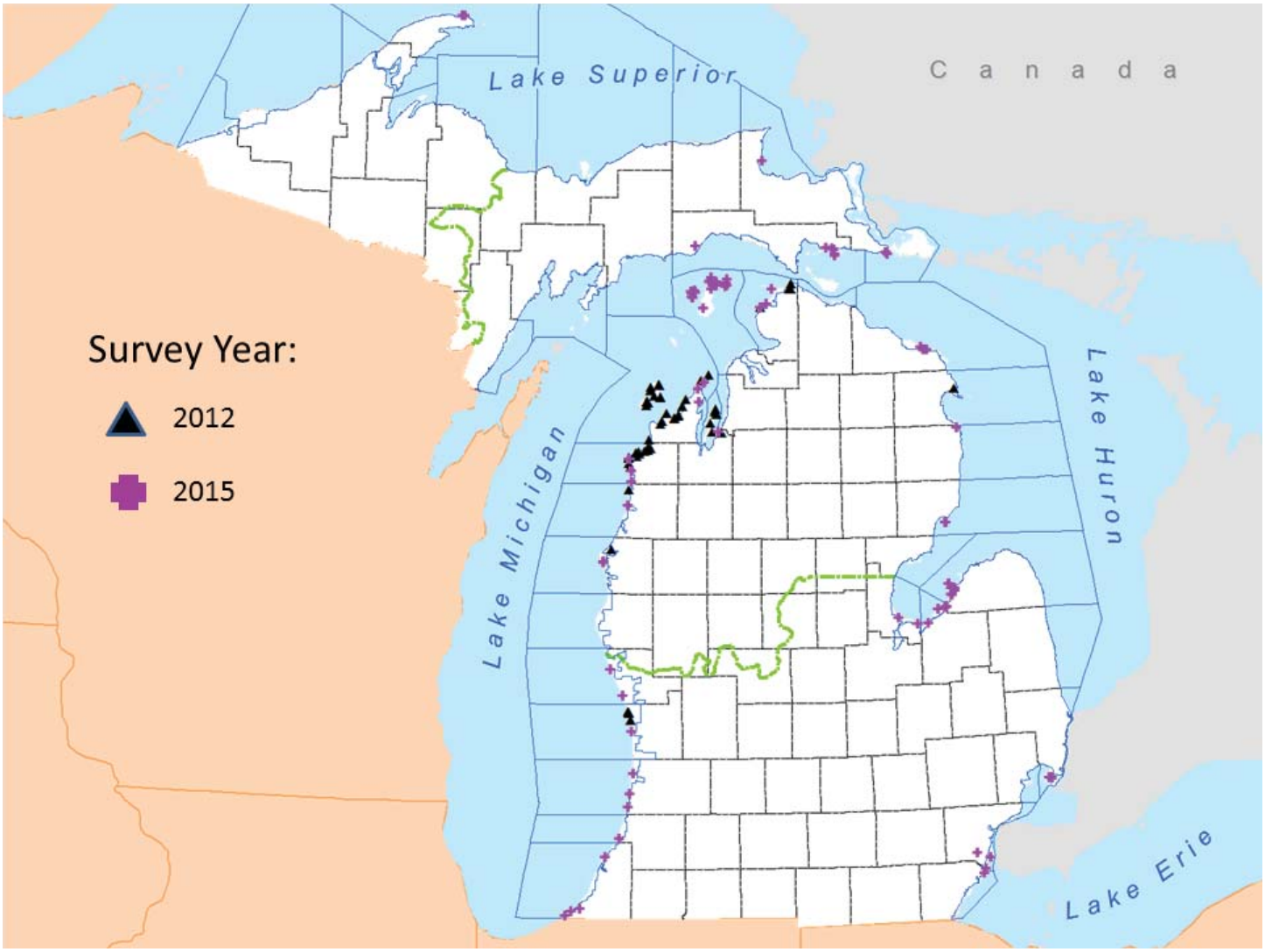


Figure 2. Natural community element occurrences documented within the Michigan coastal zone.

to rarer types. The threat severity index was developed using knowledge of general threats to natural community types and information gained during surveys on specific regional threats to natural community types. For this project, we surveyed 91 natural communities within the coastal zone, adding to the 65 natural communities surveyed during a prior CZM project in 2012. In sum, since 2006, MNFI scientists have surveyed or resurveyed 409 natural community element occurrences in the coastal zone, constituting 63% of the total number of occurrences. Twenty-five percent of coastal natural community element occurrences were surveyed during this project and the 2012 CZM project.

All of these surveys included threat assessments which were used to inform the assigning of threat severity scores for individual sites and for inferring the likely threat to sites not recently surveyed by community type and region. For each natural community element occurrence, the sum of the scores for the ecological integrity index, rarity index, and threat severity index was calculated to regionally sort the natural community element occurrences by ecological section based on their stewardship prioritization score. The regional stewardship prioritization is presented in the Stewardship Prioritization Results section and also in Appendix 1.

Table 1. Summary of natural community surveys.

Community Type	EO ID	County	Survey Site	EO RANK	Prior EO RANK	Management Area	Land Manager
Bog	20442	Charlevoix	Greene's Lake	AB	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Boreal Forest	20474	Chippewa	De Tour Peninsula	B	NA	De Tour Peninsula Nature Preserve	Little Traverse Conservancy
Boreal Forest	20475	Mackinac	Derby Boreal Forest	C	NA	Derby Nature Preserve	Little Traverse Conservancy
Boreal Forest	7487	Charlevoix	Garden Island Boreal Forest	A	A	Beaver Island State Wildlife Research Area	Wildlife Division
Boreal Forest	4856	Charlevoix	High Island	AB	BC	Beaver Island State Wildlife Research Area	Wildlife Division
Boreal Forest	20468	Leelanau	Paradesia Point	CD	NA	Finton Natural Area	Leelanau Conservancy
Clay Bluff	20464	Allegan	Miami Park	C	NA	Conservation Easement	Southwest Michigan Land Conservancy
Clay Bluff	20479	Allegan	Wau-Ke-Na	BC	NA	William Erby Smith Preserve	Southwest Michigan Land Conservancy
Clay Bluff	20465	Berrien	Whirlpool Bluff	CD	NA	Conservation Easement	Southwest Michigan Land Conservancy
Coastal Fen	3734	Charlevoix	Baldimore Bay Environmental Area	A	AB	Beaver Island State Wildlife Research Area	Wildlife Division
Coastal Fen	7888	Charlevoix	Jensen Harbor	A	A	Beaver Island State Wildlife Research Area	Wildlife Division
Coastal Fen	10574	Charlevoix	Northcutt and Monatou Bays	AB	BC	Beaver Island State Wildlife Research Area	Wildlife Division
Coastal Fen	9513	Charlevoix	Sweat Lodge Swale	B	B	Beaver Island State Wildlife Research Area	Wildlife Division
Coastal Plain Marsh	4858	Berrien	Grand Beach Marsh Preserve	CD	BC	Grand Beach Preserve	Chickaming Open Lands
Coastal Plain Marsh	8108	Van Buren	Ross Preserve	B	B	Ross Coastal Plain Marsh Preserve	The Nature Conservancy
Dry-Mesic Northern Forest	20453	Charlevoix	High Island	B	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Dry-Mesic Northern Forest	19149	Mason	Piney Ridge	BC	BC	Ludington State Park	Parks and Recreation Division
Emergent Marsh	20459	Mason	Hamlin Lake Marsh	B	NA	Ludington State Park	Parks and Recreation Division
Floodplain Forest	13781	Berrien	Hooks Corner Floodplain	BC	BC	Chikaming Township Park & Preserve	Chickaming Township
Great Lakes Barrens	20454	Charlevoix	Nezewabegon Barrens	AB	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Great Lakes Marsh	10115	Mackinac	Duck Bay -- Marquette Island	AB	A	Aldo Leopold Nature Preserve	Little Traverse Conservancy
Great Lakes Marsh	12181	Berrien	Galien River Estuary	C	B	Galien River County Park	Berrien County Park
Great Lakes Marsh	20473	Chippewa	Gut Port Marsh	B	NA	De Tour Peninsula Nature Preserve	Little Traverse Conservancy
Great Lakes Marsh	5371	Mackinac	Hessel Marsh	B	B	Mackinac Bay Nature Preserve	Little Traverse Conservancy
Great Lakes Marsh	2179	Charlevoix	Hog Island -- East Shoreline	AB	AB	Beaver Island State Wildlife Research Area	Wildlife Division
Great Lakes Marsh	1297	Mackinac	Mismer Bay	C	BC	Birge Nature Preserve	Little Traverse Conservancy
Great Lakes Marsh	20476	Chippewa	Mouth of the Tahquamenon	B	NA	Tahquamenon Falls State Park	Parks and Recreation Division
Great Lakes Marsh	823	Wayne	Pointe Mouilee State Game Area -- North	D	B	Pointe Mouilee State Game Area	Wildlife Division
Great Lakes Marsh	12549	Monroe	Pointe Mouilee State Game Area -- South	D	BC	Pointe Mouilee State Game Area	Wildlife Division
Great Lakes Marsh	20469	Iosco	Sandy Hook Marsh	C	NA	Tawas Point State Park	Parks and Recreation Division

Table 1 (continued). Summary of natural community surveys.

Community Type	EO ID	County	Survey Site	EO RANK	Prior EO RANK	Management Area	Land Manager
Great Lakes Marsh	4018	St. Clair	St. Clair River Delta	C	A	St. Clair Flats State Wildlife Area	Wildlife Division
Great Lakes Marsh	20450	Charlevoix	Taganing Marsh	A	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Great Lakes Marsh	17340	Presque Isle	Thompson's Harbor	B	B	Thompson's Harbor State Park	Parks and Recreation Division
Great Lakes Marsh	11695	Huron	Wildfowl Bay Islands	B	AB	Wildfowl Bay State Wildlife Area	Wildlife Division
Hardwood-Conifer Swamp	20466	Leelanau	Belanger Creek Swamp	BC	NA	Belanger Creek Preserve	Leelanau Conservancy
Lakeplain Oak Openings	5006	St. Clair	Dickinson Island	CD	BC	St. Clair Flats State Wildlife Area	Wildlife Division
Lakeplain Oak Openings	1705	Huron	Wildfowl Bay Islands	C	AB	Wildfowl Bay State Wildlife Area	Wildlife Division
Lakeplain Wet Prairie	355	Bay	Bangor Prairie	X	C	Private	Private
Lakeplain Wet Prairie	260	Tuscola	Berger Rd.	CD	BC	Fish Point Wildlife Area	Wildlife Division
Lakeplain Wet Prairie	358	Bay	Coryeon Point	D	CD	Quanicassee State Wildlife Area	Wildlife Division
Lakeplain Wet Prairie	11699	Huron	Geiger Haist Rds.	C	BC	Wildfowl Bay State Wildlife Area and Saginaw Bay Wetlands Nature Sanctuary	Wildlife Division and Michigan Nature Association
Lakeplain Wet Prairie	12438	Tuscola	King to Dickerson Rds.	CD	BC	Fish Point Wildlife Area	Wildlife Division
Lakeplain Wet Prairie	20435	Huron	Pigeon Rd. North	CD	NA	Wildfowl Bay State Wildlife Area	Wildlife Division
Lakeplain Wet Prairie	10756	Huron and Tuscola	Sebewaing Railroad	X	CD	Private	Private (Genessee and Wyoming Inc.)
Lakeplain Wet Prairie	5651	Tuscola	Thomas Rd. North	D	BC	Fish Point Wildlife Area	Wildlife Division
Lakeplain Wet-Mesic Prairie	2053	Tuscola	Berger Rd.	C	B	Fish Point Wildlife Area	Wildlife Division
Lakeplain Wet-Mesic Prairie	3795	Huron	Geiger Haist Rds.	C	C	Wildfowl Bay State Wildlife Area and Saginaw Bay Wetlands Nature Sanctuary	Wildlife Division and Michigan Nature Association
Lakeplain Wet-Mesic Prairie	9648	Huron	Weale Road	D	D	Private	Private
Limestone Bedrock Glade	20386	Mackinac	Fox Point Glade	C	NA	Sault Sainte Marie Forest Management Unit	Forest Resource Division
Limestone Bedrock Glade	9418	Presque Isle	Thompson's Harbor Observatory	B	B	Thompson's Harbor State Park	Parks and Recreation Division
Limestone Cobble Shore	20472	Chippewa	De Tour Shore	AB	NA	De Tour Peninsula Nature Preserve	Little Traverse Conservancy
Limestone Cobble Shore	6527	Charlevoix	High Island	AB	C	Beaver Island State Wildlife Research Area	Wildlife Division
Limestone Cobble Shore	20447	Charlevoix	Hog Island	AB	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Limestone Cobble Shore	20448	Charlevoix	Monatou Bay	A	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Limestone Cobble Shore	20449	Charlevoix	Taganing Shore	B	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Limestone Cobble Shore	10477	Presque Isle	Thompson's Harbor	AB	AB	Thompson's Harbor State Park	Parks and Recreation Division
Mesic Northern Forest	7843	Charlevoix	Hog Island	BC	B	Beaver Island State Wildlife Research Area	Wildlife Division
Mesic Northern Forest	20443	Emmet	McCort Hill	CD	NA	Woollam Nature Preserves	Little Traverse Conservancy
Mesic Northern Forest	20452	Charlevoix	Nezewabegon Forest	AB	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Mesic Northern Forest	3786	Benzie	Point Betsie	BC	BC	Zetterberg Preserve at Point Betsie	The Nature Conservancy
Mesic Northern Forest	20458	Manistee	Portage Point Forest	CD	NA	Elberta-Portage Point Easement	The Nature Conservancy
Mesic Northern Forest	10496	Charlevoix	Red Oak Garden	C	C	Beaver Island State Wildlife Research Area	Wildlife Division
Northern Fen	20446	Charlevoix	Hog Island	AB	NA	Beaver Island State Wildlife Research Area	Wildlife Division
Northern Fen	20482	Mackinac	Leopold's Fen	AB	NA	Aldo Leopold Nature Preserve	Little Traverse Conservancy

Table 1 (continued). Summary of natural community surveys.

Community Type	EO ID	County	Survey Site	EO RANK	Prior EO RANK	Management Area	Land Manager
Northern Fen	17341	Presque Isle	Thompson's Harbor	AB	AB	Thompson's Harbor State Park	Parks and Recreation Division
Open Dunes	20456	Benzie	Arcadia Dunes	BC	NA	Arcadia Dunes: The C.S. Mott Nature Preserve	Grand Traverse Land Conservancy
Open Dunes	20461	Muskegon	Duck Lake Dunes	C	NA	Duck Lake State Park	Parks and Recreation Division
Open Dunes	20481	Benzie	Green Point Dunes	BC	NA	Green Point Dunes Nature Preserve	Grand Traverse Land Conservancy
Open Dunes	10698	Charlevoix	High Island	A	B	Beaver Island State Wildlife Research Area	Wildlife Division
Open Dunes	20463	Ottawa	Kirk Park Dunes	CD	NA	Kirk Park	Ottawa County Parks
Open Dunes	20462	Muskegon	Lake Harbor Dunes	CD	NA	Lake Harbor Park	City of Norton Shores
Open Dunes	6701	Charlevoix	Lookout Point	CD	C	George and Althea Petritz Nature Preserve	Little Traverse Conservancy
Open Dunes	20484	Grand Traverse	Maple Bay Dunes	C	NA	Maple Bay Natural Area	Grand Traverse Land Conservancy
Open Dunes	20457	Manistee	Portage Point Dunes	C	NA	Elberta-Portage Point Easement	The Nature Conservancy
Open Dunes	6702	Allegan	Saugatuck Dunes	BC	BC	Mount Baldhead and Oval Beach Recreation Area	City of Saugatuck
Open Dunes	20483	Iosco	Tawas Dunes	C	NA	Tawas Point State Park	Parks and Recreation Division
Rich Conifer Swamp	9639	Charlevoix	Hog Island	AB	B	Beaver Island State Wildlife Research Area	Wildlife Division
Rich Conifer Swamp	20467	Leelanau	Soper Swamp	C	NA	Soper Natural Area	Leelanau Conservancy
Rich Conifer Swamp	20445	Emmet	Waugoshance Swamp	B	NA	Wilderness State Park	Parks and Recreation Division
Sand and Gravel Beach	20444	Emmet	Fisher Beach	C	NA	Fisher Nature Preserve	Little Traverse Conservancy
Sand and Gravel Beach	13026	Charlevoix	High Island	A	A	Beaver Island State Wildlife Research Area	Wildlife Division
Sand and Gravel Beach	10977	Charlevoix	High Island Bay	A	A	Beaver Island State Wildlife Research Area	Wildlife Division
Southern Hardwood Swamp	20470	Huron	Heisterman Swamp	BC	NA	Wildfowl Bay State Wildlife Area	Wildlife Division
Submergent Marsh	20460	Mason	Hamlin Lake Marsh	B	NA	Ludington State Park	Parks and Recreation Division
Volcanic Bedrock Glade	1911	Keweenaw	Horseshoe Harbor	AB	AC	Mary Macdonald Preserve at Horseshoe Harbor	The Nature Conservancy
Volcanic Bedrock Lakeshore	3958	Keweenaw	Horseshoe Harbor	A	A	Mary Macdonald Preserve at Horseshoe Harbor	The Nature Conservancy
Wet-Mesic Flatwoods	20471	St. Clair	Dickinson Flatwoods	C	NA	St. Clair Flats State Wildlife Area	Wildlife Division
Wet-Mesic Flatwoods	20411	Wayne	Grosse Ile South	C	NA	Meridian Woods Open Space; Finazzo Preserve; Emily's Way; Wright Woods Preserve; Centennial Farm & Open Space	Grosse Ile Nature and Land Conservancy
Wet-Mesic Flatwoods	20495	Berrien	Harbert Road Nature Preserve	C	NA	Harbert Road Nature Preserve	Chikaming Township
Wooded Dune and Swale Complex	409	Alcona and Alpena	Negwegon Dune and Swale	B	B	Negwegon State Park	Wildlife Division
Wooded Dune and Swale Complex	20451	Charlevoix	Taganing Dune and Swale	C	NA	Beaver Island State Wildlife Research Area	Wildlife Division

RESULTS

Survey Results

The 91 occurrences of high-quality natural communities were surveyed during the 2015 field season. As noted above, the 91 sites surveyed were within 26 different counties (Table 1).

A total of 27 different natural community types were visited including: bog (1 element occurrence or EO), boreal forest (5 EOs), clay bluffs (3 EOs), coastal fen (4 EOs), coastal plain marsh (2 EOs), dry-mesic northern forest (2 EOs), emergent marsh (1 EO), floodplain forest (1 EO), Great Lakes barrens (1 EO), Great Lakes marsh (14 EOs), hardwood-conifer swamp (1 EO), lakeplain oak openings (2 EOs), lakeplain wet prairie (8 EOs), lakeplain wet-mesic prairie (3 EOs), limestone bedrock glade (2 EOs), limestone cobble shore (6 EOs), mesic northern forest (6 EOs), northern fen (3 EOs), open dunes (11 EOs), rich conifer swamp (3 EOs), sand and gravel beach (3 EOs), southern hardwood swamp (1 EO), submergent marsh (1 EO), volcanic bedrock glade (1 EO), volcanic bedrock lakeshore (1 EO), wet-mesic flatwoods (3 EOs), and wooded dune and swale complex (2 EOs). Table 1 lists the visited sites, their element occurrence ranks, and their previous element occurrence ranks if applicable.

The following site summaries summarize threats and management recommendations for each of these 91 natural community EOs organized alphabetically by community type and then by element occurrence. Each grouping of communities begins with an overview of the natural community type, which was adapted from MNFI's natural community classification (Cohen et al. 2014, Kost et al. 2007). In addition, an ecoregional distribution map is provided for each natural community type (from Albert et al. 2008 or Cohen et al. 2014). For each site summary, we indicate if the site is an update of a previously identified EO or a new EO and provide the following information:

a) site name

b) natural community type

c) state and global rank (see Appendix 2 for ranking criteria)

d) current element occurrence rank

e) size

f) locational information

g) land manager

h) digital photograph(s)

i) aerial photograph with natural community boundary

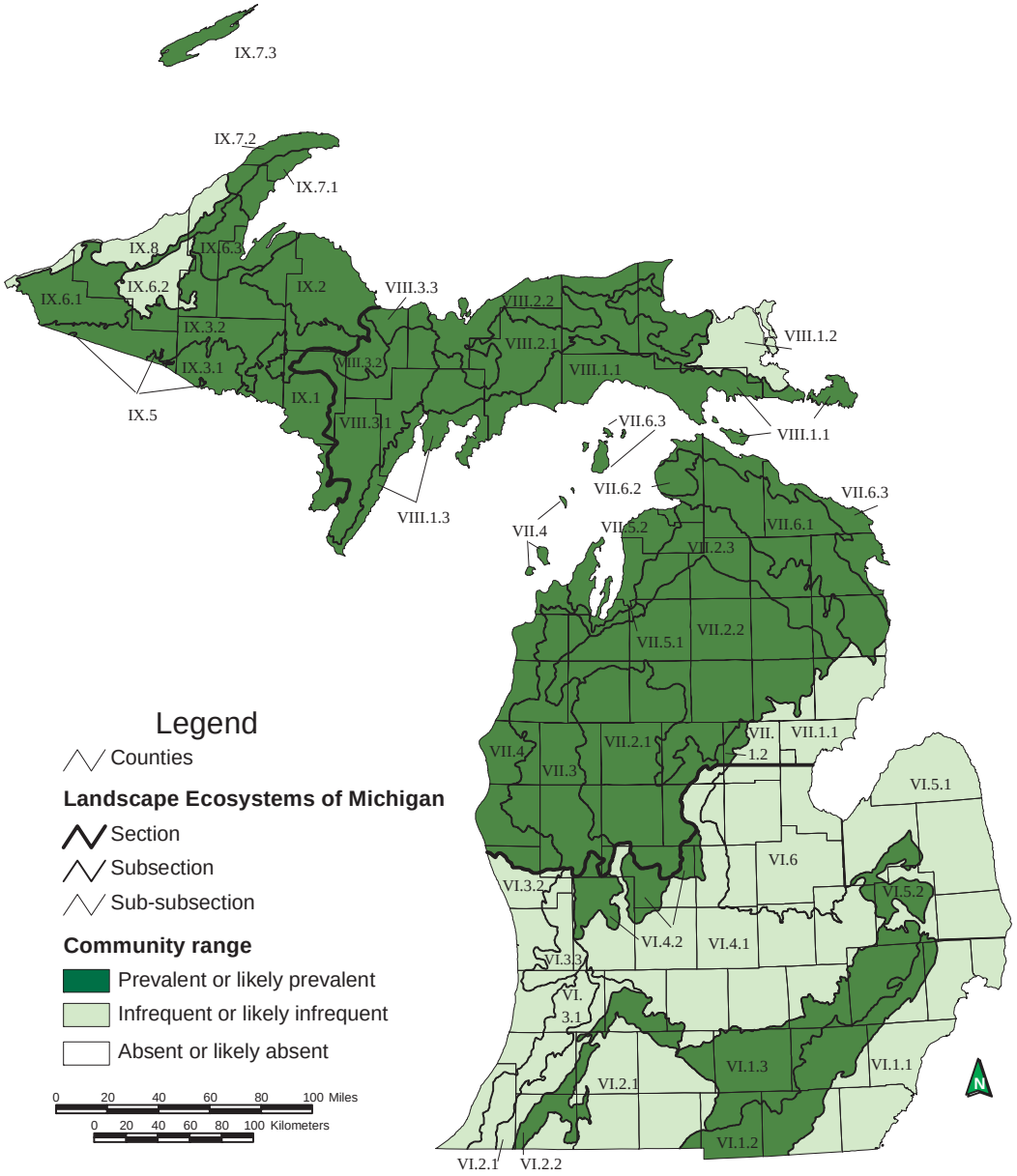
j) threat assessment

k) management recommendations

MNFI Ecologist Aaron Kortenhoven surveying Great Lakes marsh. Photo by Joshua G. Cohen.

BOG

Overview: Bog is a nutrient-poor peatland characterized by a continuous carpet of sphagnum moss, a species-poor herbaceous layer, low ericaceous, evergreen shrubs, and widely scattered and stunted conifers. Though much more prevalent in the north, bogs occur throughout Michigan in kettle depressions within pitted outwash plains and moraines and in shallow depressions on glacial outwash plains and glacial lakeplains. Bogs often develop on the margins of lakes and slowly colonize the lake basin. Soils are extremely acidic to very strongly acidic, saturated peat. Natural processes that influence species composition and community structure include peat accumulation, insect outbreaks, flooding by beaver, windthrow, and occasional fires. Bogs are dominated by sphagnum mosses (*Sphagnum* spp.), few-seed sedge (*Carex oligosperma*), ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), bog laurel (*Kalmia polifolia*), low sweet blueberry (*Vaccinium angustifolium*), highbush blueberry (*V. corymbosum*), large cranberry (*V. macrocarpon*), and small cranberry (*V. oxycoccos*), and scattered trees, especially conifers such as black spruce (*Picea mariana*), tamarack (*Larix laricina*), and pines (*Pinus* spp.). Insectivorous plants are characteristic of bogs and include round-leaved sundew (*Drosera rotundifolia*), pitcher-plant (*Sarracenia purpurea*), and bog bladderwort (*Utricularia geminiscapa*) (Kost et al. 2007, Cohen et al. 2014).



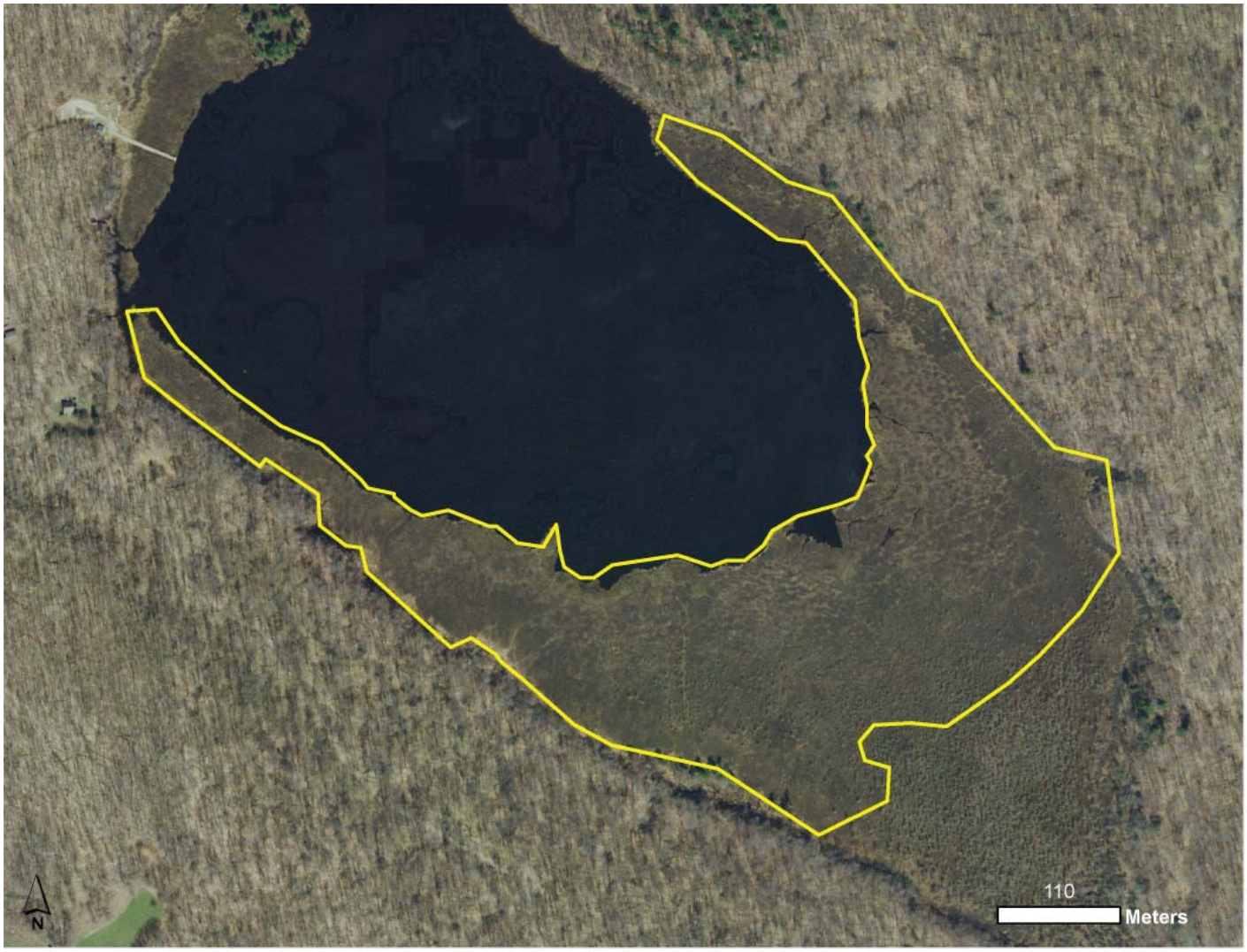
Map 1. Distribution of bog in Michigan (Albert et al. 2008).

1. Greene's Lake
Natural Community Type: Bog
Rank: G3G5 S4, vulnerable to secure globally and secure within the state
Element Occurrence Rank: AB
Size: 40 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20442 (new EO)

Threats: Species composition and vegetative structure are patterned by natural processes. No significant disturbances were noted during the survey, although the adjacent uplands are impacted by recent logging.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the wetland to minimize the threat of hydrological alteration.

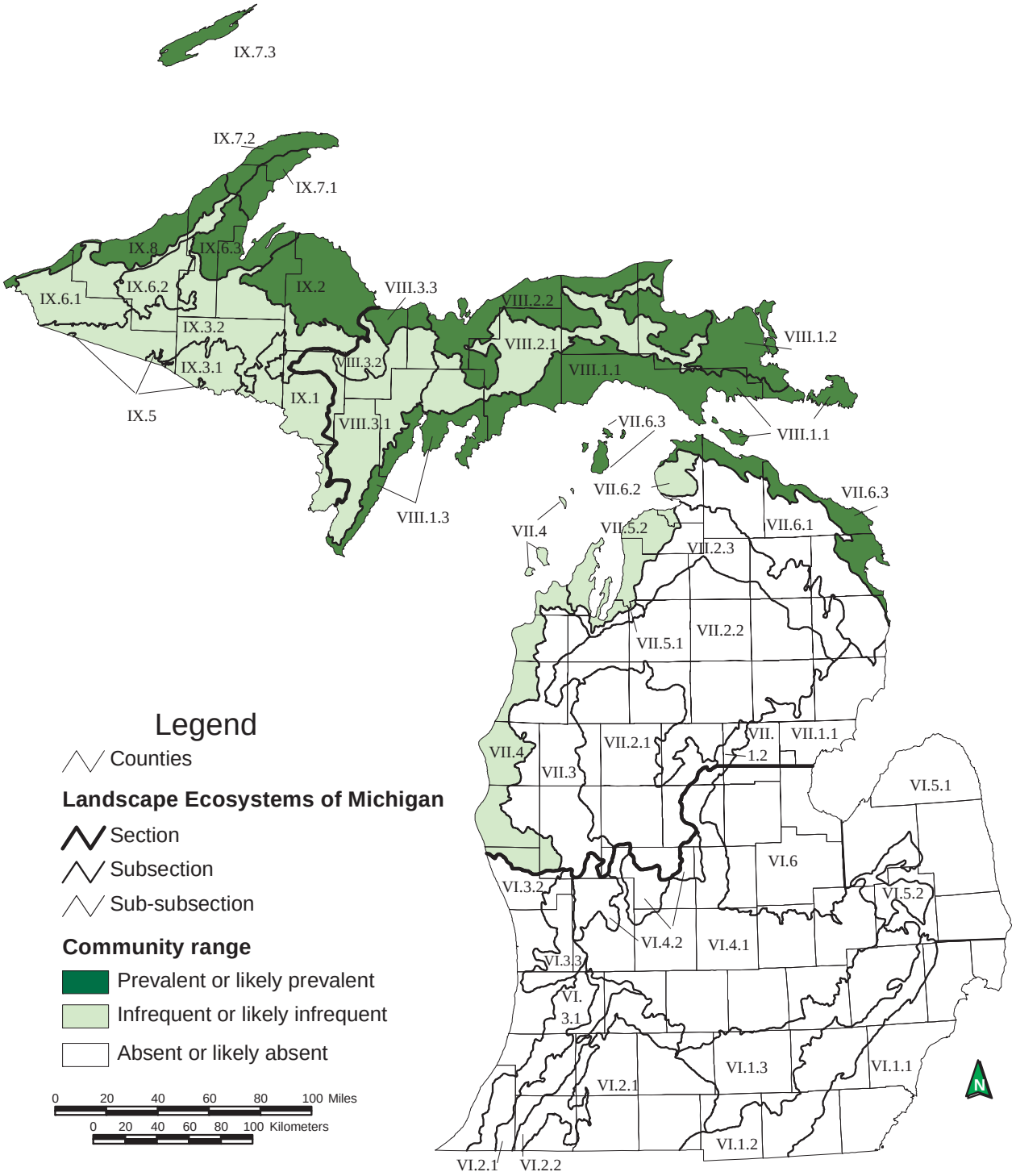
Greene's Lake bog. Photo by Bradford S. Slaughter.



Aerial photograph of Greene's Lake bog.

BOREAL FOREST

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



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

2. De Tour Peninsula
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: B
Size: 81 acres
Location: De Tour Peninsula Nature Preserve, Chippewa County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20474 (new EO)

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

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

De Tour Peninsula boreal forest. Photo by Joshua G. Cohen.

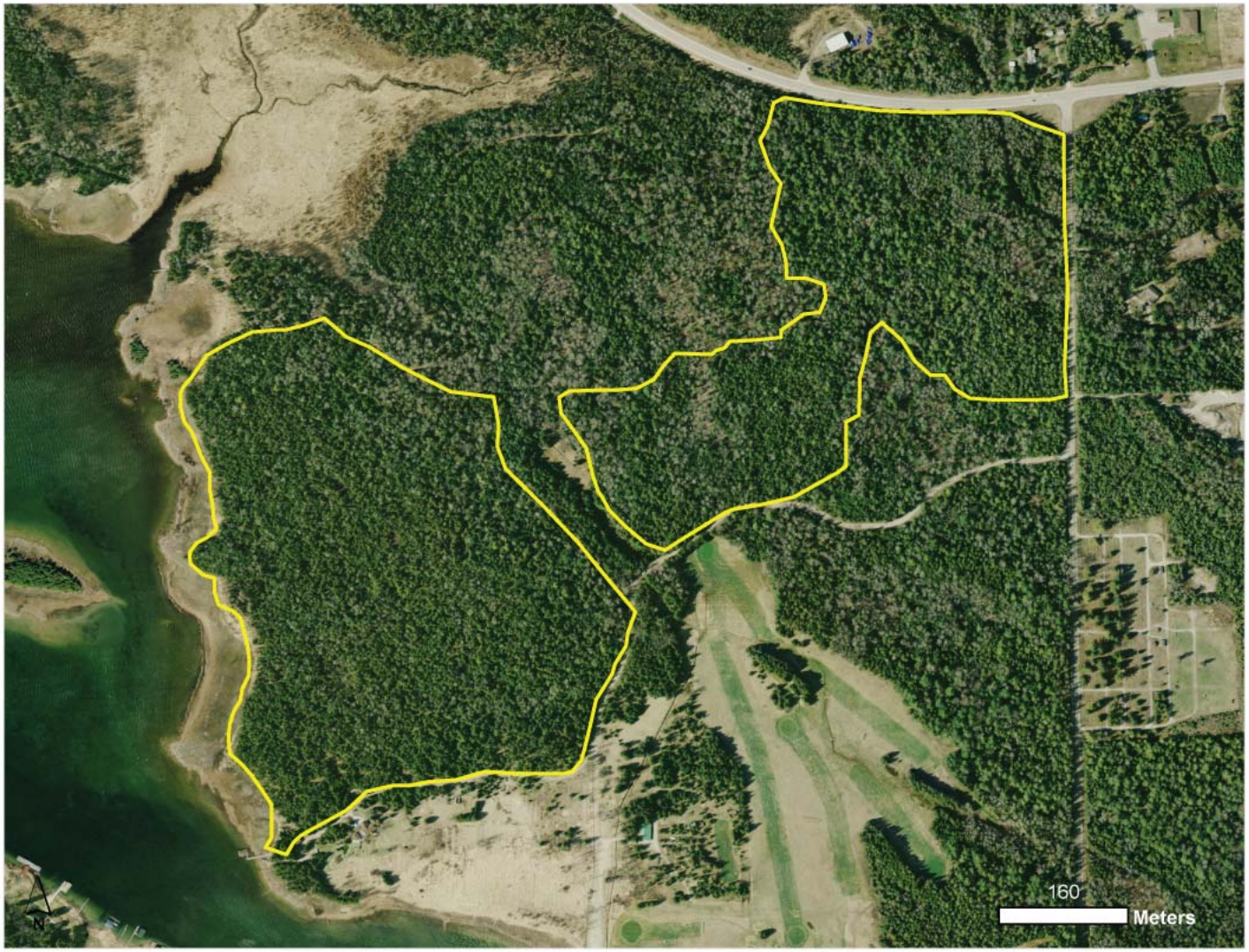
Aerial photograph of De Tour Peninsula boreal forest.

3. Derby Boreal Forest
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: C
Size: 101 acres
Location: Derby Nature Preserve, Mackinac County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20475 (new EO)

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

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

Derby Boreal Forest. Photo by Joshua G. Cohen.



Aerial photograph of Deby Boreal Forest.

4. Garden Island Boreal Forest
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: A
Size: 906 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 7487 (EO update)

Threats: Species composition and vegetative structure are patterned by natural processes. No threats were observed during the course of the survey. Scattered non-natives observed in the ground cover include bittersweet nightshade (*Solanum dulcamara*) (locally common) and helleborine (*Epipactis helleborine*).

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

Garden Island Boreal Forest. Photo by Joshua G. Cohen.

Aerial Photograph of Garden Island Boreal Forest.

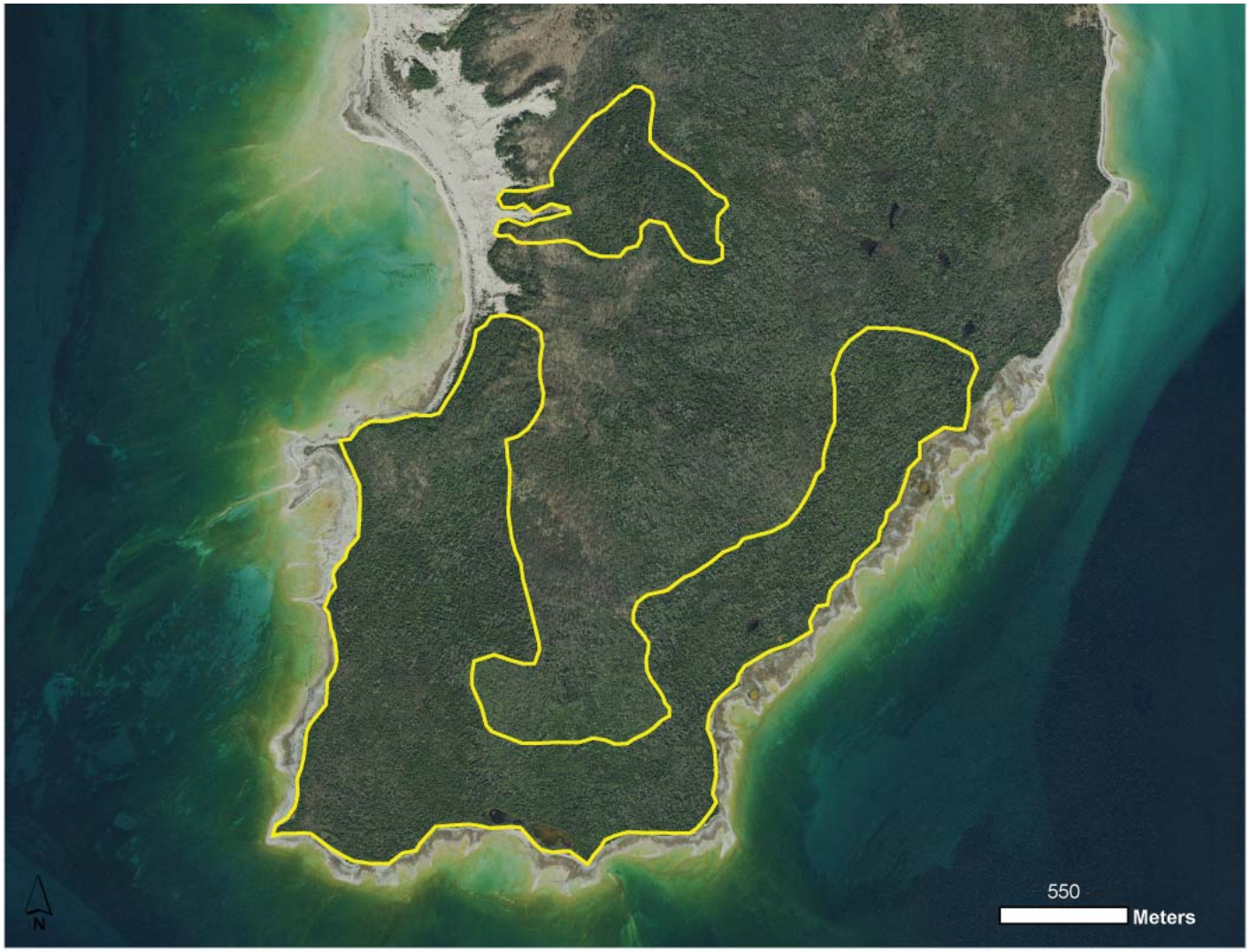
Garden Island Boreal Forest. Photo by Joshua G. Cohen.

5. High Island
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: AB
Size: 784 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 4856 (EO update)

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

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

High Island boreal forest. Photo by Joshua G. Cohen.



Aerial Photograph of High Island boreal forest.

High Island boreal forest. Photo by Joshua G. Cohen.

6. Paradesia Point
Natural Community Type: Boreal Forest
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: CD
Size: 101 acres
Location: Finton Natural Area, Leelanau County
Land Manager: Leelanau Conservancy
Element Occurrence Identification Number: 20468 (New EO)

Threats: The sparse understory and ground cover is likely due to high deer browse pressure. Non-native species noted within the forest include helleborine (*Epipactis helleborine*) and common speedwell (*Veronica officinalis*) (locally common).

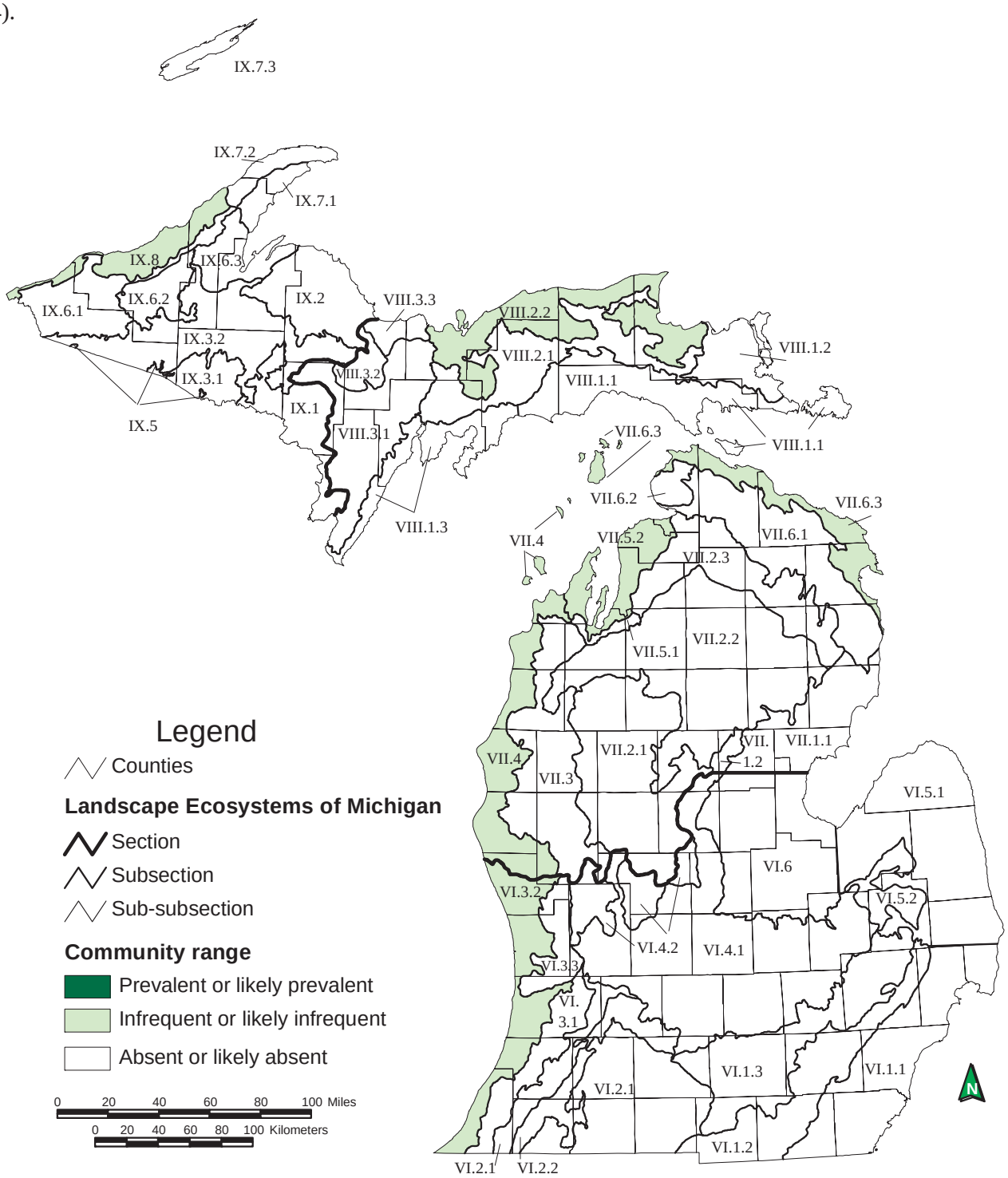
Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to retain an intact buffer of natural communities surrounding the boreal forest. Reducing local deer densities would help reduce deer browse pressure.

Paradesia Point boreal forest. Photo by Joshua G. Cohen.

Aerial photograph of Paradesia Point boreal forest.

CLAY BLUFF

Overview: Clay bluff is a forb-, graminoid-, and shrub-dominated and erosion-dependent community that occurs infrequently on steep to near-vertical slopes along the shorelines of Lake Michigan and Lake Superior. Clay bluff is less commonly found localized along eroding banks of rivers and streams that form ravines through clay soils and drain into these Great Lakes. Clay bluff range from three to 30 meters (10 to 100 feet) tall. Clay bluffs are dynamic systems with active sloughing occurring following frost heave and spring thaw and vegetation varying from year to year. Clay bluffs occurs on alkaline clays that are locally exposed following these landslide events. Species composition and vegetative structure of clay bluffs is patterned by sloughing of clay slopes due to groundwater seepage. Clay bluff is characterized by sparse forb, graminoid, and low shrub cover, dense patches of tall shrubs, and scattered and stunted overstory trees (Cohen et al. 2014).



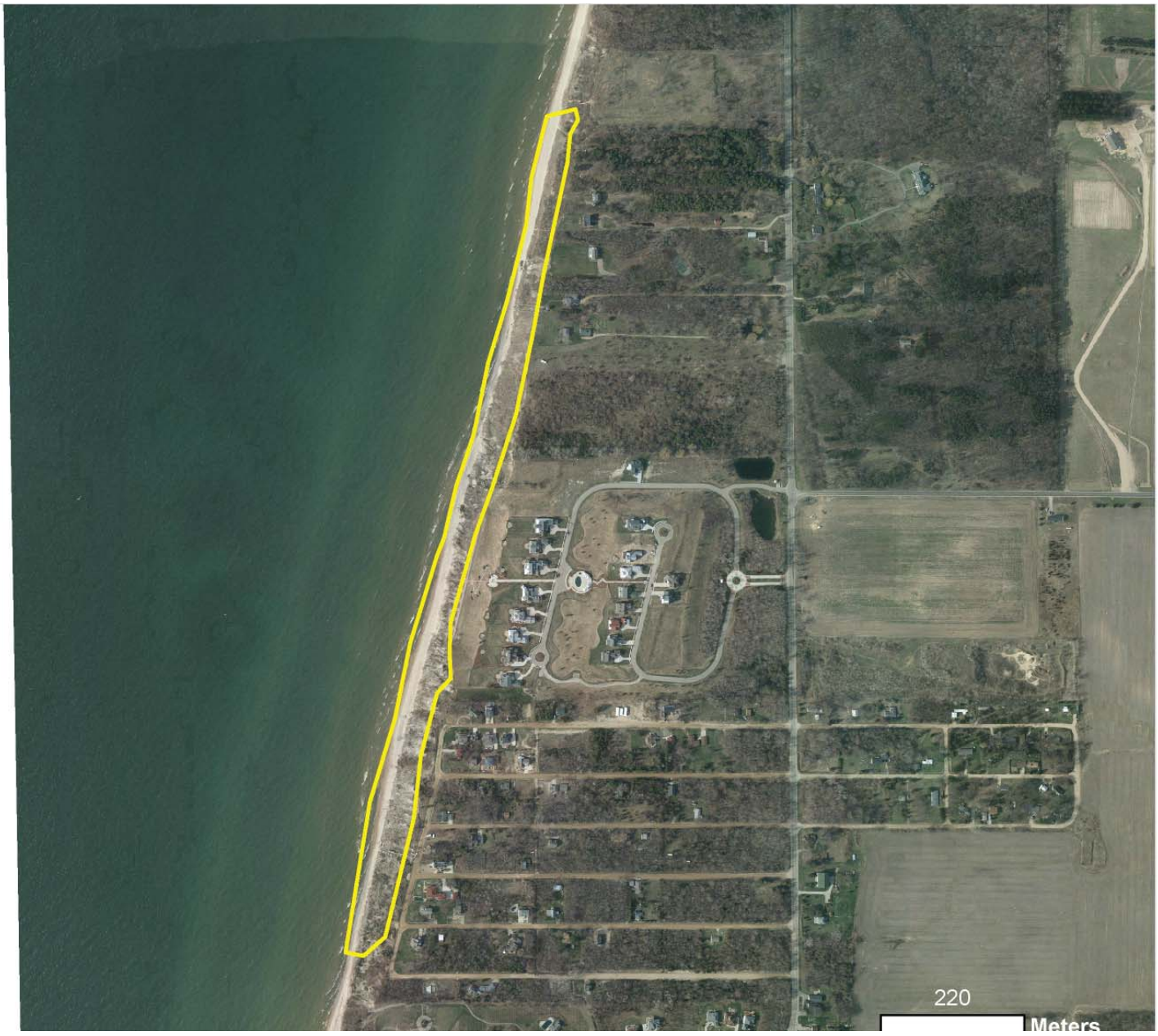
Map 3. Distribution of clay bluff in Michigan (Cohen et al. 2014).

7. Miami Park
Natural Community Type: Clay Bluff
Rank: GNR S2, not ranked globally and imperiled within the state
Element Occurrence Rank: C
Size: 17 acres
Location: Allegan County
Land Manager: Southwest Michigan Land Conservancy
Element Occurrence Identification Number: 20464 (New EO)

Threats: The upland above this stretch of clay bluff is highly disturbed, likely facilitating the establishment and spread of invasive plants within the clay bluff. Woody invasives are common and include autumn-olive (*Elaeagnus umbellata*), black locust (*Robinia pseudoacacia*), and multiflora rose (*Rosa multiflora*). Areas of dry clay seem to be particularly prone to invasive species including white sweet-clover (*Melilotus albus*) and Queen-Anne's-Lace (*Daucus carota*). In addition, kudzu (*Pueraria montana*) occurs south of the clay bluff along the shoreline.

Management Recommendations: The primary management recommendation is to maintain a buffer of natural communities to reduce the risk of further hydrological alteration and establishment of non-native species. Invasive species occurring along and near the bluff should be controlled and these control efforts should be monitored.

Miami Park clay bluff. Photo by Joshua G. Cohen.



Aerial photograph of Miami Park clay bluff.

8. Wau-Ke-Na
Natural Community Type: Clay Bluff
Rank: GNR S2, not ranked globally and imperiled within the state
Element Occurrence Rank: BC
Size: 0.5 acres
Location: William Erby Smith Preserve, Allegan County
Land Manager: Southwest Michigan Land Conservancy
Element Occurrence Identification Number: 20479 (New EO)

Threats: The natural processes of seepage and landslide drive the species composition and structure of this community. Non-natives documented along the clay bluff include autumn-olive (*Elaeagnus umbellata*), redtop (*Agrostis gigantea*), and narrow-leaved cat-tail (*Typha angustifolia*). Non-native species occurring in the forest at the top of the bluffs could potentially seed into the clay seepage bluffs.

Management Recommendations: The primary management recommendation is to maintain a buffer of natural communities to reduce the risk of further hydrological alteration and establishment of non-native species. Invasive species occurring along the bluff and nearby should be controlled and these control efforts should be monitored.

Wau-Ke-Na clay bluff. Photo by Joshua G. Cohen.

Aerial photograph of Wau-Ke-Na clay bluff.

Wau-Ke-Na clay bluff. Photo by Joshua G. Cohen.

9. Whirpool Bluff
Natural Community Type: Clay Bluff
Rank: GNR S2, not ranked globally and imperiled within the state
Element Occurrence Rank: CD
Size: 6.5 acres
Location: Berrien County
Land Manager: Southwest Michigan Land Conservancy
Element Occurrence Identification Number: 20465 (New EO)

Threats: The natural processes of seepage and landslide drive the species composition and structure of this community. However, non-native species are prevalent along the clay bluffs and include autumn-olive (*Elaeagnus umbellata*), black locust (*Robinia pseudoacacia*), multiflora rose (*Rosa multiflora*), glossy buckthorn (*Frangula alnus*) (locally common), common privet (*Ligustrum vulgare*), Siberian elm (*Ulmus pumila*), Tartarian honeysuckle (*Lonicera tatarica*), Japanese barberry (*Berberis thunbergii*), narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*) (locally common), white sweet-clover (*Melilotus albus*), asparagus (*Asparagus officinalis*), and mullein (*Verbascum thapsus*). Non-native species occurring in the open field at the top of the bluff could potentially seed into the clay bluff. In addition, the lack of an upland buffer above the clay bluff may contribute to increased surface water flow and increased flashy events of erosion.

Management Recommendations: Maintain a buffer of natural communities to reduce the risk of further hydrological alteration and establishment of non-native species. Allow the mowed field to return to forest cover to reduce the immediate seed source of invasive species. Invasive species occurring along the bluff and nearby should be controlled and these control efforts should be monitored.

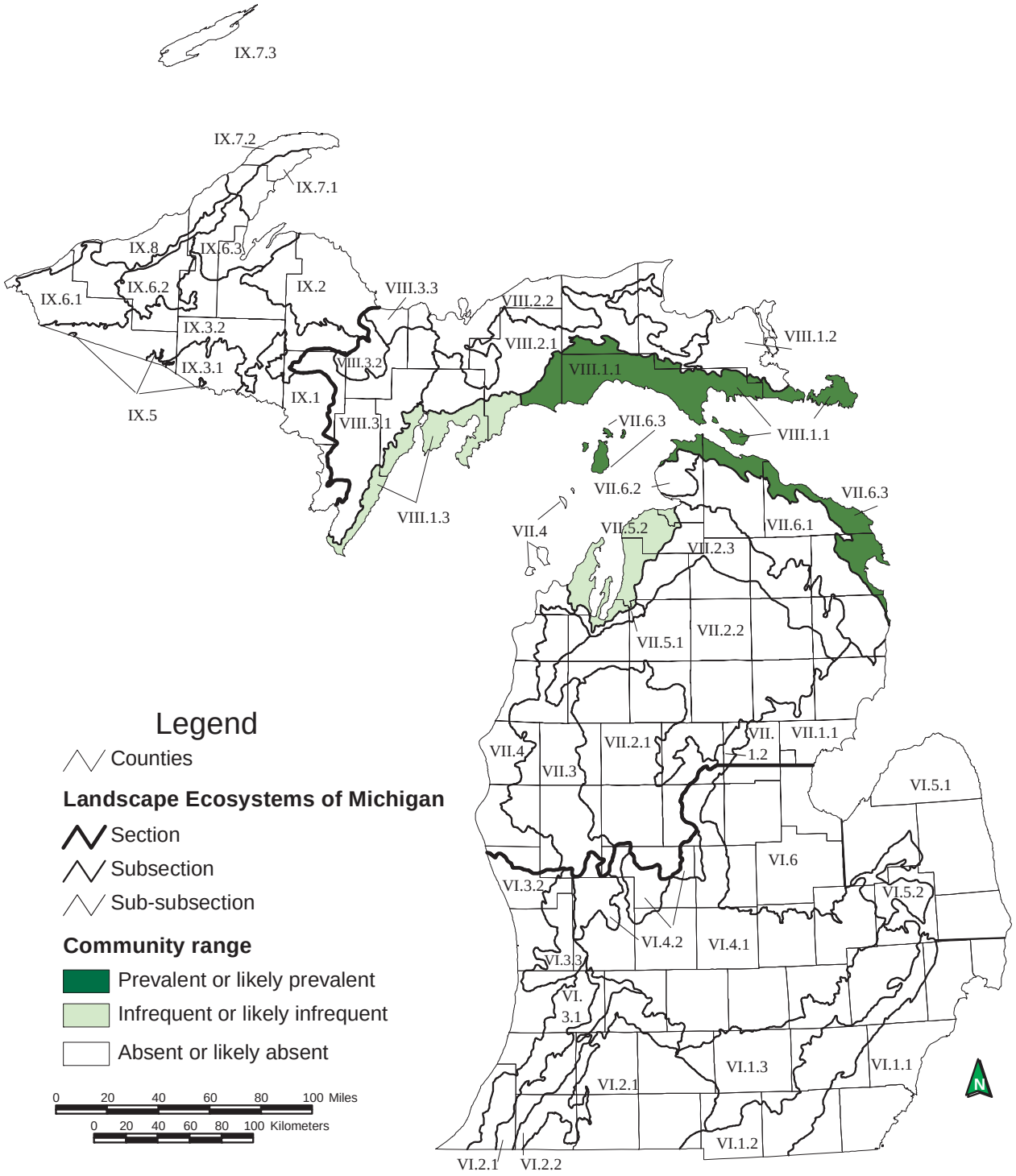
Whirlpool Bluff clay bluff. Photo by Joshua G. Cohen.

Aerial photograph of Whirlpool Bluff clay bluff.

Whirlpool Bluff clay bluff. Photo by Joshua G. Cohen.

COASTAL FEN

Overview: Coastal fen is a sedge- and rush-dominated wetland that occurs on calcareous substrates along Lake Huron and Lake Michigan north of the climatic tension zone. The community occurs where marl and organic soils accumulate in protected coves and abandoned coastal embayments and grade to moderately alkaline glacial tills and lacustrine sediments lakeward. Sediments along the lakeshore are typically fine-textured and rich in calcium and magnesium carbonates. Vegetation is comprised primarily of calcicolous species capable of growing on wet alkaline substrates (Kost et al. 2007, Cohen et al. 2014).



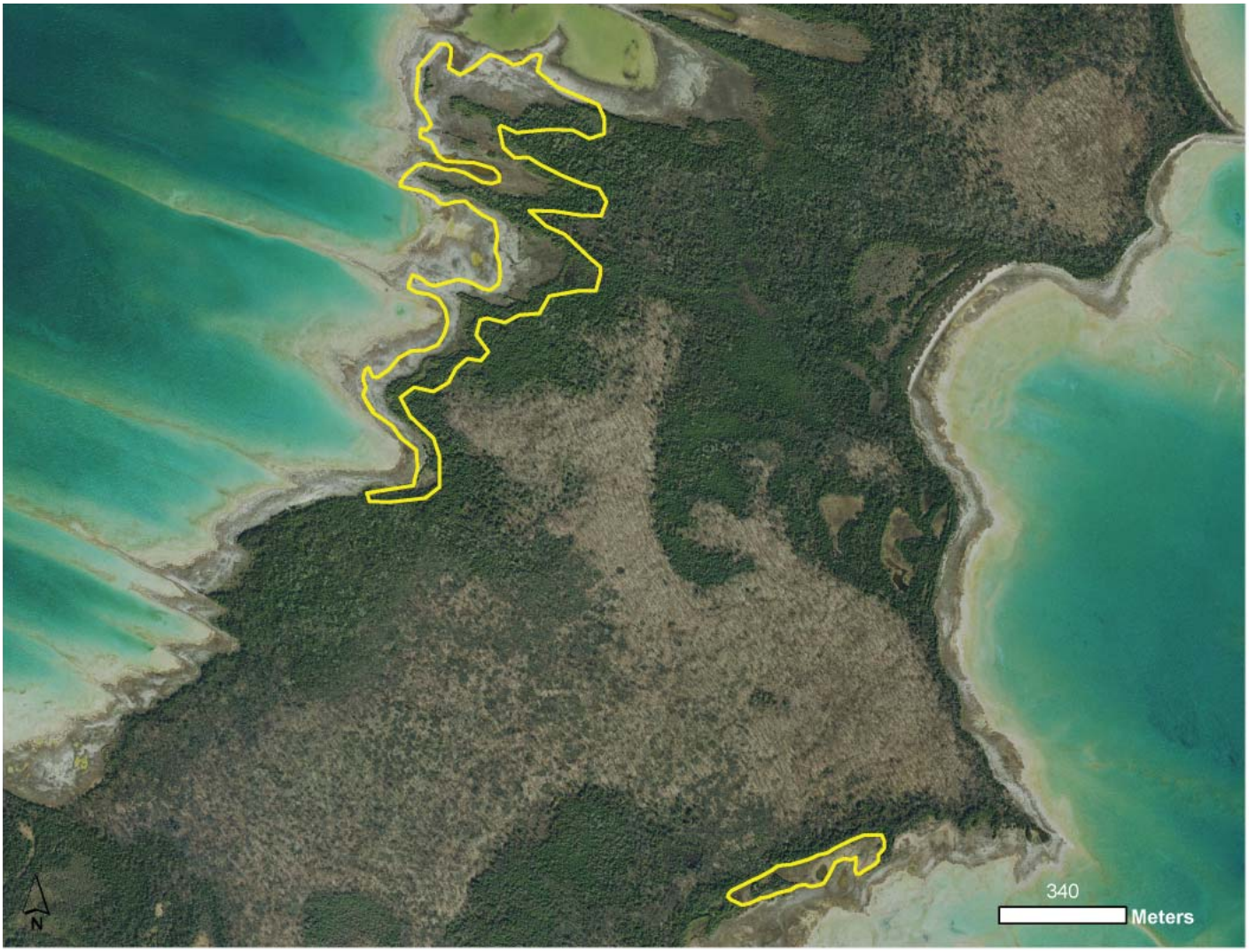
Map 4. Distribution of coastal fen in Michigan (Albert et al. 2008).

10. Baldimore Bay Environmental Area
Natural Community Type: Coastal Fen
Rank: G1G2 S2, globally critically imperiled to imperiled and imperiled within the state
Element Occurrence Rank: A
Size: 74 acres
Location: Beaver Island State Wildlife Research Area, Hog Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 3734 (EO update)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The main management recommendations are to allow natural processes (i.e., Great Lakes water level fluctuations) to operate unhindered, maintain a natural community buffer surrounding the shoreline to minimize surface water flow into the fen and to maintain groundwater seepage, and monitor for invasive plant populations.

Baldimore Bay Environmental Area coastal fen. Photo by Joshua G. Cohen.



Aerial photograph of Baldimore Bay Environmental Area, coastal fen.

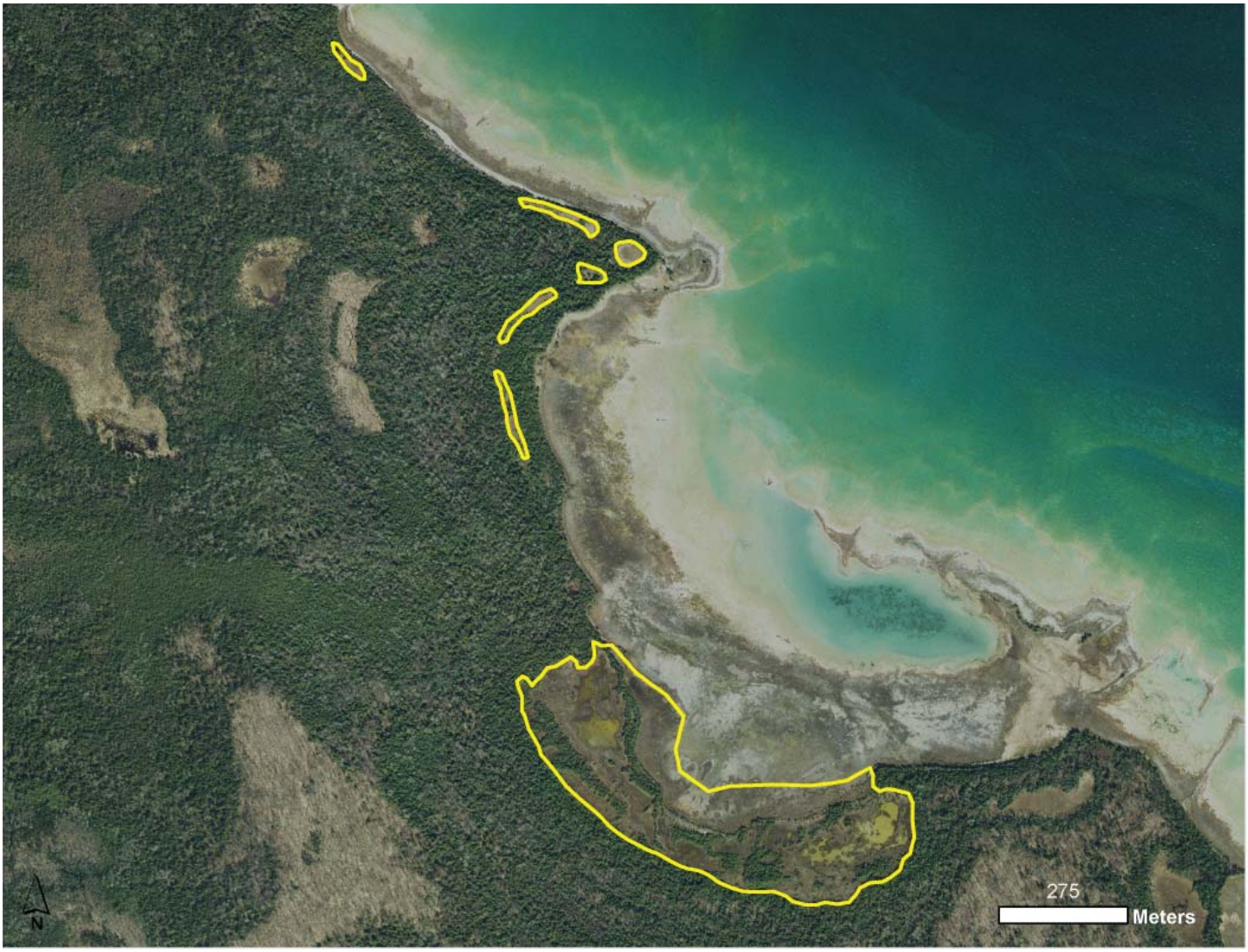
Baldimore Bay Environmental Area coastal fen. Photo by Joshua G. Cohen.

11. Jensen Harbor
Natural Community Type: Coastal Fen
Rank: G1G2 S2, globally critically imperiled to imperiled and imperiled within the state
Element Occurrence Rank: A
Size: 59 acres
Location: Beaver Island State Wildlife Research Area, Garden Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 7888 (EO update)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The main management recommendations are to allow natural processes (i.e., Great Lakes water level fluctuations) to operate unhindered, maintain a natural community buffer surrounding the shoreline to minimize surface water flow into the fen and to maintain groundwater seepage, and monitor for invasive plant populations.

Jensen Harbor coastal fen. Photo by Joshua G. Cohen.



Aerial photograph of Jensen Harbor coastal fen.

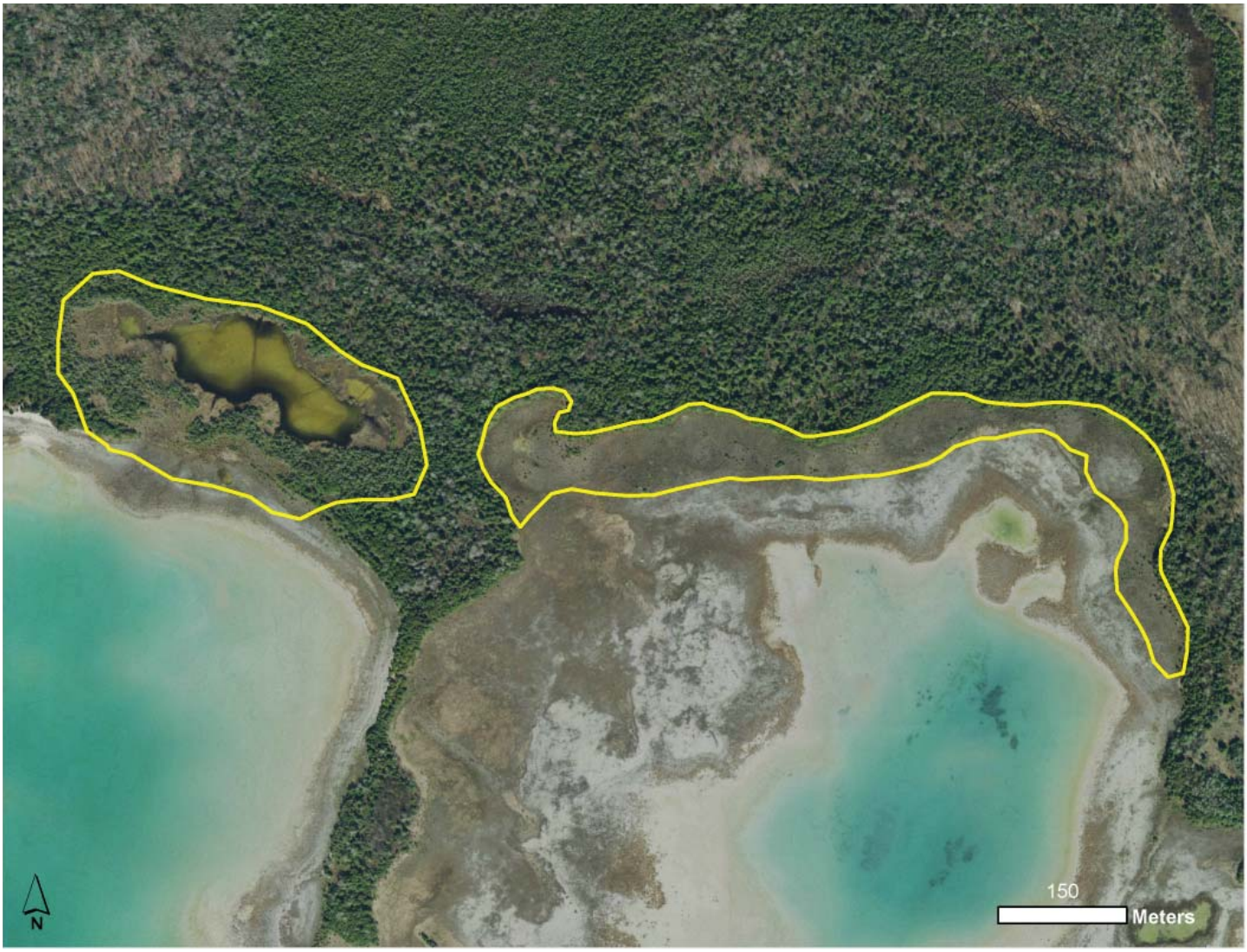
Jensen Harbor coastal fen. Photo by Joshua G. Cohen.

12. Northcutt and Monatou Bays
Natural Community Type: Coastal Fen
Rank: G1G2 S2, globally critically imperiled to imperiled and imperiled within the state
Element Occurrence Rank: AB
Size: 37 acres
Location: Beaver Island State Wildlife Research Area, Garden Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 10574 (EO update)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The main management recommendations are to allow natural processes (i.e., Great Lakes water level fluctuations) to operate unhindered, maintain a natural community buffer surrounding the shoreline to minimize surface water flow into the fen and to maintain groundwater seepage, and monitor for invasive plant populations.

Northcutt Bay and Monatou Bays coastal fen. Photo by Joshua G. Cohen.



Aerial photograph of Northcutt Bay and Monatou Bays coastal fen.

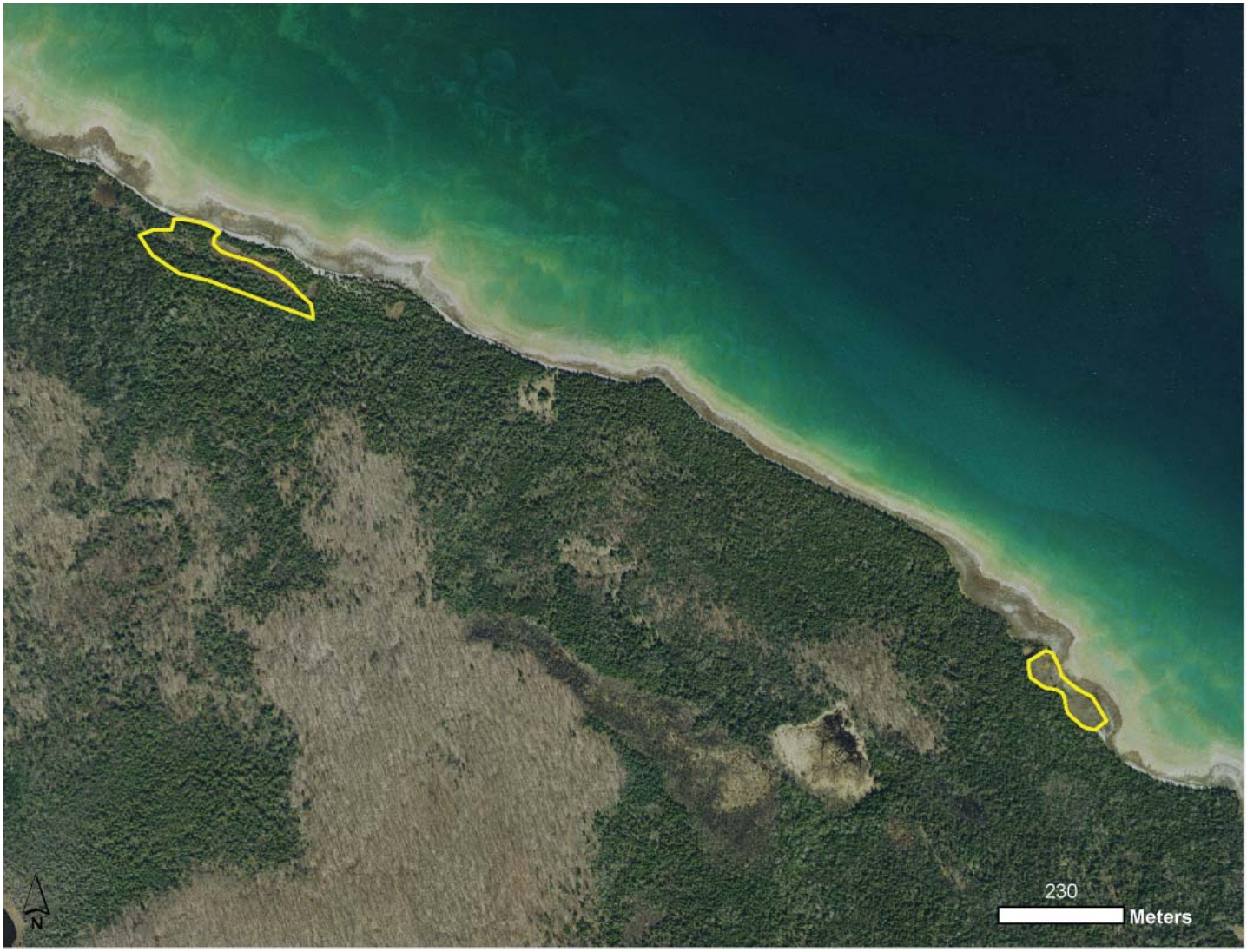

Northcutt Bay and Monatou Bays coastal fen. Photo by Joshua G. Cohen.

13. Sweat Lodge Swale
Natural Community Type: Coastal Fen
Rank: G1G2 S2, globally critically imperiled to imperiled and imperiled within the state
Element Occurrence Rank: B
Size: 6.7 acres
Location: Beaver Island State Wildlife Research Area, Garden Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 9513 (EO update)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The main management recommendations are to allow natural processes (i.e., Great Lakes water level fluctuations) to operate unhindered, maintain a natural community buffer surrounding the shoreline to minimize surface water flow into the fen and to maintain groundwater seepage, and monitor for invasive plant populations.

Sweat Lodge Swale coastal fen. Photo by Joshua G. Cohen.

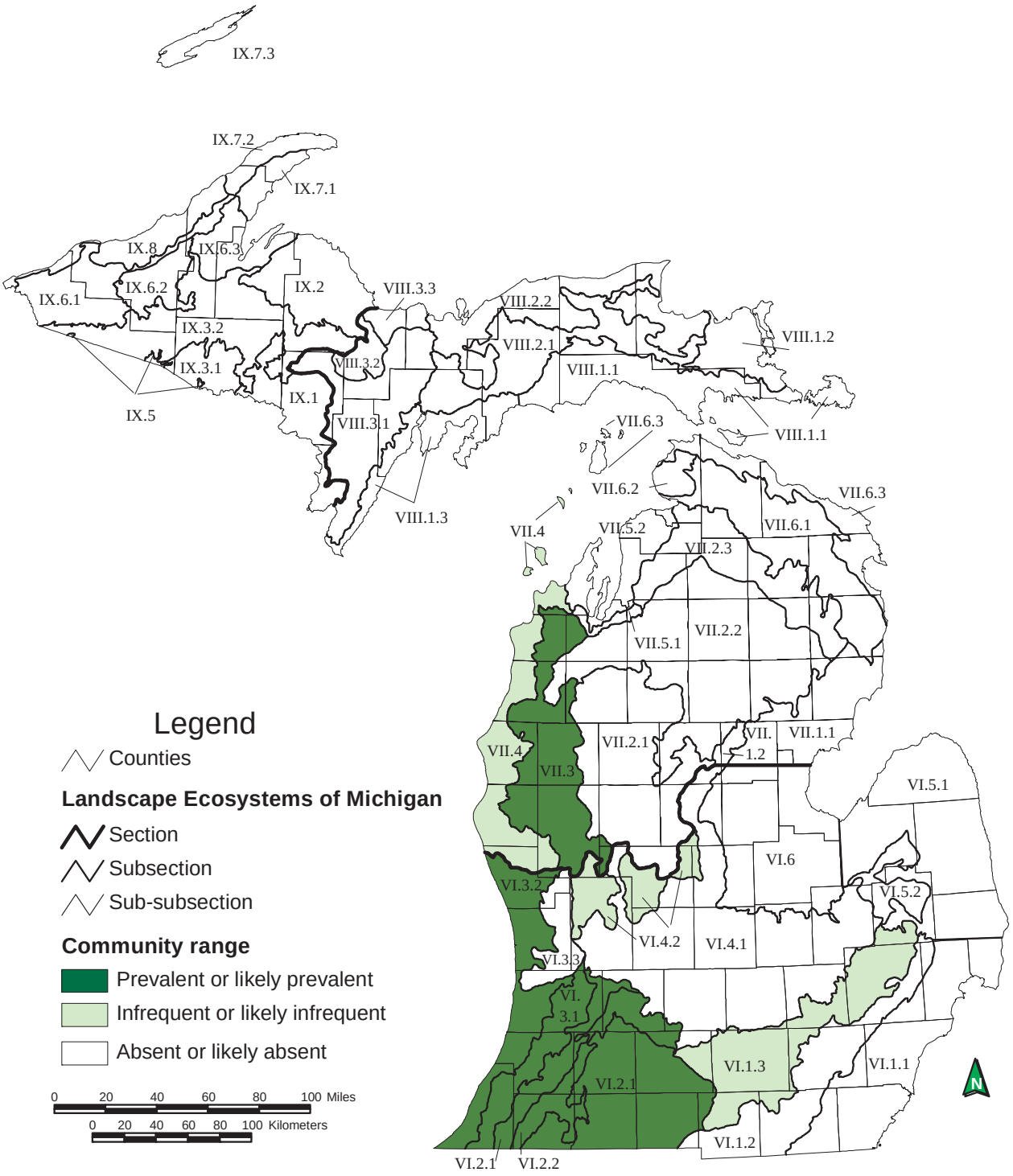


Aerial photograph of Sweat Lodge Swale coastal fen.

Sweat Lodge Swale coastal fen. Photo by Joshua G. Cohen.

COASTAL PLAIN MARSH

Overview: Coastal plain marsh is a grass-, spike-rush–, and rush-dominated wetland community that contains numerous plant disjuncts from the Atlantic and Gulf coastal plains. The community occurs in depressions on sand deposits associated with postglacial lakes and outwash channels in western Lower Michigan, northern Indiana, northern and central Wisconsin, and the southeastern Georgian Bay region of Ontario (Kost et al. 2007, Cohen et al. 2014).



Map 5. Distribution of coastal plain marsh in Michigan (Albert et al. 2008).

14. Grand Beach Marsh Preserve
Natural Community Type: Coastal Plain Marsh
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: CD
Size: 14 acres
Location: Grand Beach Marsh Preserve, Berrien County
Land Manager: Chikaming Open Lands
Element Occurrence Identification Number: 4858 (EO update)

Threats: Invasive species are locally problematic, particularly reed (*Phragmites australis* subsp. *australis*) and glossy buckthorn (*Frangula alnus*). In addition, roads and off-road vehicle activity have altered the hydrology of the wetland and pose a continuing threat. In the long term, climate change and associated changes in hydrology may impact the community.

Management Recommendations: The main management recommendations are to implement prescribed fire to set back woody species and burn off thatch, prevent off-road vehicle activity, control invasive species and monitor following control efforts.

Grand Beach Marsh Preserve coastal plain marsh. Photo by Bradford S. Slaughter.

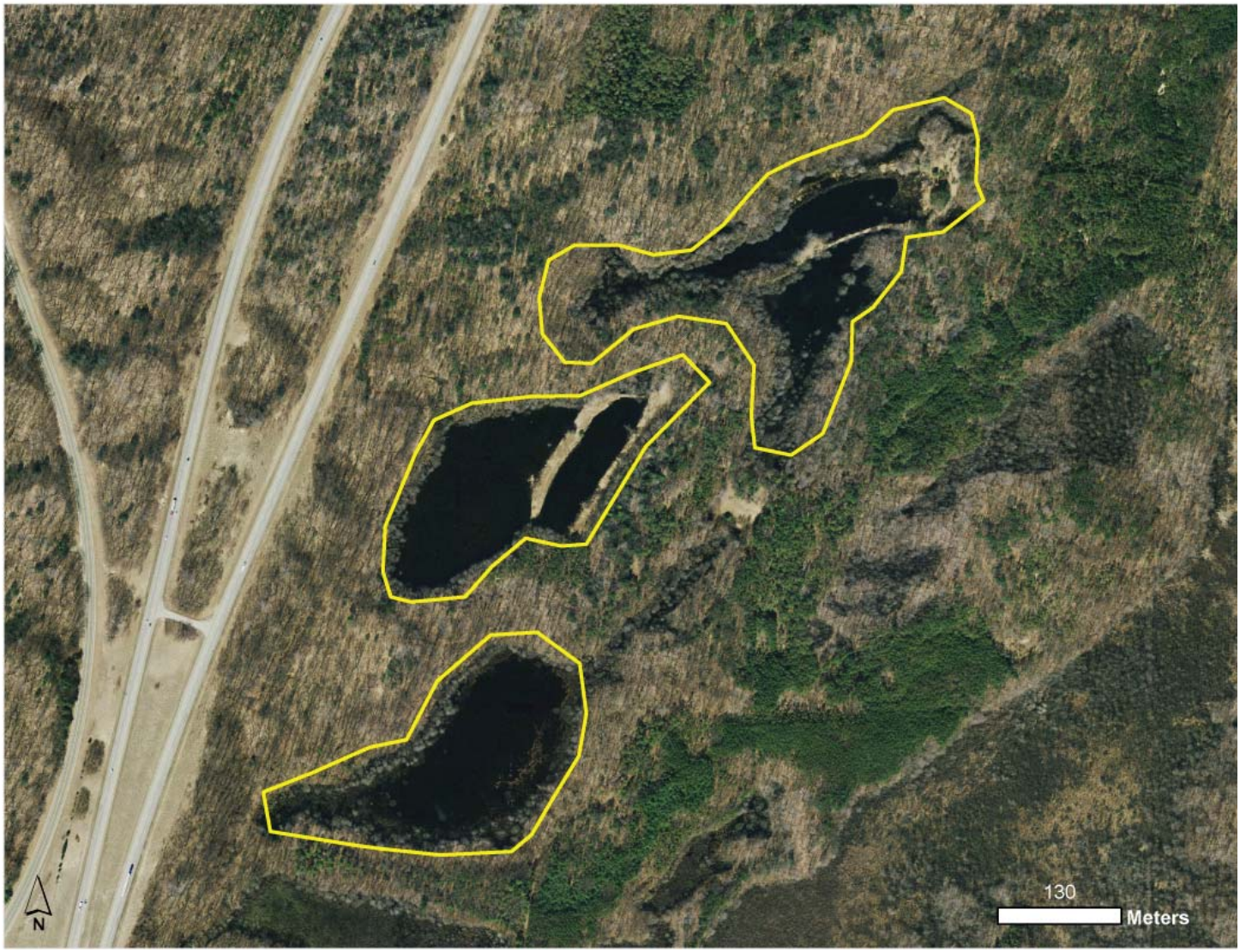
Aerial photograph of Grand Beach Marsh Preserve coastal plain marsh.

15. Ross Preserve
Natural Community Type: Coastal Plain Marsh
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: B
Size: 40 acres
Location: Ross Coastal Plain Marsh Preserve, Van Buren County
Land Manager: The Nature Conservancy
Element Occurrence Identification Number: 8108 (EO update)

Threats: The fire regime has been altered in the surrounding landscape. Historically, periodic fires within the adjacent dry-mesic forest would have carried into the margins of the coastal plain marsh, particularly when the wetland was dry and fuels were abundant. Narrow-leaved cat-tail (*Typha angustifolia*) and reed (*Phragmites australis* subsp. *australis*) (locally common) are locally dominant within the middle wetland depression. In addition, off-road vehicle tracks were noted within this area and two of the three wetlands were historically dredged.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered (i.e., allow fires to burn in the surrounding uplands and within the coastal plain marsh), prevent off-road vehicle activity, control invasive species and monitor following control efforts. Re-introducing fire as a primary disturbance factor and reducing deer densities in the surrounding landscape will benefit the coastal plain marsh and surrounding uplands.

Ross Preserve coastal plain marsh. Photo by Joshua G. Cohen.

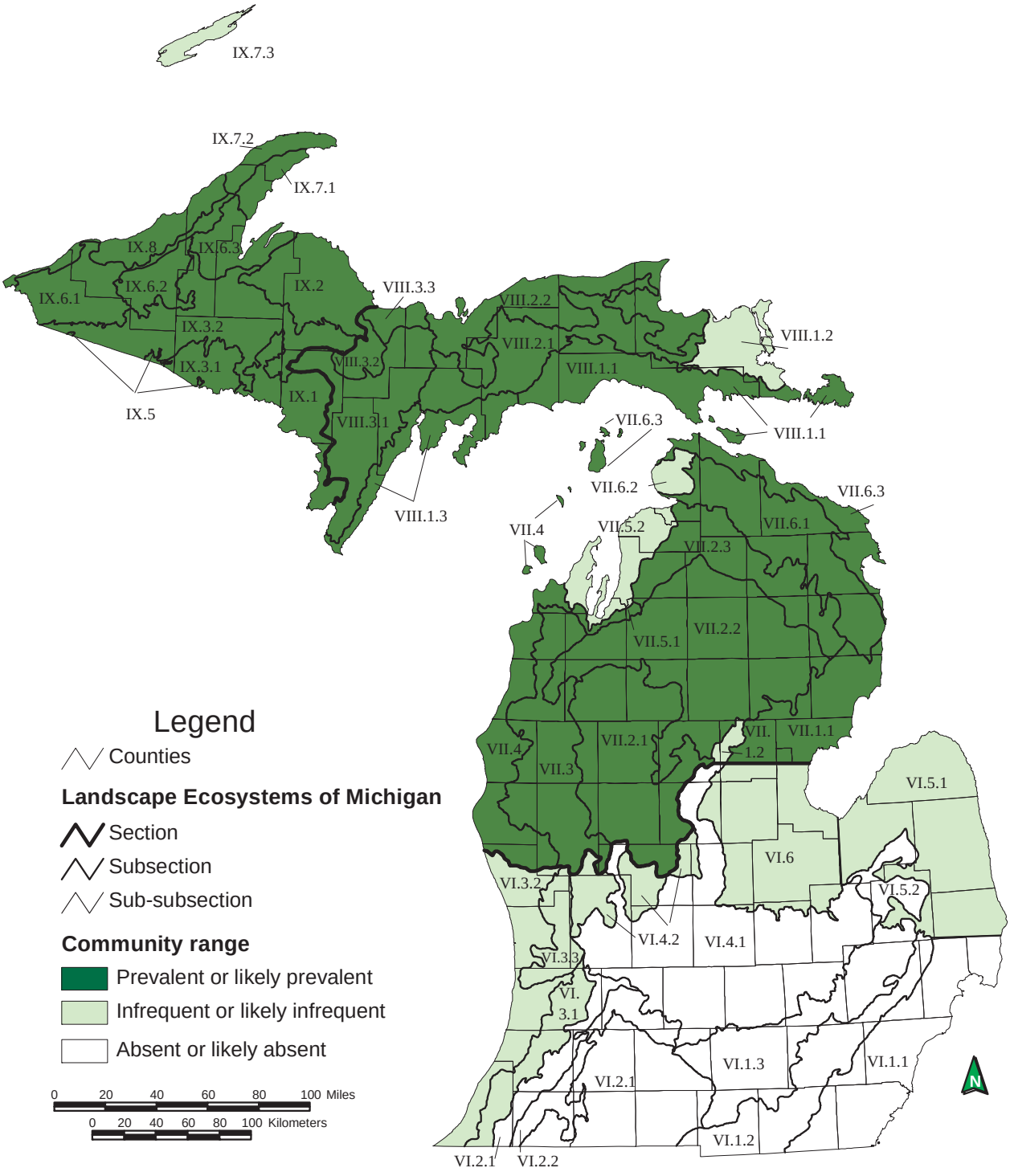


Aerial photograph of Ross Preserve coastal plain marsh.

Ross Preserve coastal plain marsh. Photo by Joshua G. Cohen.

DRY-MESIC NORTHERN FOREST

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



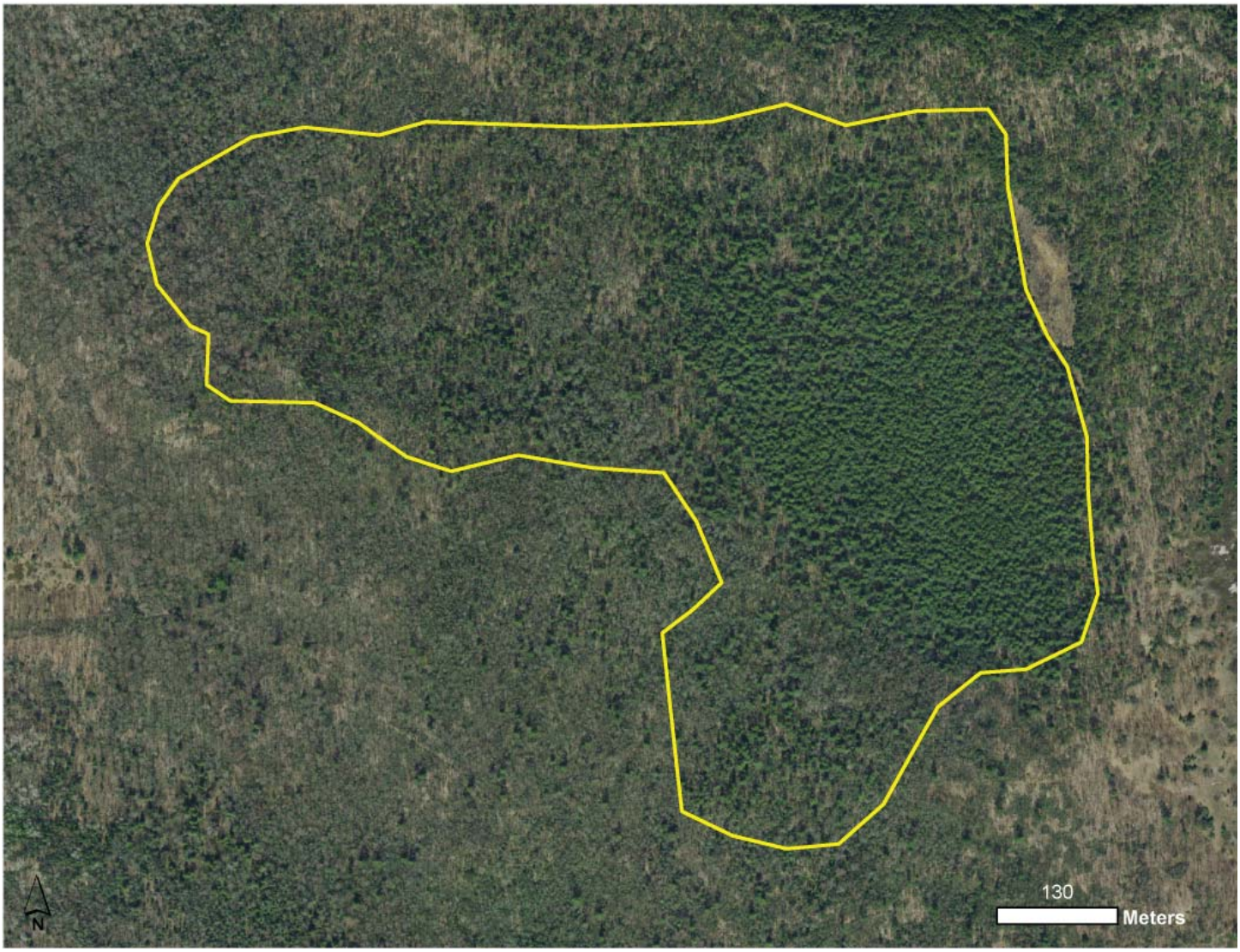
Map 6. Distribution of dry-mesic northern forest in Michigan (Albert et al. 2008).

16. High Island
Natural Community Type: Dry-mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: B
Size: 115 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20453 (New EO)

Threats: Species composition and vegetative structure are patterned by natural processes. No threats were observed during the course of the survey. Scattered cut stumps occur within the forest.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered (i.e., permit wildfires to burn through this site), retain an intact buffer of natural communities surrounding the dry-mesic northern forest, and monitor for invasive species.

High Island dry-mesic northern forest. Photo by Joshua G. Cohen.



Aerial photograph of High Island dry-mesic northern forest.

17. Piney Ridge
Natural Community Type: Dry-mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 138 acres
Location: Ludington State Park, Mason County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 19149 (EO update)

Threats: No major threats were noted during the course of the survey. Scattered cut stumps were noted within the forest and deer browse was noted on understory northern white-cedar (*Thuja occidentalis*).

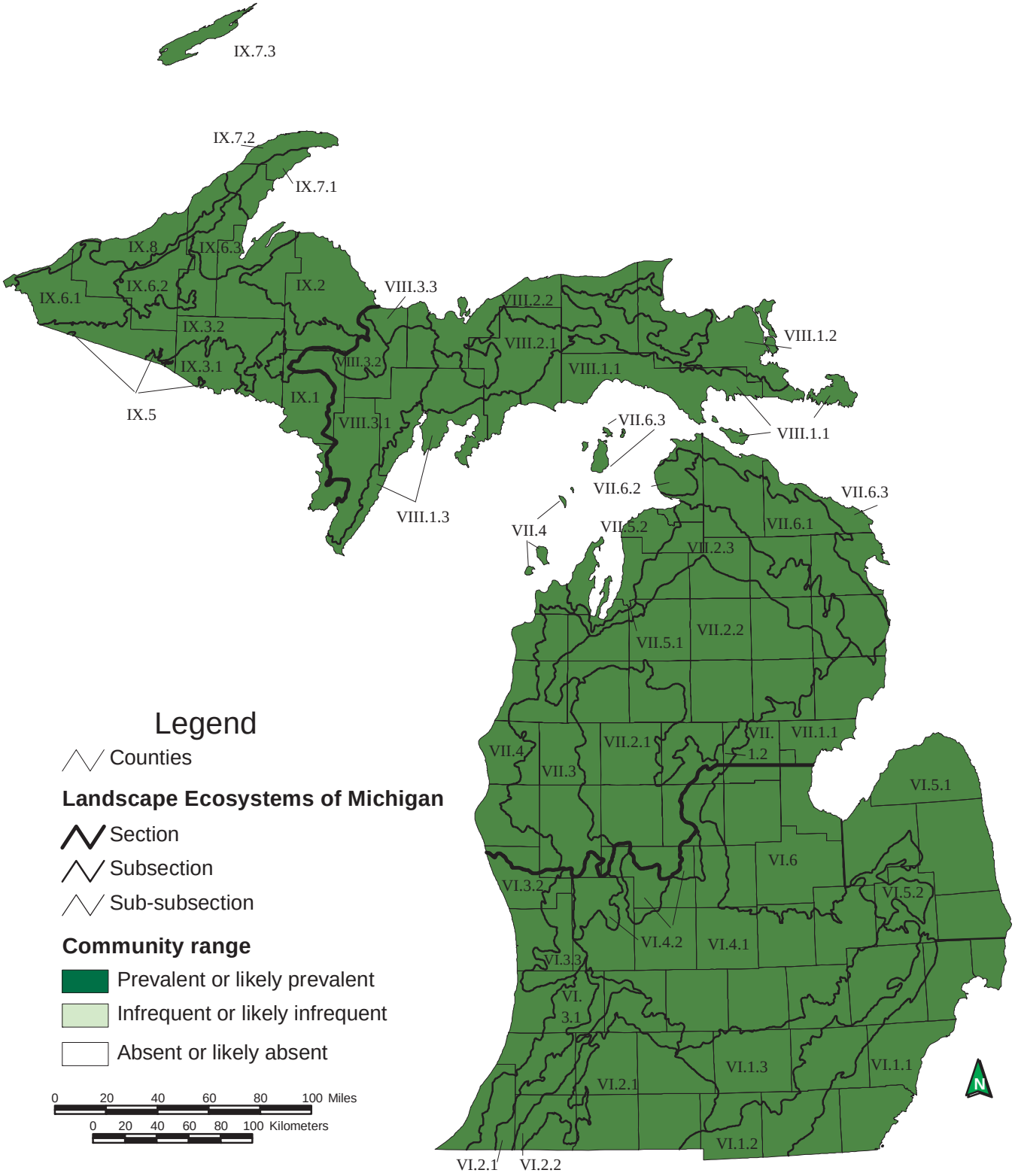
Management Recommendations: The primary management recommendation is to allow natural processes to operate unhindered (i.e., permit wildfires to burn through this site and the surrounding wetlands). The site should be monitored to ascertain if overstory species are recruiting and whether or not surface fires are occurring. If no fire occurs in 20 to 40 years, then advanced regeneration should be assessed, and, if lacking, prescribed fire should be considered as a management option. In the event of a wildfire or if prescribed fire is implemented, establishment of new fire lines should be avoided and existing fire breaks (i.e., trails, wetlands, and lakes) should be used. In addition, monitoring should be implemented to evaluate deer browse impacts.

Piney Ridge dry-mesic northern forest. Photo by Joshua G. Cohen.

Aerial photograph of Piney Ridge dry-mesic northern forest.

EMERGENT MARSH

Overview: Emergent marsh is a shallow-water wetland along the shores of lakes and streams characterized by emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs. Common plants include water plantains (*Alisma* spp.), sedges (*Carex* spp.), spike-rushes (*Eleocharis* spp.), pond-lilies (*Nuphar* spp.), pickerel weed (*Pontederia cordata*), arrowheads (*Sagittaria* spp.), bulrushes (*Schoenoplectus* spp.), and cat-tails (*Typha* spp.). The community occurs on both mineral and organic soils (Kost et al. 2007, Cohen et al. 2014).



Map 7. Distribution of emergent marsh in Michigan (Albert et al. 2008).

18. Hamlin Lake Marsh
Natural Community Type: Emergent Marsh
Rank: GU S4, globally unrankable and secure within the state
Element Occurrence Rank: B
Size: 32 acres
Location: Ludington State Park, Mason County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20459 (New EO)

Threats: The site is shaped by natural processes and is buffered by adjacent uplands and wetlands. The invasive narrow-leaved cat-tail (*Typha angustifolia*) is locally dominant within the marsh.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the wetland to minimize the threat of hydrological alteration, and control and monitor for invasive species.

Hamlin Lake Marsh emergent marsh. Photo by Joshua G. Cohen.

Aerial photograph of Hamlin Lake Marsh emergent marsh.

Hamlin Lake Marsh emergent marsh. Photo by Joshua G. Cohen.

FLOODPLAIN FOREST

Overview: Floodplain forest is a bottomland, deciduous or deciduous-conifer forest community occupying low-lying areas adjacent to streams and rivers of third order or greater, and subject to periodic over-the-bank flooding and cycles of erosion and deposition. Species composition and community structure vary regionally and are influenced by flooding frequency and duration. Silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*) are typically major overstory dominants, although green ash is declining in importance with the spread of emerald ash borer (*Agrilus planipennis*). Floodplain forests occur along major rivers throughout the state, but are most extensive in the Lower Peninsula. Species richness is greatest in the southern Lower Peninsula, where many floodplain species reach the northern extent of their range (Kost et al. 2007, Cohen et al. 2014).

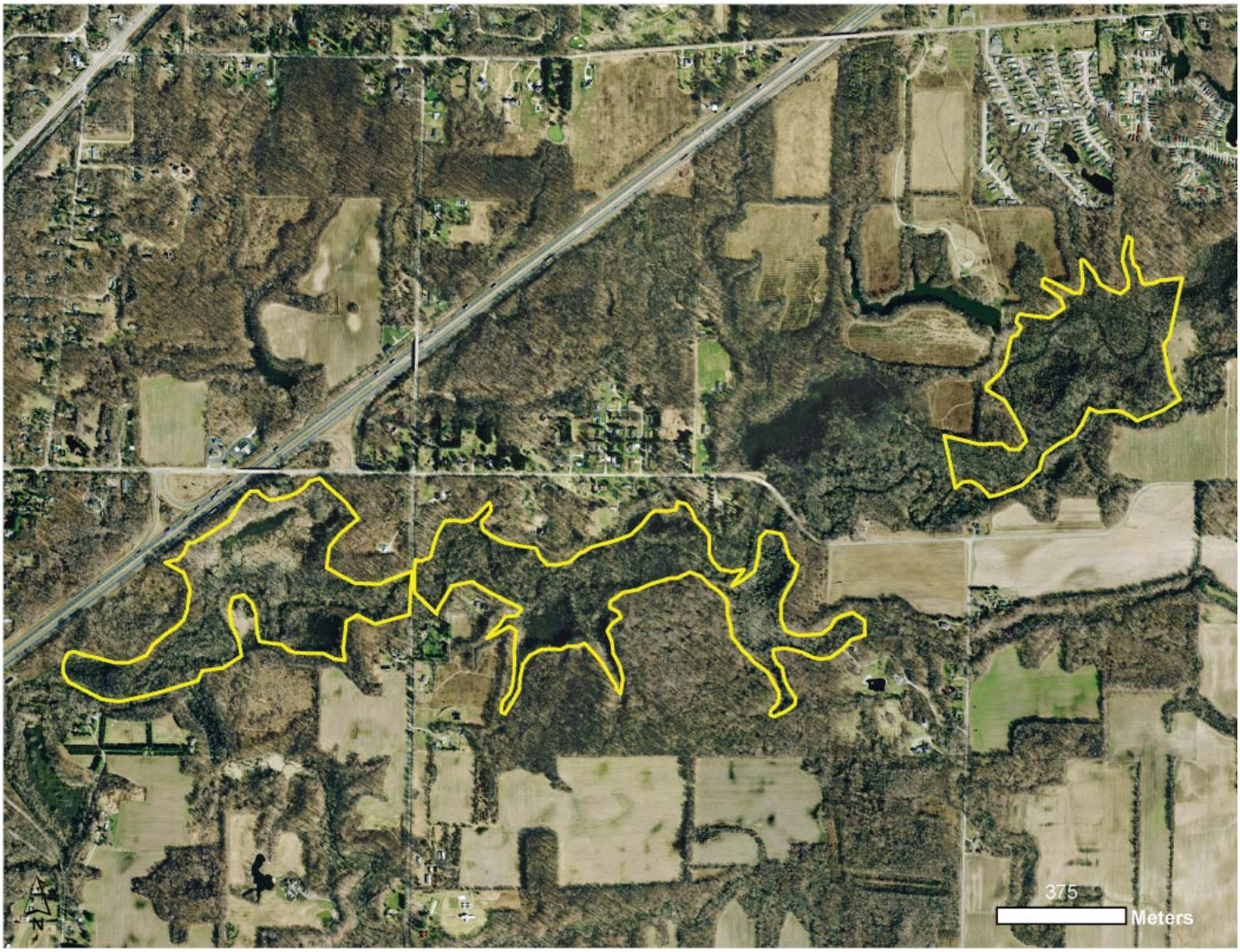
Map 8. Distribution of floodplain forest in Michigan (Albert et al. 2008).

19. Hooks Corner Floodplain
Natural Community Type: Floodplain Forest
Rank: G3? S3, vulnerable throughout range
Element Occurrence Rank: BC
Size: 184 acres
Location: Chikaming Township Park and Preserve, Berrien County
Land Manager: Chikaming Township
Element Occurrence Identification Number: 13781 (EO update)

Threats: Species composition and natural community composition are patterned by the fluvial processes of erosion and deposition. In addition to over-the-bank flooding, windthrow, logging, invasive species, and deer herbivory have influenced the floodplain forest. Infestations of multiflora rose (*Rosa multiflora*) and common privet (*Ligustrum vulgare*) occur locally.

Management Recommendations: The main management recommendations are to maintain the mature floodplain forest and the hydrology of the river, reduce local deer populations, eliminate off-road vehicle activity, control invasive species (especially woody species), and monitor for deer browse, invasive species, and off-road vehicle activity.

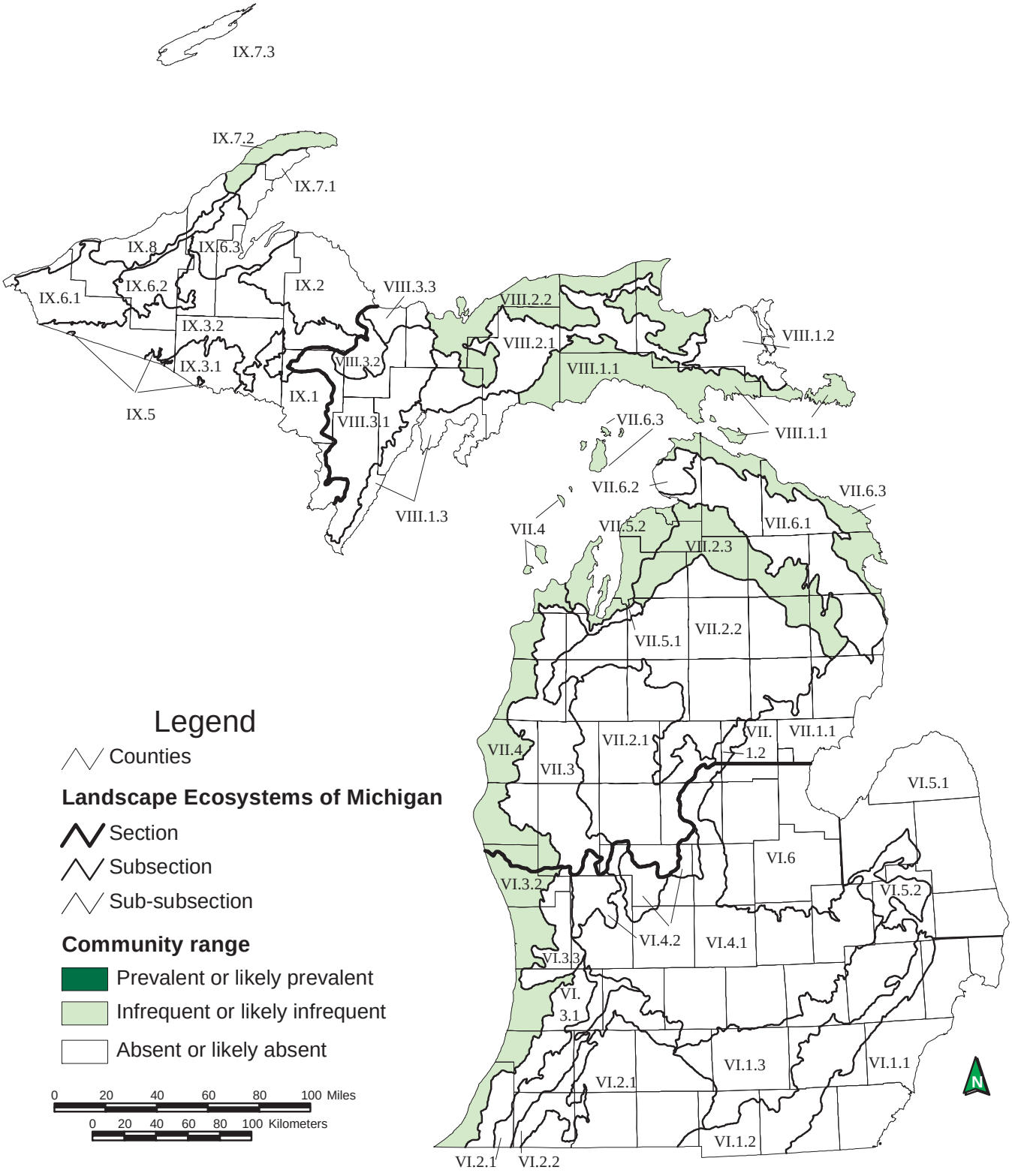
Hooks Corner Floodplain Forest. Photo by Bradford S. Slaughter.



Aerial photograph of Hooks Corner Floodplain Forest

GREAT LAKES BARRENS

Overview: Great Lakes barrens is a coniferous savanna community of scattered and clumped trees, and an often dense, low or creeping shrub layer. The community occurs along the shores of the Great Lakes where it is often associated with interdunal wetlands and open dunes (Kost et al. 2007, Cohen et al. 2014).



Map 9. Distribution of Great Lakes barrens in Michigan (Albert et al. 2008).

20. Nezewabegon Barrens
Natural Community Type: Great Lakes Barrens
Rank: G3 S2, vulnerable globally and imperiled within the state
Element Occurrence Rank: AB
Size: 19 acres
Location: Beaver Island State Wildlife Research Area, High Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20454 (New EO)

Threats: Species composition and structure are driven by natural processes. The Great Lakes barrens is threatened by invasive plants. Canada bluegrass (*Poa compressa*) is locally common within the Great Lakes barrens. Invasives found along the shoreline include mossy stonecrop (*Sedum acre*), narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and white sweet-clover (*Melilotus albus*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants within the dune complex and nearby areas of shoreline. Monitoring for invasive species within the Great Lakes barrens should be implemented and they should be controlled in nearshore areas adjacent to the barrens.

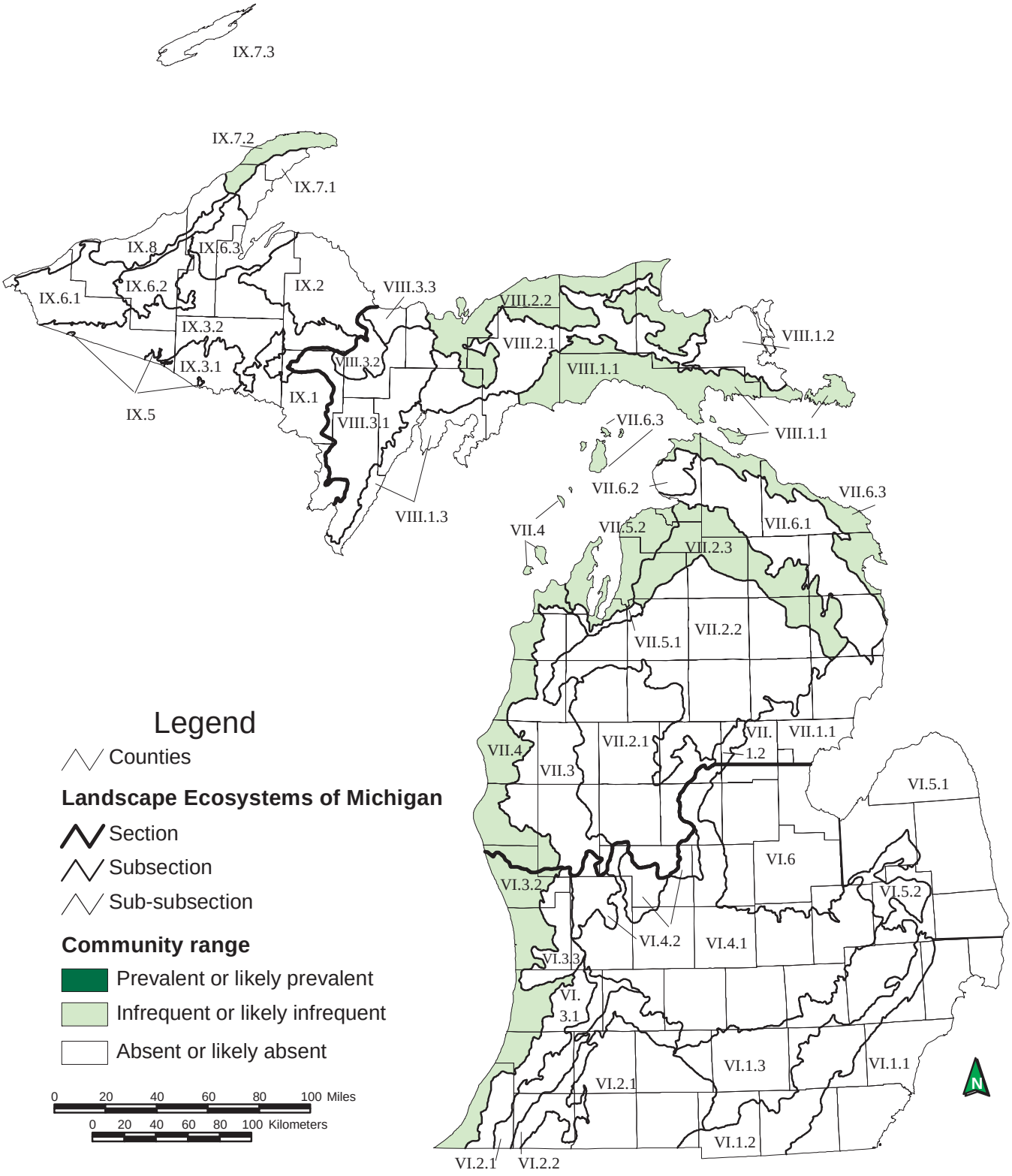
Nezewabegon Barrens Great Lakes barrens. Photo by Joshua G. Cohen.

Aerial photograph of Nezewabegon Barrens Great Lakes barrens.

Nezewabegon Barrens Great Lakes barrens. Photo by Joshua G. Cohen.

GREAT LAKES MARSH

Overview: Great Lakes marsh is an herbaceous wetland community occurring statewide along the shoreline of the Great Lakes and their major connecting rivers. Vegetational patterns are strongly influenced by water level fluctuations and type of coastal feature, but generally include the following: a deep marsh with submerged plants; an emergent marsh of mostly narrow-leaved species; and a sedge-dominated wet meadow that is inundated by storms. Great Lakes marsh provides important habitat for migrating and breeding waterfowl, shore-birds, spawning fish, and medium-sized mammals (Kost et al. 2007, Cohen et al. 2014).



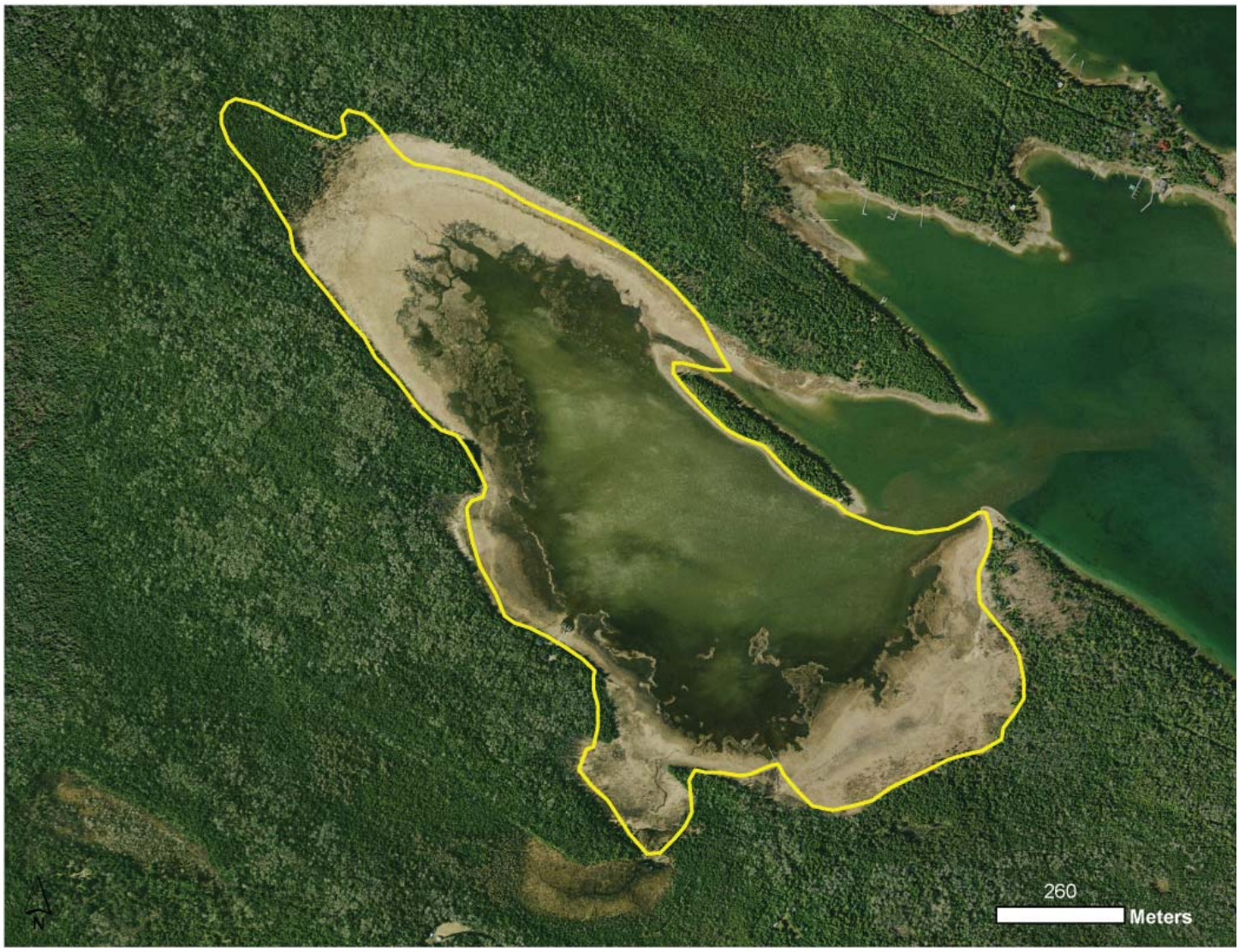
Map 10. Distribution of Great Lakes marsh in Michigan (Albert et al. 2008).

21. Duck Bay -- Marquette Island
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: AB
Size: 243 acres
Location: Aldo Leopold Nature Preserve, Mackinac County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 10115 (EO update)

Threats: Species composition and zonation are patterned primarily by natural processes. Vacation homes occur southwest of the marsh on the island and boat traffic from this development has resulted in several boating channels through the marsh vegetation. Localized patches of narrow-leaved cat-tail (*Typha angustifolia*) and hybrid cat-tail (*Typha* x*glauca*) occur within the marsh, especially within the emergent marsh zone.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, control invasive plants, maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source, and prevent the creation of additional boating channels through the marsh. Monitoring should be implemented following efforts to control invasive species.

Duck Bay Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of Duck Bay Great Lakes marsh.

Invasive cat-tail beds occur locally in Duck Bay. Photo by Joshua G. Cohen.

22. Galien River Estuary
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: C
Size: 377 acres
Location: Galien River County Park and Louis J. Sima Great Lakes Marsh Preserve, Berrien County
Land Manager: Berrien County Park and Chikaming Open Lands
Element Occurrence Identification Number: 12181 (EO update)

Threats: Degraded marsh has been impacted by channelization of the stream mouth, pollution from point and non-point inputs of fertilizers and other pollutants, and invasive species infestations. Invasive species occur as local dominants and include reed (*Phragmites australis* subsp. *australis*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), morrow honeysuckle (*Lonicera morrowii*), oriental bittersweet (*Celastrus orbiculatus*), and European highbush-cranberry (*Viburnum opulus*).

Management Recommendations: The primary management recommendations are to reduce point and non-point inputs of fertilizers and other pollutants to improve water quality and control invasive species infestations, especially reed and the invasive shrubs.

Galien River Estuary Great Lakes marsh. Photo by Bradford S. Slaughter.

Aerial photograph of Galien River Estuary Great Lakes marsh.

Galien River Estuary Great Lakes marsh. Photo by Bradford S. Slaughter.

23. Gut Port Marsh
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: B
Size: 18 acres
Location: De Tour Peninsula Nature Preserve, Chippewa County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20473 (New EO)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed within the marsh during the survey. Numerous non-native species occur along the adjacent limestone cobble shore, including reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), spotted knapweed (*Centaurea stoebe*), white sweet-clover (*Melilotus albus*), common mullein (*Verbascum thapsus*), and wild parsnip (*Pastinaca sativa*).

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, to control populations of non-native species along the adjacent limestone cobble shore, and to maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source. Monitoring should be implemented for non-native plant populations.

Gut Port Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

Aerial photograph of Gut Port Marsh Great Lakes marsh.

Gut Port Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

24. Hessel Marsh
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: B
Size: 306 acres
Location: Mackinac Bay Nature Preserve, Mackinac County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 5371 (EO update)

Threats: The marsh is intersected by M-134 along the northern portion of the complex. In addition, several boating channels pass through the marsh to the private residences along the eastern portion of the marsh. Invasive species are locally common. Narrow-leaved cat-tail (*Typha angustifolia*) is a local dominant within areas of deepwater marsh and emergent marsh.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, control invasive plants, maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source, and prevent the construction of additional boating channels through the marsh. Monitoring should be implemented following efforts to control invasive species.

Hessel Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

Aerial photograph of Hessel Marsh Great Lakes marsh.

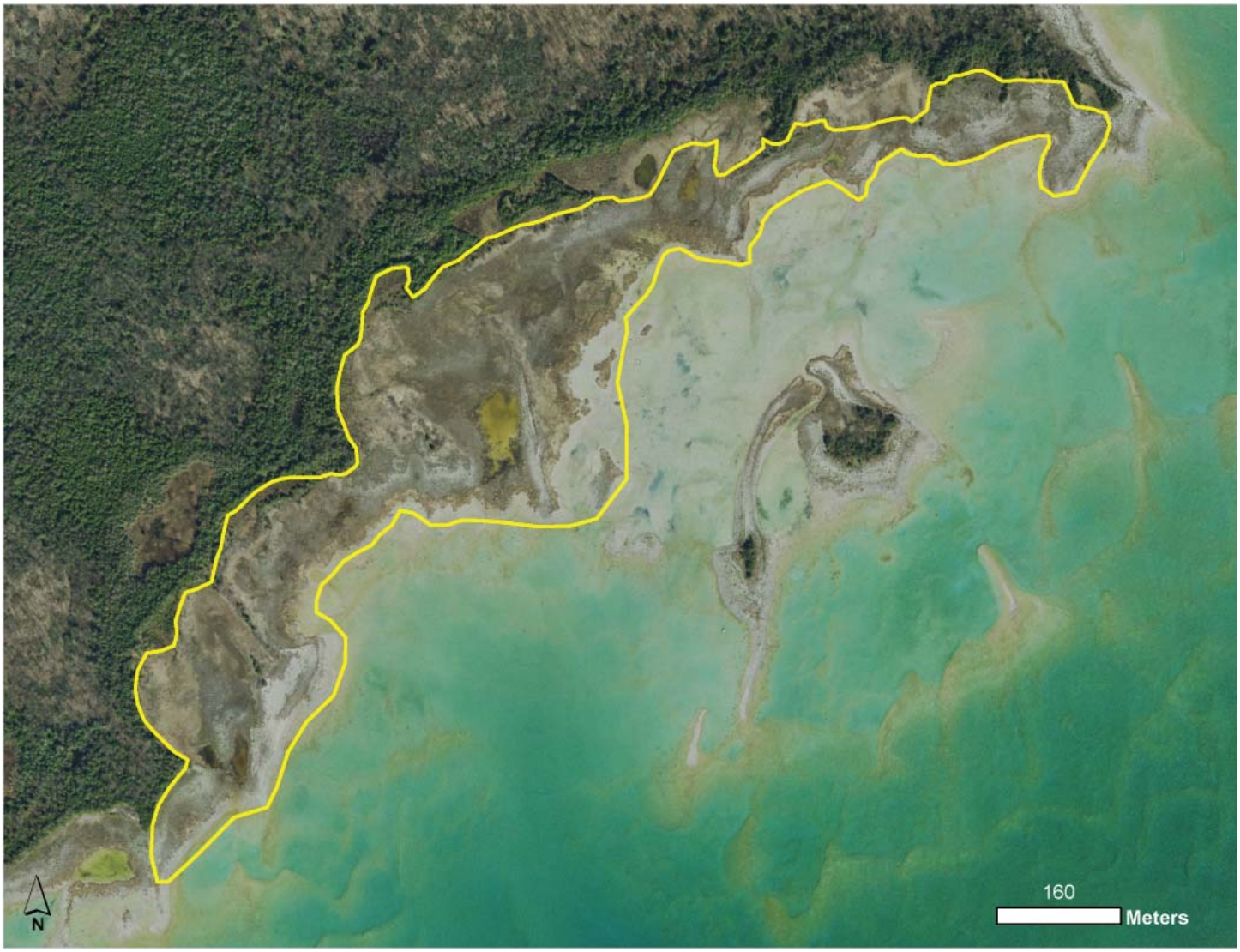
Hessel Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

25. Hog Island -- East Shoreline
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: AB
Size: 149 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 2179 (EO Update)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, maintain a natural community buffer surrounding the shoreline, and monitor for invasive species.

Hog Island Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of Hog Island Great Lakes marsh.

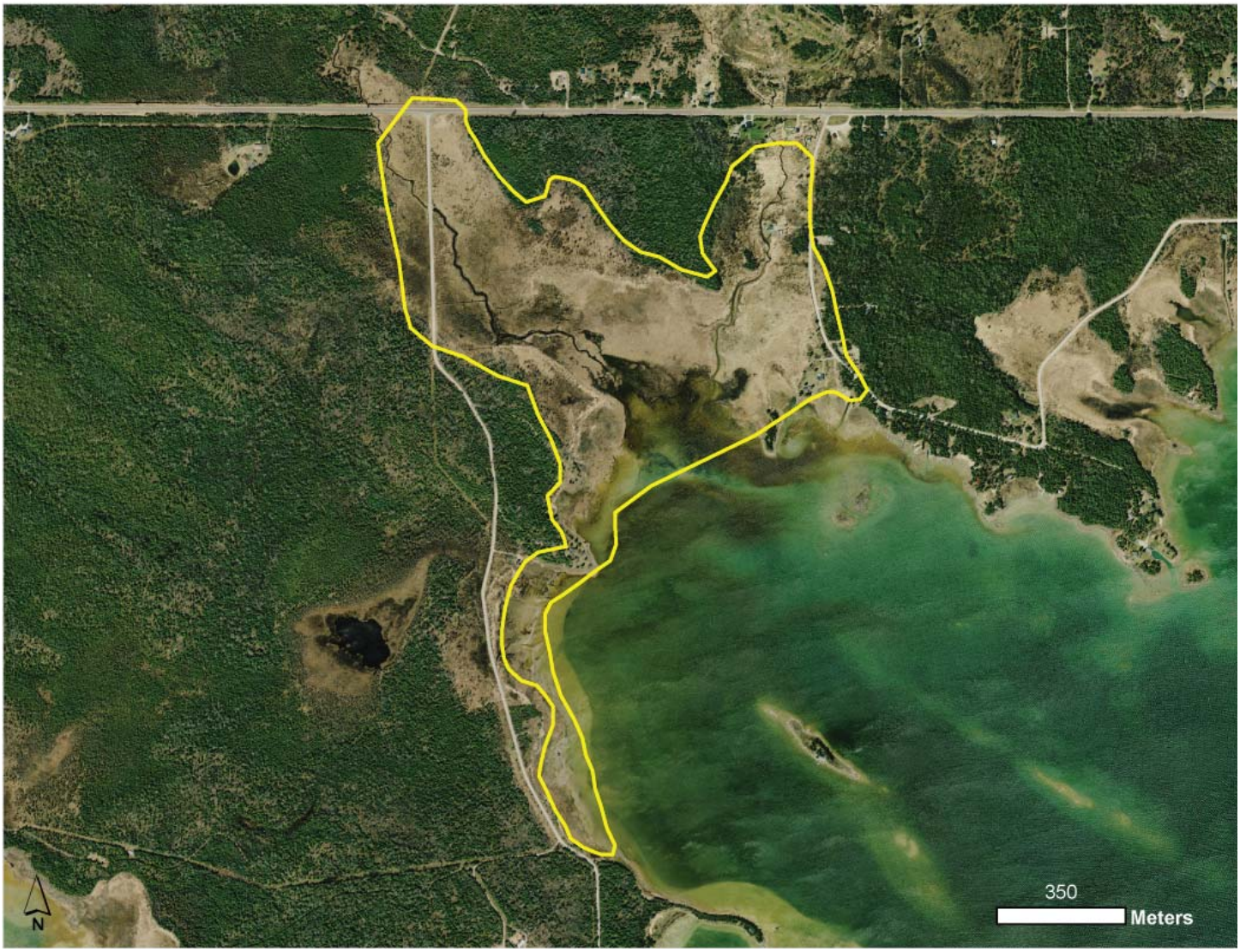
Hog Island Great Lakes marsh. Photo by Joshua G. Cohen.

26. Mismer Bay
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: C
Size: 227 acres
Location: Birge Nature Preserve, Mackinac County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 1297

Threats: The marsh is intersected by M-134 along the northern portion of the complex and also by Point Brulee Road along the southwestern portion of the marsh. In addition, a dredged boating channel was documented in the northeastern portion of the marsh. Invasive species are locally common. Reed canary grass (*Phalaris arundinacea*) occurs along the margin of Point Brulee Road and also on the margins of the dredged channel in the northeastern portion of the marsh. Narrow-leaved cat-tail (*Typha angustifolia*) and hybrid cat-tail (*Typha* x*glauca*) are local dominants within areas of deepwater marsh.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, control invasive plants, maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source, and prevent the construction of additional boating channels through the marsh. Monitoring should be implemented following efforts to control invasive species.

Mismer Bay Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of Mismer Bay Great Lakes marsh.

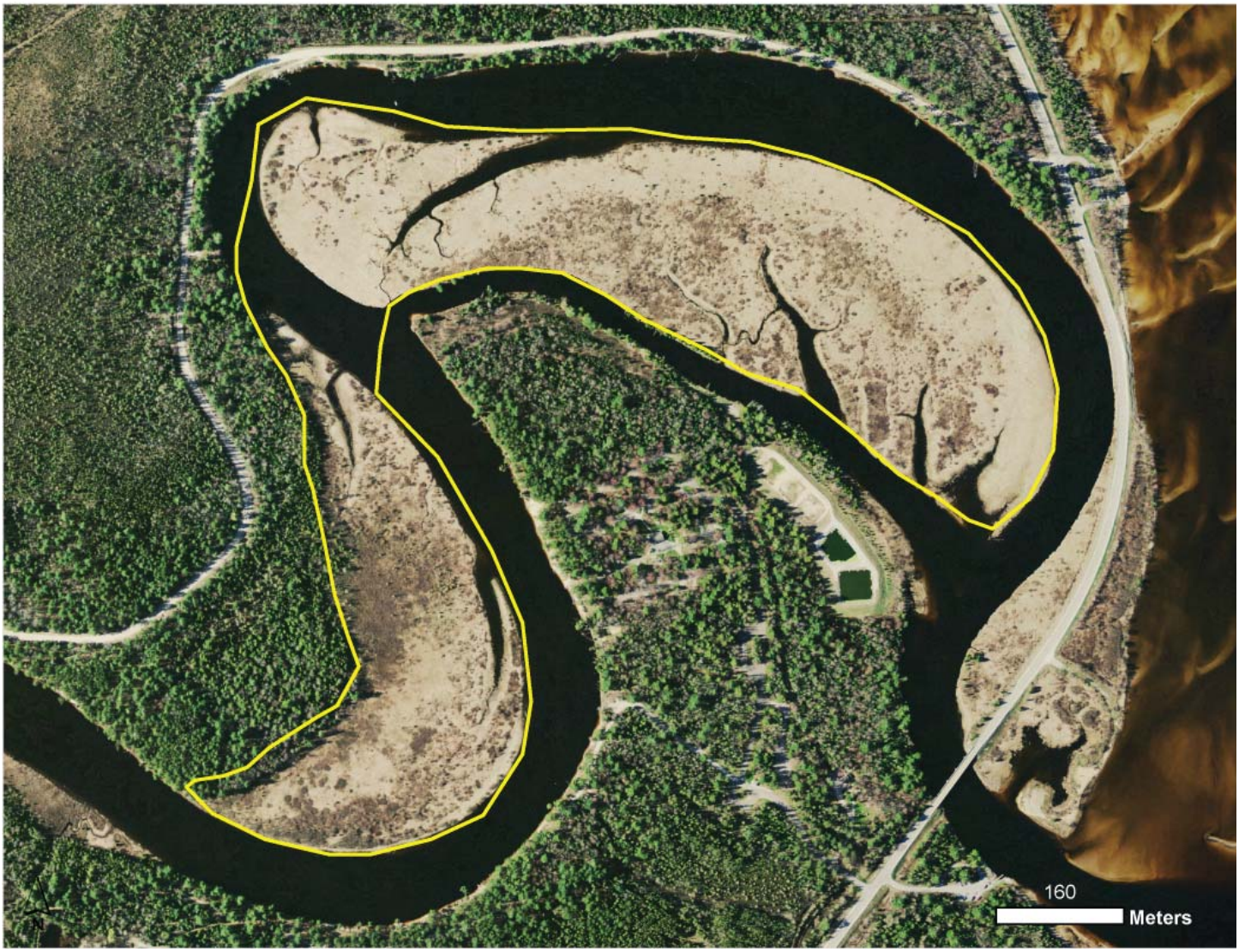
Narrow-leaved cat-tail (*Typha angustifolia*) is locally dominant in Mismer Bay. Photo by Joshua G. Cohen.

27. Mouth of the Tahquamenon
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: B
Size: 100 acres
Location: Tahquamenon Falls State Park, Chippewa County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20476 (New EO)

Threats: Species composition and zonation are patterned primarily by natural processes. M-123 occurs to the east of the marsh and may partially interrupt the connectivity of the marsh to Whitefish Bay. Localized areas of emergent marsh are dominated by narrow-leaved cat-tail (*Typha angustifolia*). A fair amount of boat traffic passes by this marsh.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, control invasive plants, and maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source. Monitoring should be implemented following efforts to control invasive species.

Mouth of the Tahquamenon Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of Mouth of the Tahquamenon Great Lakes marsh.

Mouth of the Tahquamenon Great Lakes marsh. Photo by Joshua G. Cohen.

28. Pointe Mouillee State Game Area -- North
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: D
Size: 149 acres
Location: Pointe Mouillee State Game Area, Wayne County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 823 (EO update)

Threats: This marsh has been severely degraded by altered hydrology and invasive species infestations. Dredged channels occur throughout the marsh. Invasive species are pervasive throughout the marsh and include narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and flowering rush (*Butomus umbellatus*) in emergent marsh and European frog's-bit (*Hydrocharis morsus-ranae*) in areas of submergent marsh.

Management Recommendations: This marsh is in dire need of continued intensive invasive species management. Four pernicious invasive species (reed, narrow-leaved cat-tail, flowering-rush, and European frog's-bit) are locally dominant throughout the marsh. Efforts to control these invasive species should be monitored.

Invasive species dominate throughout the Pointe Mouillee State Game Area -- North and include narrow-leaved cat-tail, flowering rush, and reed (pictured from left to right). Photo by Joshua G. Cohen.

Aerial photograph of Pointe Mouillee State Game Area -- North Great Lakes marsh.

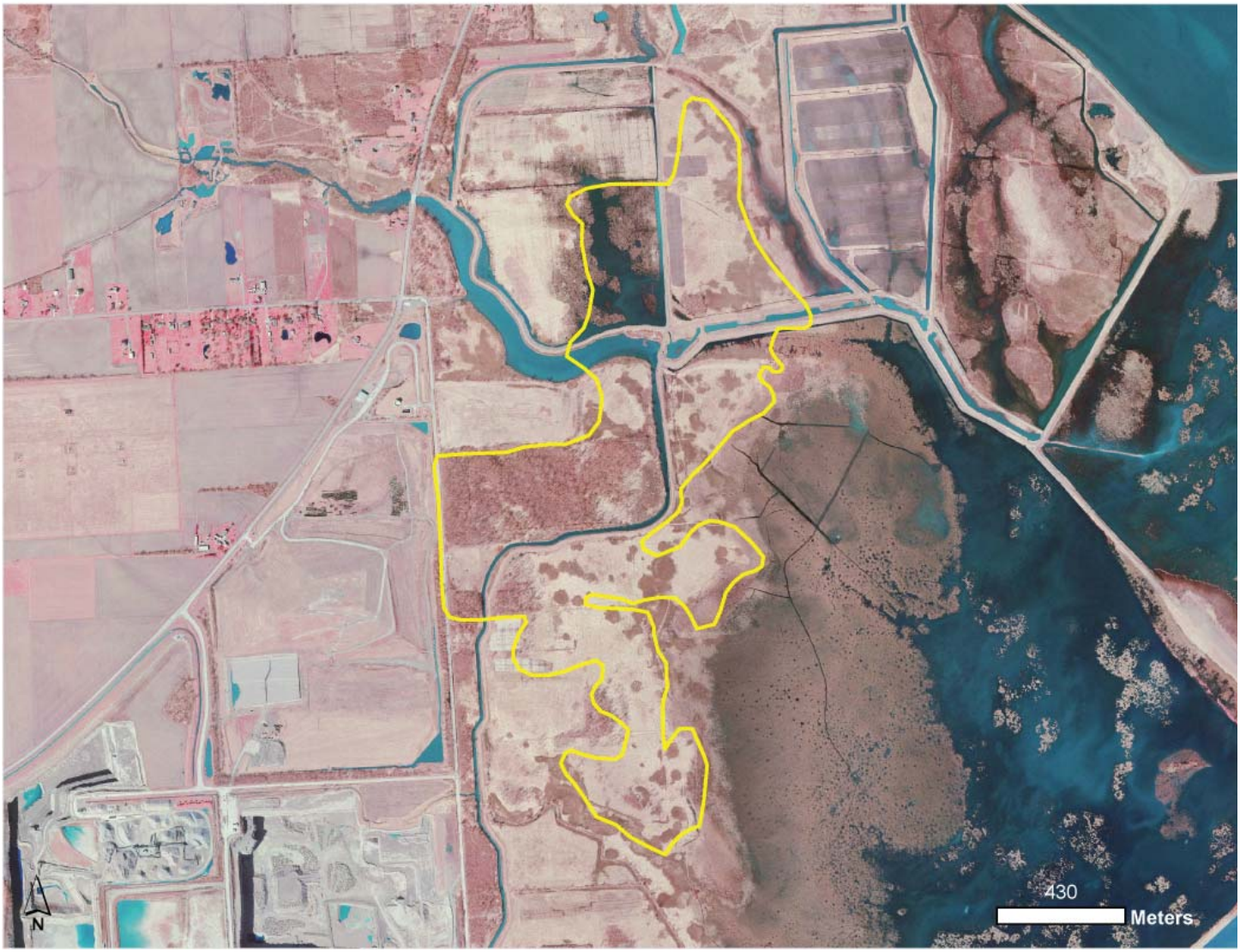
Narrow-leaved cat-tail (*Typha angustifolia*) dominates much of the Pointe Mouillee State Game Area -- North. Photo by Joshua G. Cohen.

29. Pointe Mouillee State Game Area -- South
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: D
Size: 331 acres
Location: Pointe Mouillee State Game Area, Wayne County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 12549 (EO update)

Threats: This marsh has been severely degraded by altered hydrology and invasive species infestations. Dredged channels or dikes occur throughout the marsh and the marsh has been separated from the direct influence of the Great Lakes by an extensive causeway. Invasive species are pervasive throughout the marsh and include narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and flowering rush (*Butomus umbellatus*) in emergent marsh and European frog's-bit (*Hydrocharis morsus-ranae*) in areas of submergent marsh.

Management Recommendations: This marsh is in dire need of continued intensive invasive species management. Four pernicious invasive species (reed, narrow-leaved cat-tail, flowering-rush, and European frog's-bit) are locally dominant throughout the marsh. Efforts to control these invasive species should be monitored.

Reed (*Phragmites australis* subsp. *australis*) dominates much of the Pointe Mouillee State Game Area -- South. Photo by Joshua G. Cohen.



Aerial photograph of Pointe Mouillee State Game Area -- South Great Lakes marsh.

30. Sandy Hook Marsh
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: C
Size: 15 acres
Location: Tawas Point State Park, Iosco County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20469 (New EO)

Threats: Species composition and zonation are patterned primarily by natural processes but influenced by invasive species. The invasives narrow-leaved cat-tail (*Typha angustifolia*) and reed (*Phragmites australis* subsp. *australis*) are locally dominant, especially in areas of deeper water. In addition, purple loosestrife (*Lythrum salicaria*) occurs locally.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, control invasive plants, and maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source. Monitoring should be implemented following efforts to control invasive species.

Sandy Hook Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

Aerial photograph of Sandy Hook Marsh Great Lakes marsh.

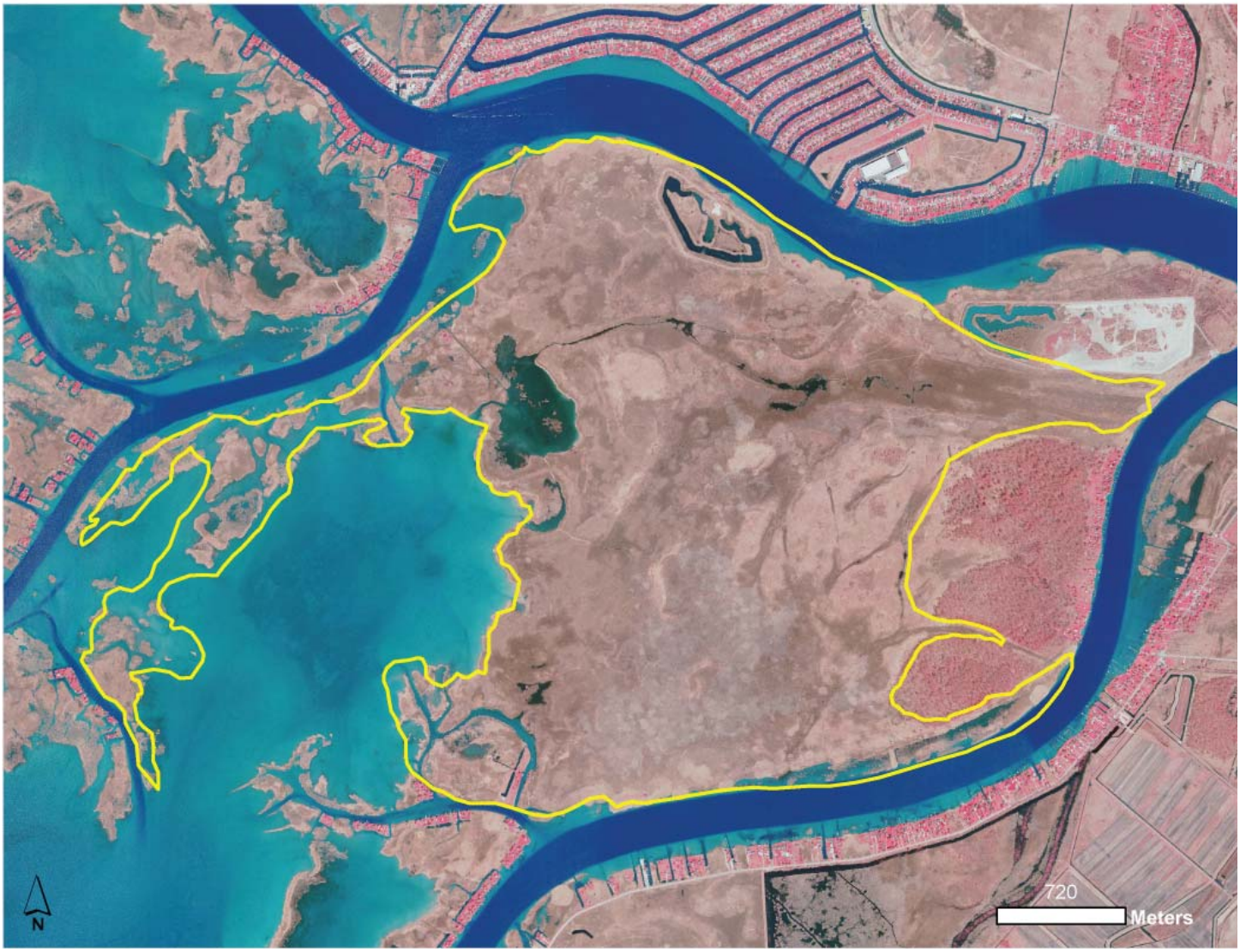
Reed (*Phragmites australis* subsp. *australis*) is locally dominant in the Sandy Hook Marsh. Photo by Joshua G. Cohen.

31. St. Clair River Delta
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: C
Size: 2590 acres
Location: St. Clair Flats State Wildlife Area, St. Clair County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 4018 (EO update)

Threats: This marsh has been degraded by invasive species infestations. Invasive species are locally dominant throughout the marsh and include narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and hybrid cat-tail (*Typha* x*glauca*).

Management Recommendations: This marsh is in dire need of continued intensive invasive species management. Three invasive species (reed, narrow-leaved cat-tail, and hybrid cat-tail) are locally dominant throughout the marsh. Efforts to control these invasive species should be monitored.

St. Clair River Delta Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of St. Clair River Delta Great Lakes marsh.

Reed (*Phragmites australis* subsp. *australis*) dominates throughout the St. Clair River Delta Great Lakes marsh. Photo by Joshua G. Cohen.

32. Taganing Marsh
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: A
Size: 225 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20450 (New EO)

Threats: Species composition and zonation are patterned by natural processes. No threats were observed during the survey.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, maintain a natural community buffer surrounding the shoreline, and monitor for invasive species.

Taganing Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

Aerial photograph of Taganing Marsh Great Lakes marsh.

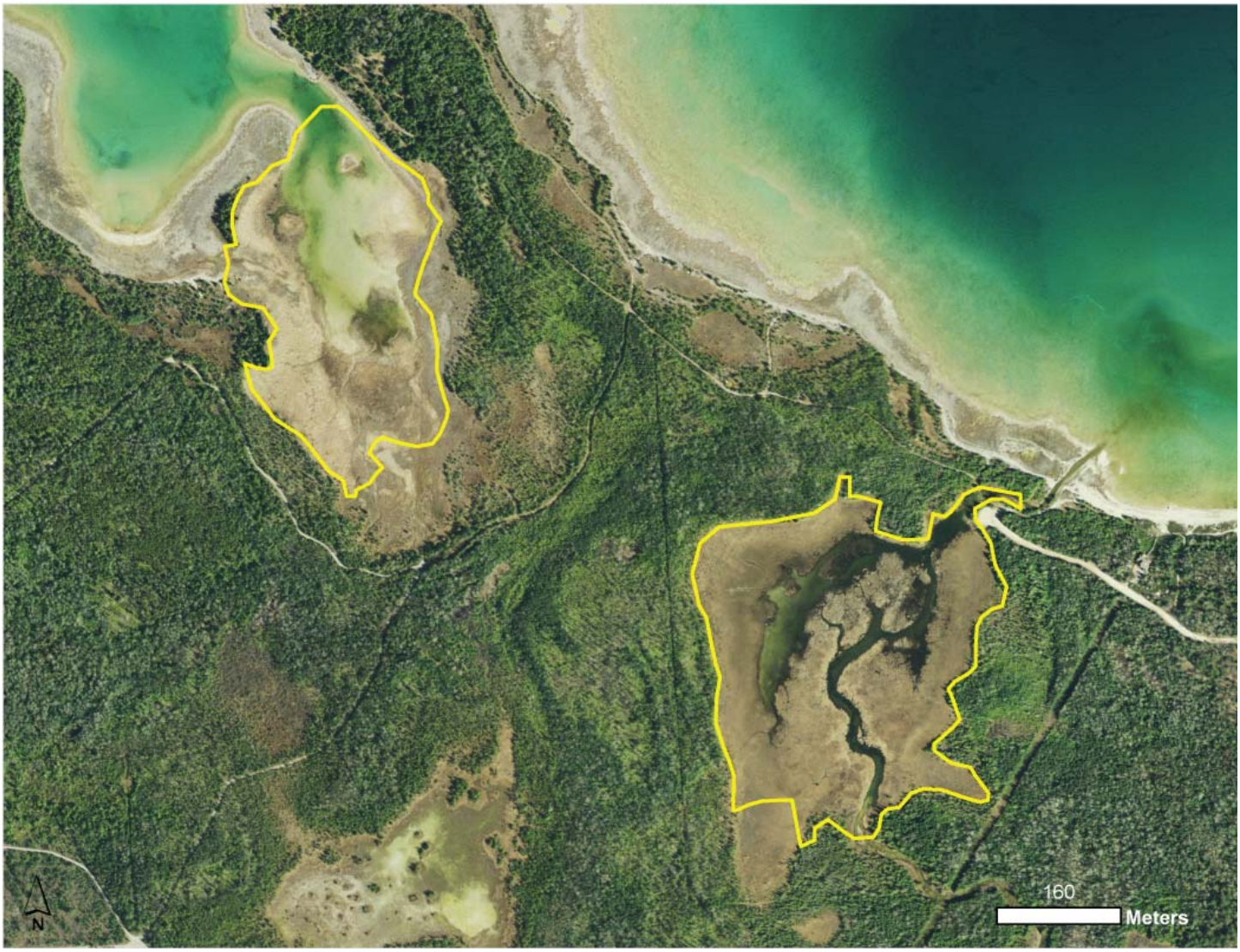
Taganing Marsh Great Lakes marsh. Photo by Joshua G. Cohen.

33. Thompson's Harbor
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: B
Size: 55 acres
Location: Thompson's Harbor State Park, Presque Isle County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 17340 (EO update)

Threats: No threats were noted during the course of the survey.

Management Recommendations: The main management recommendations are to maintain a natural community buffer adjacent to the marsh to help preserve the wetland's hydrology and monitor for invasive species.

Thompson's Harbor Great Lakes marsh. Photo by Joshua G. Cohen.



Aerial photograph of Thompson's Harbor Great Lakes marsh.

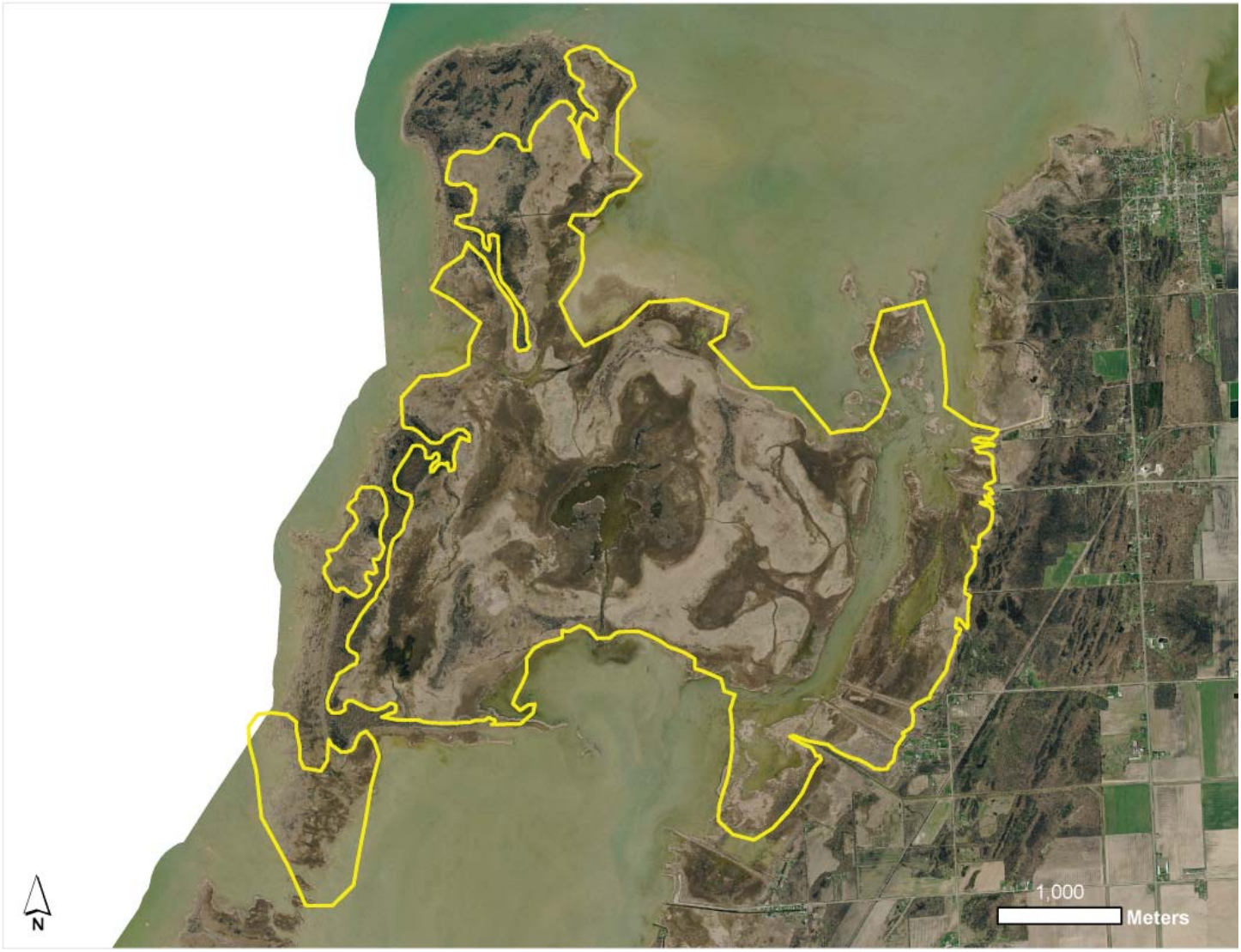
Thompson's Harbor Great Lakes marsh. Photo by Joshua G. Cohen.

34. Wildfowl Bay Islands
Natural Community Type: Great Lakes Marsh
Rank: G2 S3, globally imperiled and vulnerable within the state
Element Occurrence Rank: B
Size: 4155 acres
Location: Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 11695 (EO update)

Threats: This marsh has been impacted by invasive species infestations. Invasive species are locally dominant throughout the marsh and include narrow-leaved cat-tail (*Typha angustifolia*) and reed (*Phragmites australis* subsp. *australis*).

Management Recommendations: This marsh is in dire need of intensive invasive species management. Two pernicious invasive species, reed and narrow-leaved cat-tail, are locally dominant throughout the marsh. Efforts to control these invasive species should be monitored.

Wildfowl Bay Islands Great Lakes marsh. Photo by Joshua G. Cohen.

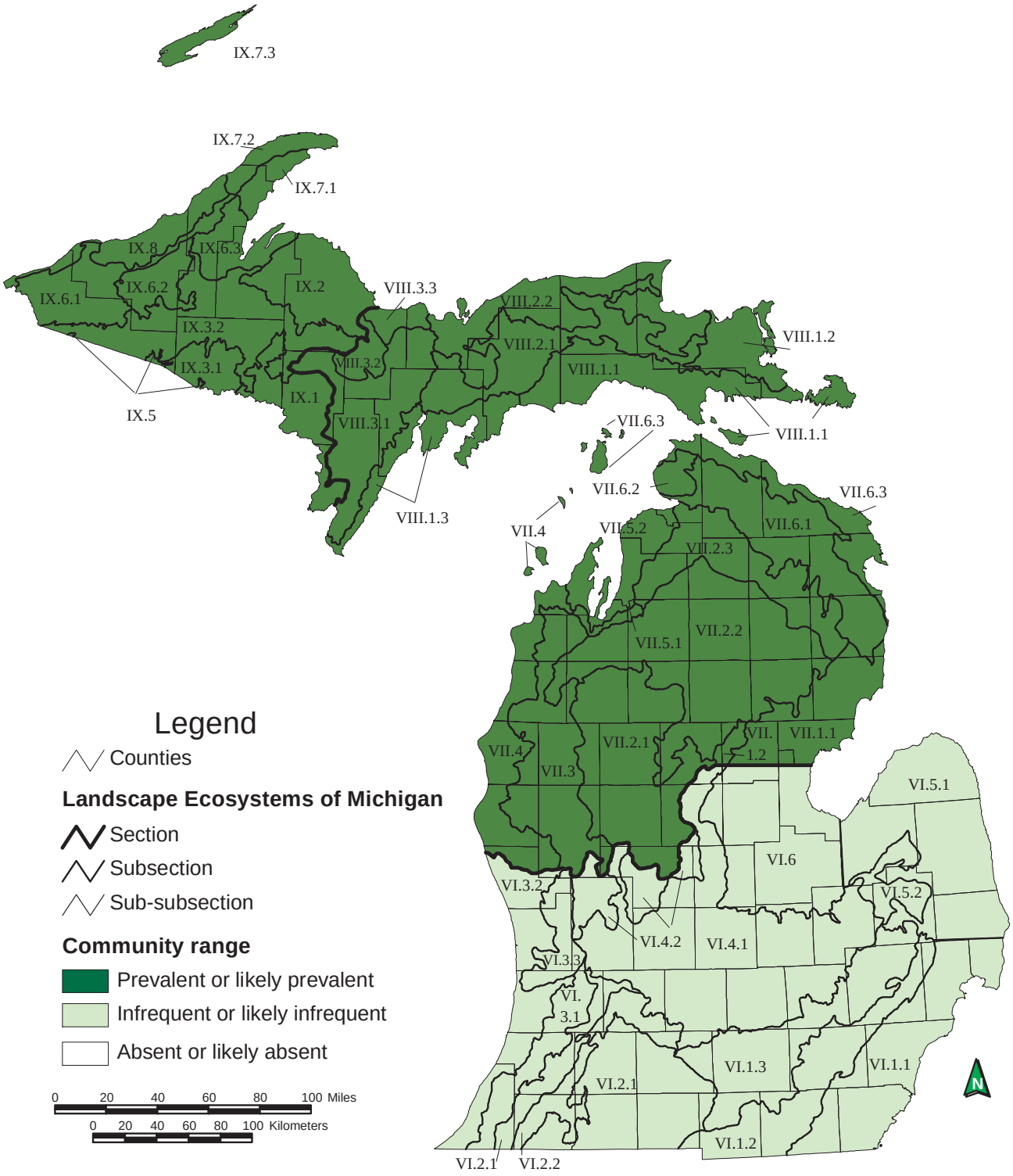


Aerial photograph of Wildfowl Bay Islands Great Lakes marsh.

Reed (*Phragmites australis* subsp. *australis*) dominates throughout the Wildfowl Bay Islands Great Lakes marsh. Photo by Joshua G. Cohen.

HARDWOOD-CONIFER SWAMP

Overview: Hardwood-conifer swamp is a minerotrophic forested wetland dominated by a mixture of lowland hardwoods and conifers, occurring on organic (i.e., peat) and poorly drained mineral soils throughout Michigan. The community occurs on a variety of landforms, often associated with headwater streams and areas of groundwater discharge. Species composition and dominance patterns can vary regionally. Windthrow and fluctuating water levels are the primary natural disturbances that structure hardwood-conifer swamp (Kost et al. 2007, Cohen et al. 2014).



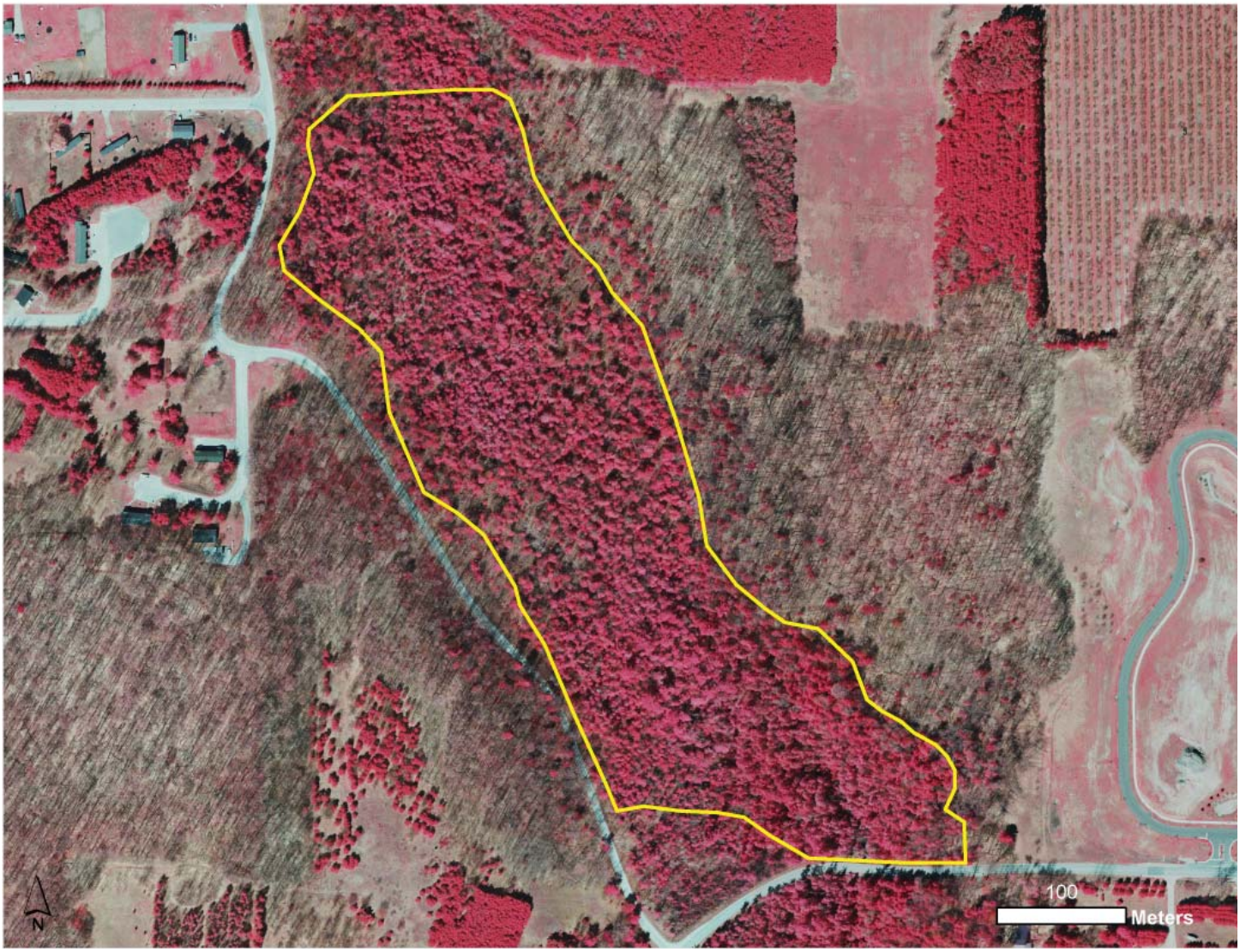
Map 11. Distribution of hardwood-conifer swamp in Michigan (Albert et al. 2008).

35. Belanger Creek Swamp
Natural Community Type: Hardwood-Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 30 acres
Location: Belanger Creek Preserve, Leelanau County
Land Manager: Leelanau Conservancy
Element Occurrence Identification Number: 20466 (New EO)

Threats: Portions of the hardwood-conifer swamp were historically cut and scattered deer trails occur throughout the swamp. Deer browse is likely impacting floristic composition and vegetative structure. Emerald ash borer has impacted the black ash (*Fraxinus nigra*) with much of the canopy ash dying from this invasive pest.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the wetland, and reduce deer densities within the larger landscape.

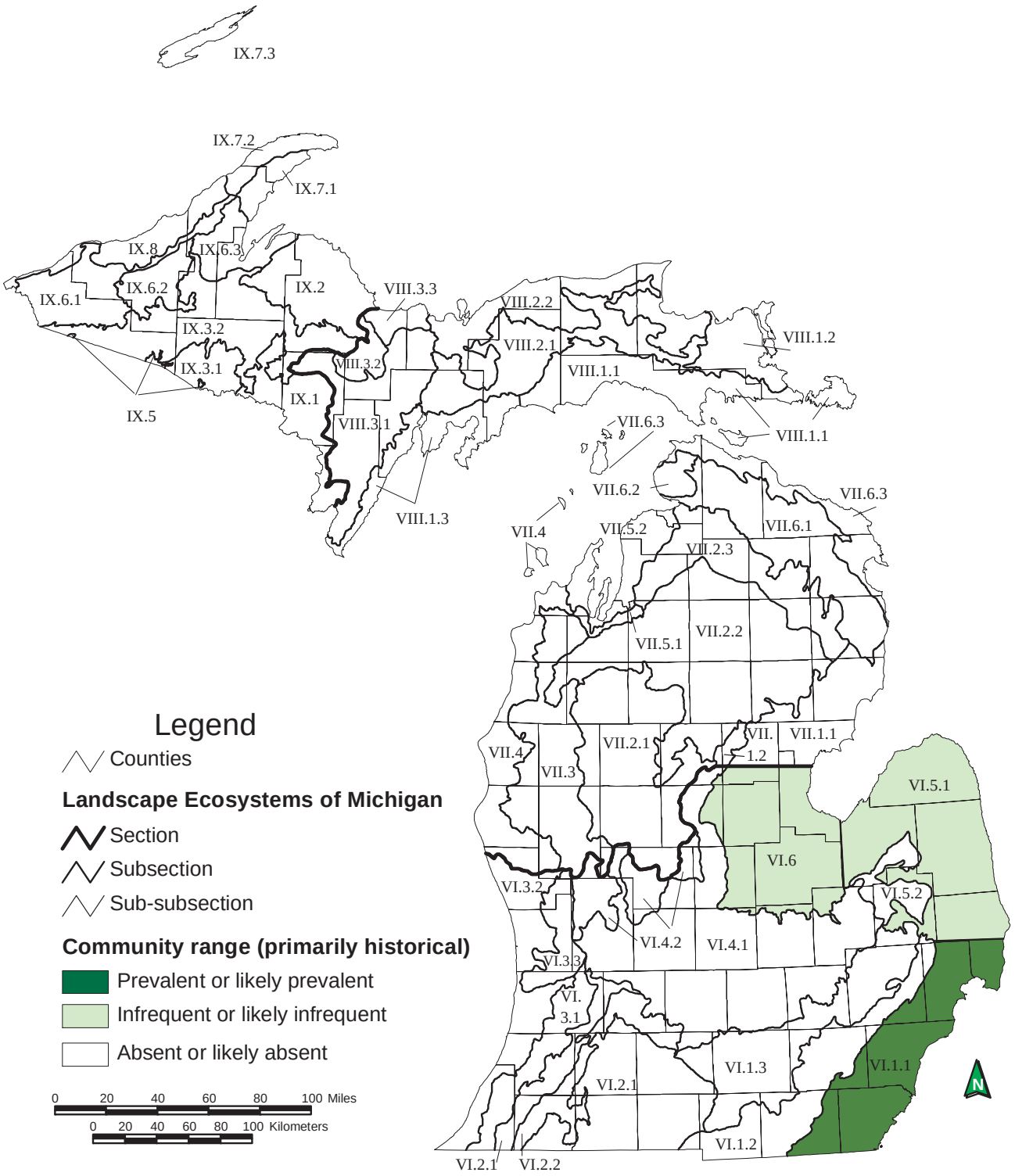
Belanger Creek Swamp hardwood-conifer swamp. Photo by Joshua G. Cohen.



Aerial photograph of Belanger Creek Swamp hardwood-conifer swamp

LAKEPLAIN OAK OPENINGS

Overview: Lakeplain oak openings are a fire-dependent savanna community, dominated by oaks and characterized by a graminoid-dominated ground layer of species associated with both lakeplain prairie and forest communities. Lakeplain oak openings occur within the southern Lower Peninsula on glacial lakeplains on sand ridges, level sandplains, or adjacent depressions. Soils are typically mildly alkaline, very fine sandy loams, loamy sands, or sands with moderate water-retaining capacity. Open conditions were historically maintained by frequent fire, and in depressions, by seasonal flooding (Kost et al. 2007, Cohen et al. 2014).



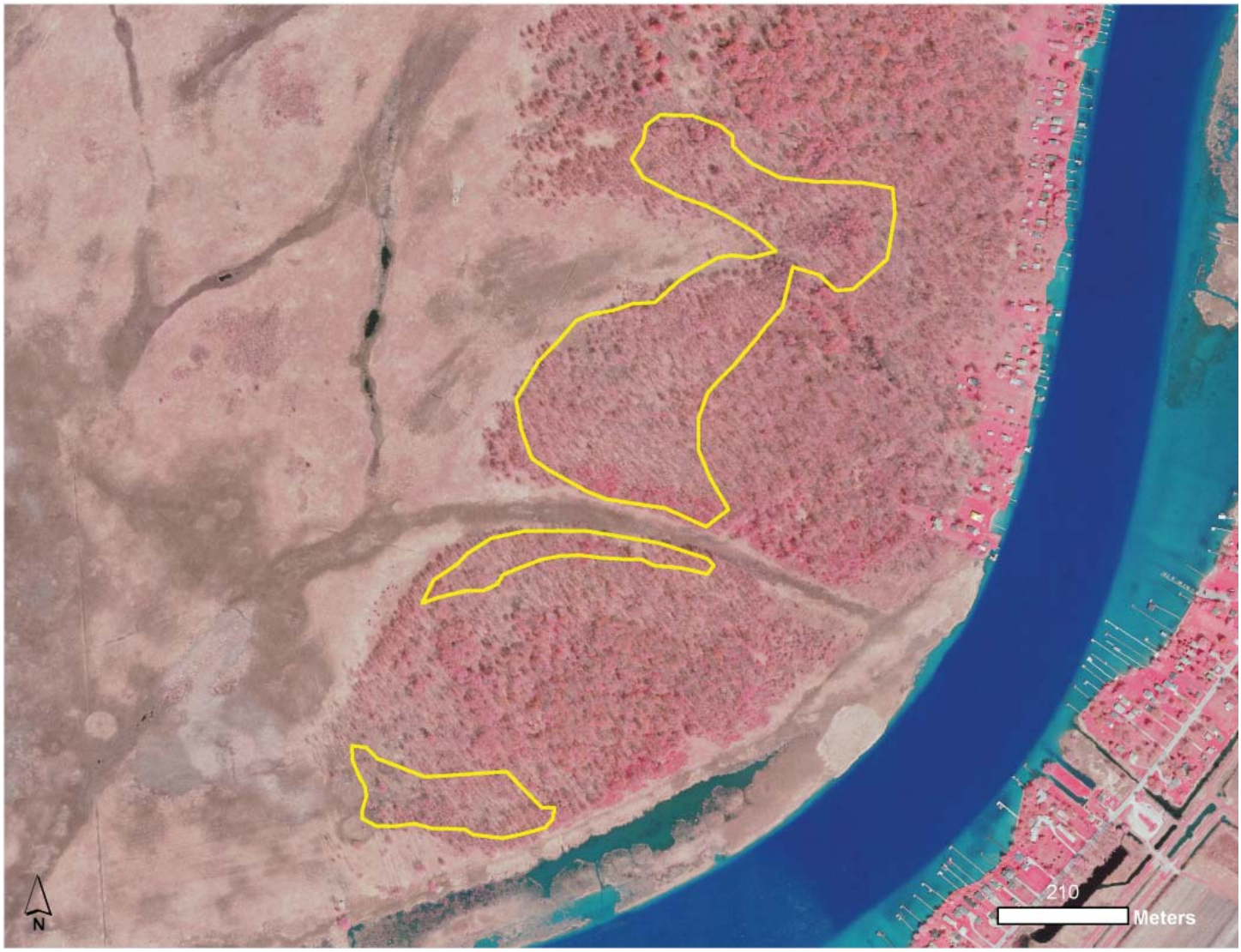
Map 12. Distribution of lakeplain oak openings in Michigan (Albert et al. 2008).

36. Dickinson Island
Natural Community Type: Lakeplain Oak Openings
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: CD
Size: 51 acres
Location: St. Clair Flats State Wildlife Area, St. Clair County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 5006 (EO Update)

Threats: Threats to the lakeplain oak opening include fire suppression and invasive species encroachment. The canopy of the lakeplain oak opening has closed for the most part. Invasive shrubs are locally dominant and include Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*). Where these invasives are dominant, there is little floristic diversity in the ground cover. Glossy buckthorn (*Frangula alnus*) also occurs locally. Reed (*Phragmites australis* subsp. *australis*) is locally prevalent in open wet areas within the lakeplain oak openings and wet-mesic flatwoods. Deer browse and trails were noted throughout the island.

Management Recommendations: The main management recommendations are to reintroduce fire as a prevalent disturbance factor within the lakeplain oak opening to open up the canopy and understory and control invasive species. In addition, control of invasive species through cutting and herbiciding is recommended. Monitoring should be implemented following management to gauge success. The management of the oak opening should be coordinated with efforts to control reed in the surrounding marsh so that the reed does not encroach into the lakeplain oak opening when the canopy is opened up.

Dickinson Island lakeplain oak openings. Photo by Joshua G. Cohen.



Aerial photograph of Dickinson Island lakeplain oak openings.

37. Wildfowl Bay Islands
Natural Community Type: Lakeplain Oak Openings
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: C
Size: 348 acres
Location: Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 1705 (EO update)

Threats: Threats to the lakeplain oak opening include fire suppression, invasive species encroachment, and high levels of deer herbivory. Deer browse was noted as prevalent within the understory. Invasive shrubs are locally common and include autumn-olive (*Elaeagnus umbellata*), Tartatian honeysuckle (*Lonicera tatarica*), and Japanese barberry (*Berberis thunbergii*). Invasives that are common in the ground cover include Canada bluegrass (*Poa compressa*), Garlic mustard (*Alliaria petiolata*), timothy (*Phleum pratense*), and common burdock (*Arctium minus*). Some of the oaks within the oak opening are stump sprouts suggesting that they were cut or burnt historically.

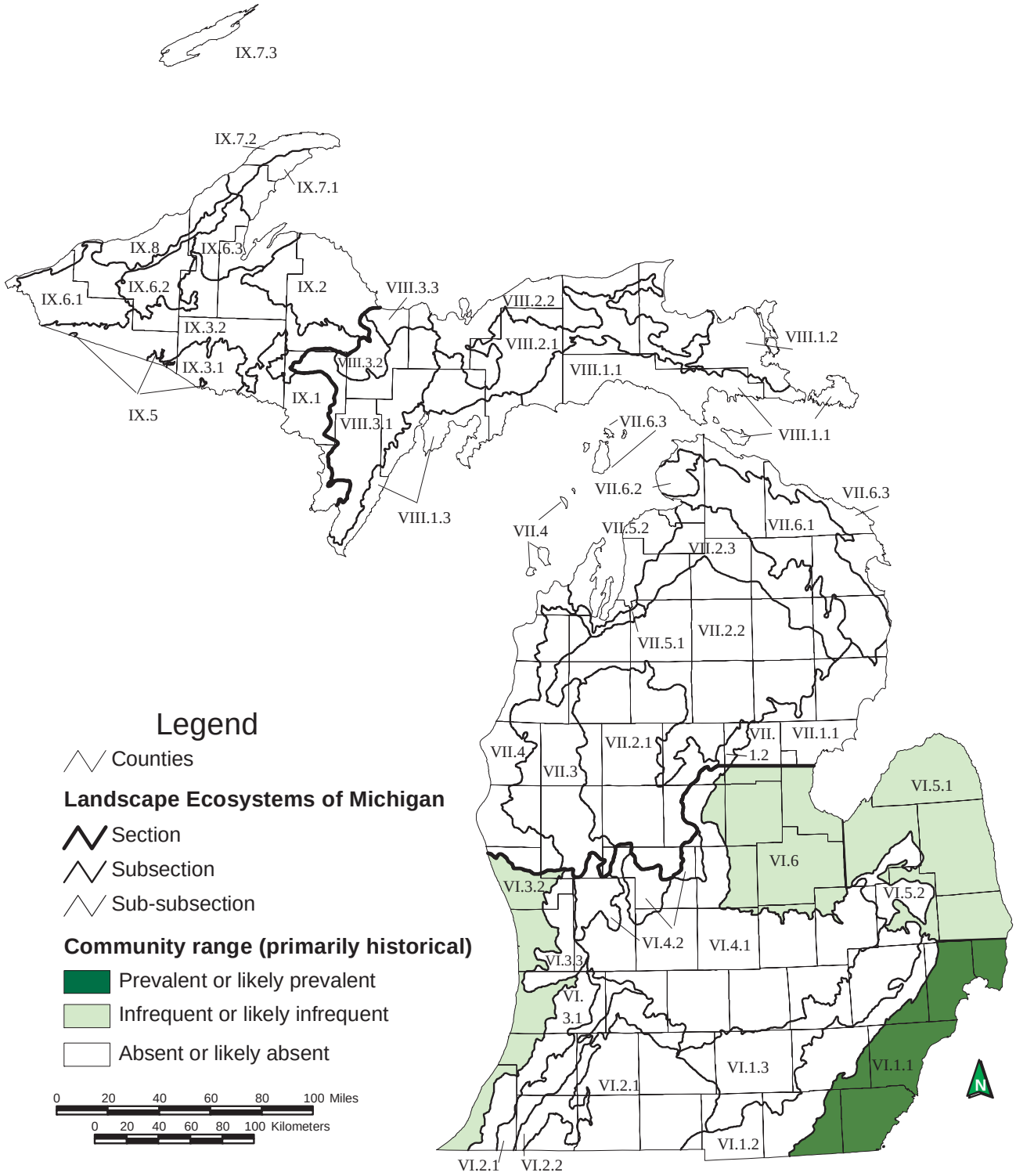
Management Recommendations: The main management recommendations are to reintroduce fire as a prevalent disturbance factor within the lakeplain oak opening to open up the canopy and understory and control invasive species. In addition, control of invasive species through cutting and herbiciding is recommended and deer levels on the island should be reduced to limit the impacts of deer browse. Monitoring should be implemented following management to gauge success. The management of the oak opening should be coordinated with effort to control the reed (*Phragmites australis* subsp. *australis*) in the surrounding marsh so that the reed does not encroach into the lakeplain oak opening when the canopy is opened up.

Wildfowl Bay Islands lakeplain oak openings. Photo by Joshua G. Cohen.

Aerial photograph of Wildfowl Bay Islands lakeplain oak openings.

LAKEPLAIN WET PRAIRIE

Overview: Lakeplain wet prairie is a species-rich prairie community that occurs on the seasonally wet ground of glacial lakeplains in the southern Great Lakes region. The community occurs along the shoreline of Lake Huron in Saginaw Bay, within the St. Clair River Delta, and near Lake Erie. Soils are medium- to fine-textured, slightly acid to moderately alkaline sands, sandy loams, or silty clays with poor to moderate water-retaining capacity. Seasonal flooding, cyclic changes in Great Lakes water levels, beaver flooding, and fire historically maintained the species composition and community structure of lakeplain wet prairies (Kost et al. 2007, Cohen et al. 2014).

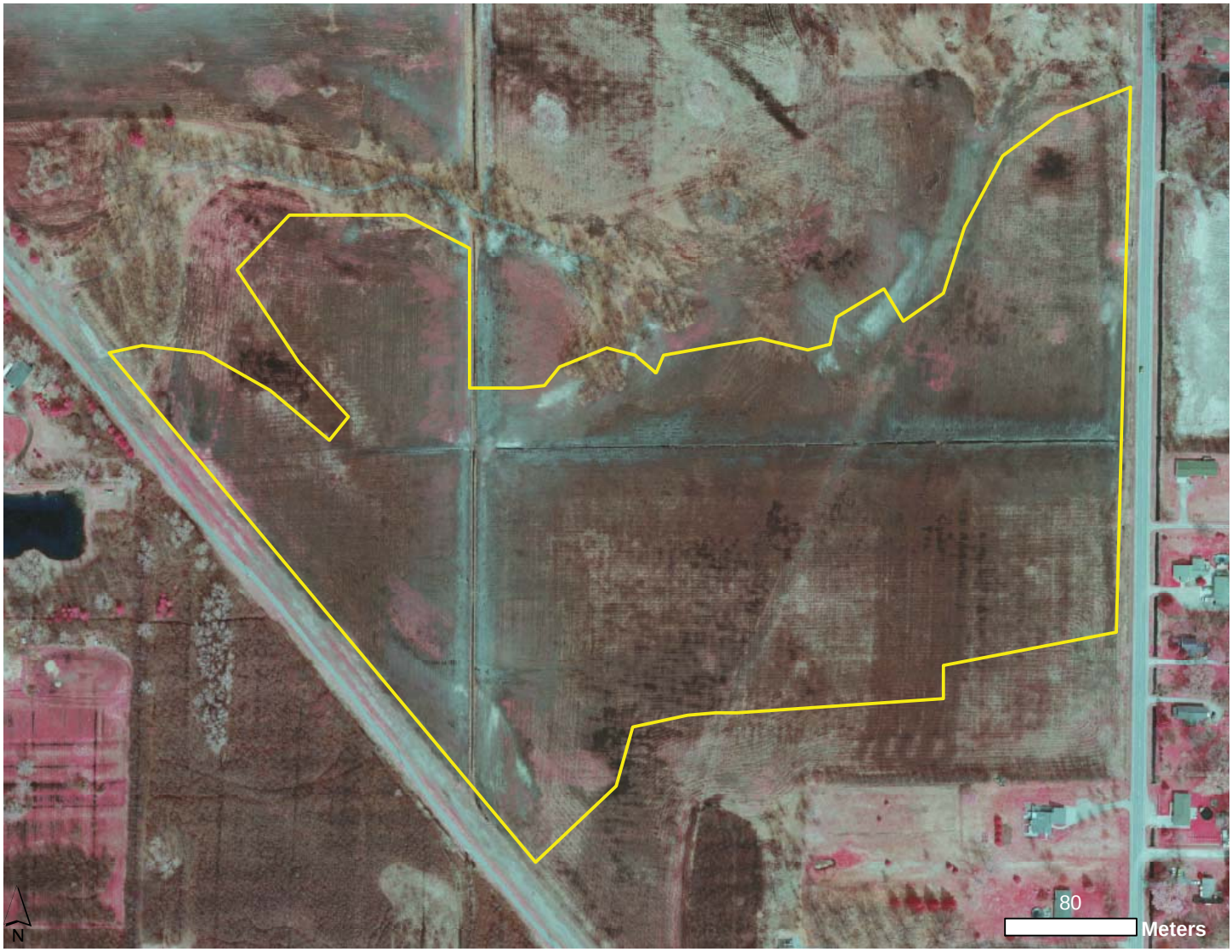


Map 13. Distribution of lakeplain wet prairie in Michigan (Albert et al. 2008).

38. Bangor Prairie
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: X (extirpated)
Size: 35 acres
Location: Bay County
Land Manager: Private
Element Occurrence Identification Number: 355 (EO update)

Following surveys in 2015, this former lakeplain wet prairie was determined to be extirpated since the site was tilled and converted to row crops some time after 1998.

The Bangor Prairie was converted to row crops and is now extirpated. Photo by Bradford. S. Slaughter.



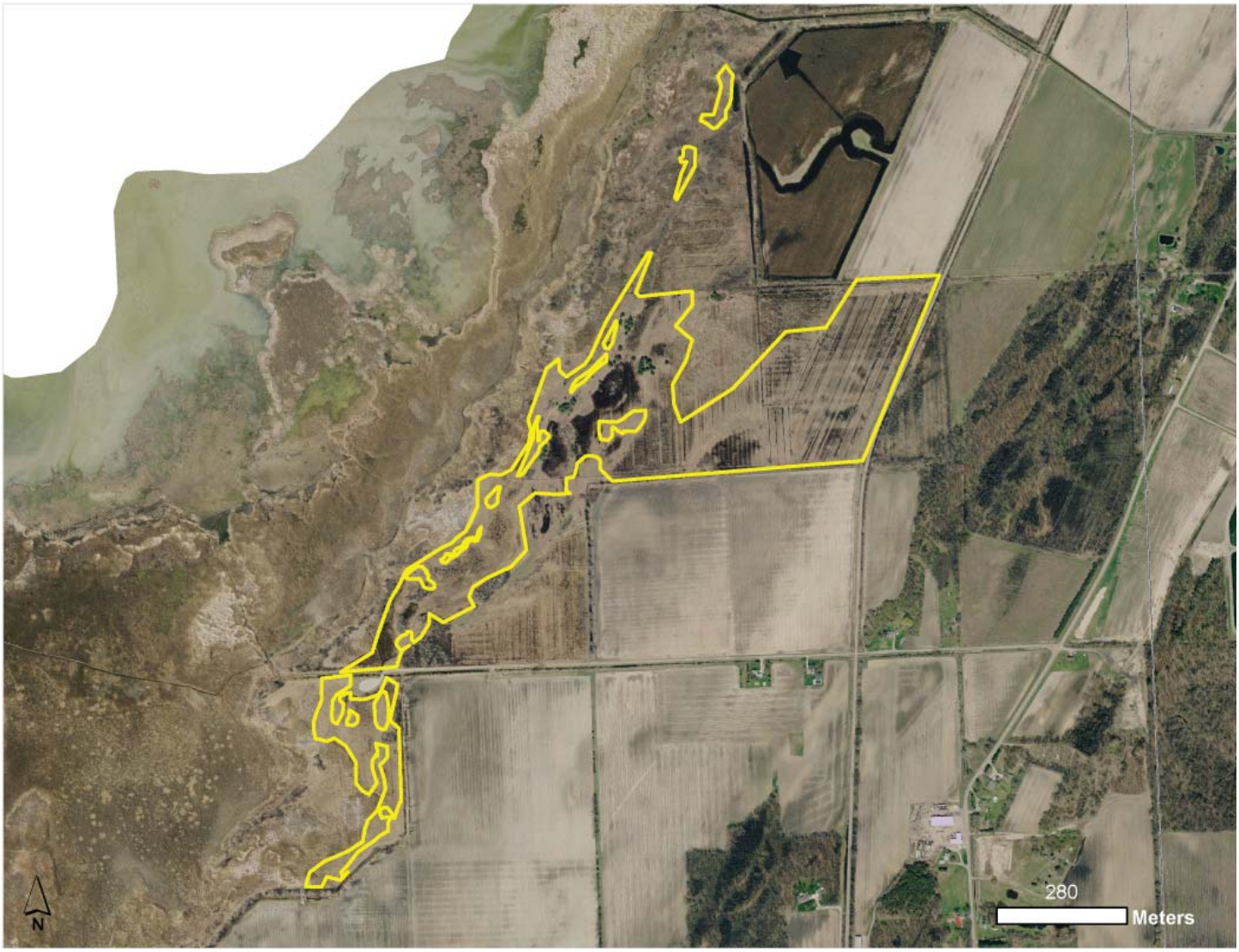
Aerial photograph of the extirpated Bangor Prairie lakeplain wet prairie.

39. Berger Rd.
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: C
Size: 78 acres
Location: Fish Point Wildlife Area, Tuscola County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 260 (EO update)

Threats: The primary threats to the prairie include fire suppression, woody species encroachment, the spread of invasive species, and off-road vehicle activity. Reed (*Phragmites australis* subsp. *australis*) is prevalent in wetter areas of the prairie and in the adjacent Great Lakes marsh.

Management Recommendations: The primary management recommendations are to continue mechanical removal of woody plants and prescribed fire to control woody encroachment, control invasive species, and prevent off-road vehicle activity. Patches of reed within the prairie and in the adjacent Great Lakes marsh should be treated. Monitoring should be implemented to assess efforts to control woody encroachment and non-native plant populations and evaluate the success of fire management. Water table fluctuations should be monitored to help determine the frequency and intensity of prescribed fire and mechanical thinning.

Berger Rd. lakeplain wet prairie. Photo by Bradford S. Slaughter.



Aerial photograph of Berger Rd. lakeplain wet prairie.

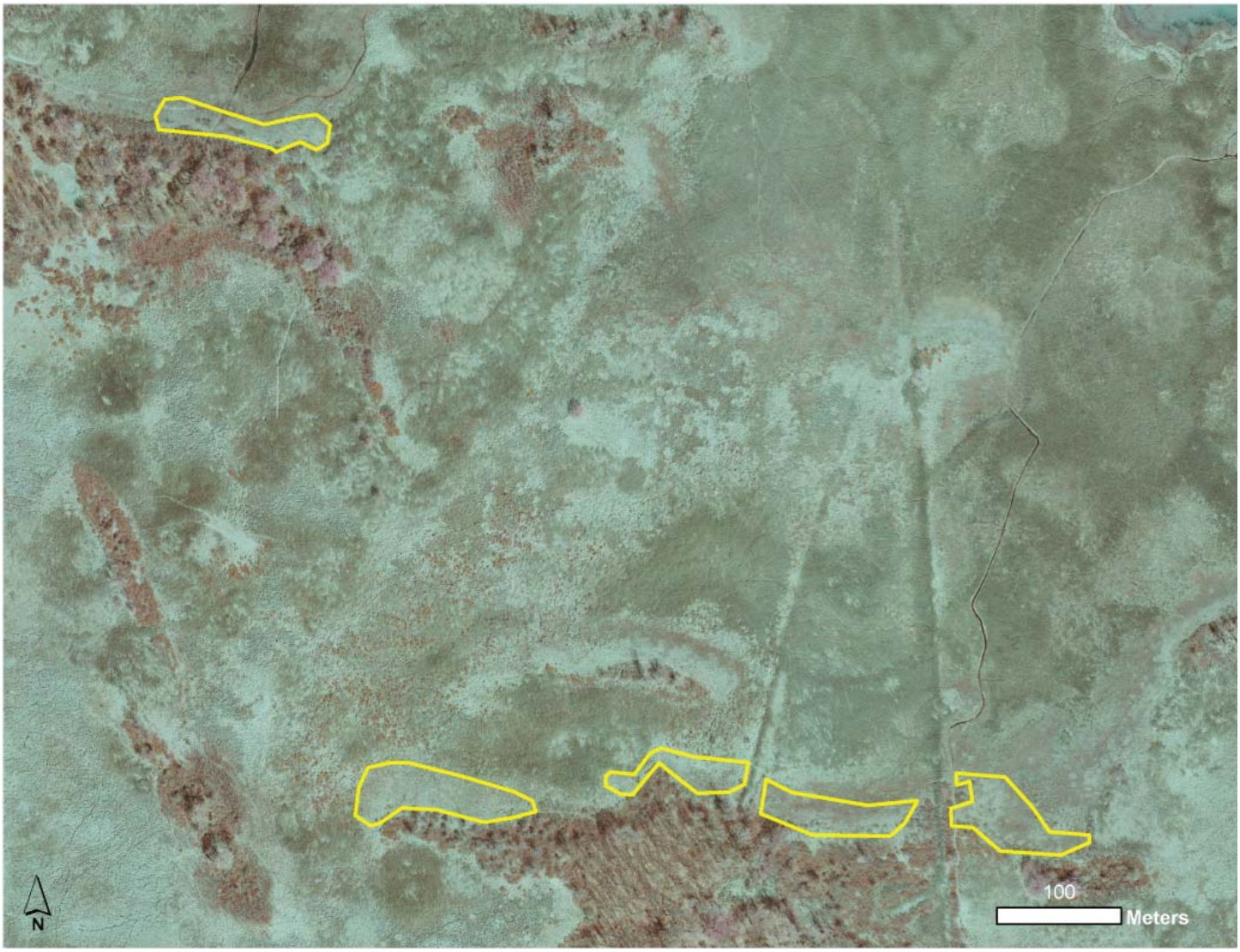
Berger Rd. lakeplain wet prairie. Photo by Bradford S. Slaughter.

40. Coryeon Point
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: D
Size: 4.1 acres
Location: Quanicassee State Wildlife Area, Bay County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 358 (EO update)

Threats: This degraded lakeplain wet prairie is negatively impacted by fire suppression and invasive species. Reed (*Phragmites australis* subsp. *australis*) is locally common in wetter areas of the prairie along with purple loosestrife (*Lythrum salicaria*), and autumn-olive (*Elaeagnus umbellata*) is locally prevalent on low rises.

Management Recommendations: The primary management recommendations are to implement prescribed fire, control invasive species, and reduce deer densities. Monitoring should be implemented to assess efforts to control non-native plant populations and evaluate the success of fire management.

Coryeon Point lakeplain wet prairie. Photo by Bradford S. Slaughter.



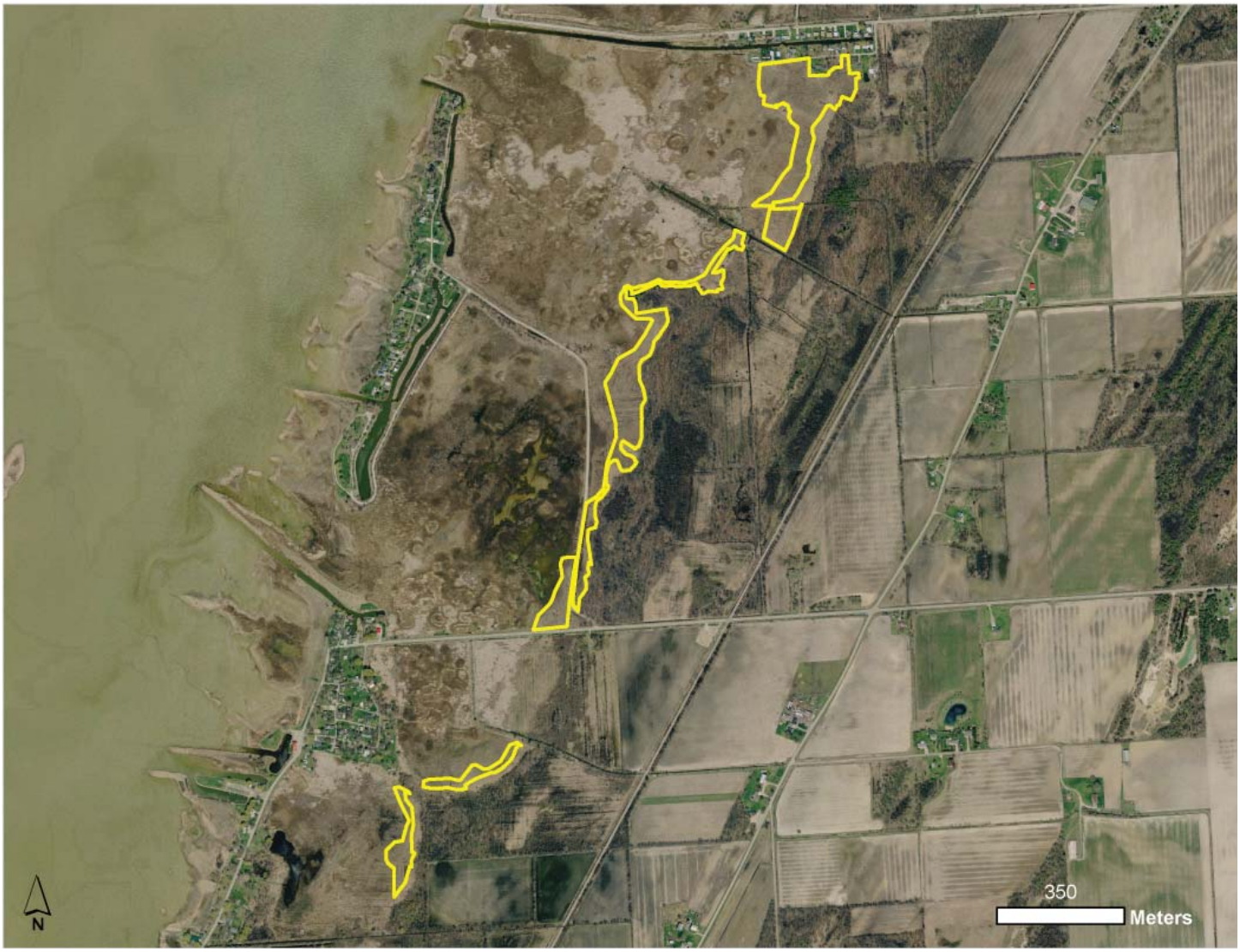
Aerial photograph of Coryeon Point lakeplain wet prairie.

41. Geiger to Haist Rds.
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: C
Size: 31 acres
Location: Saginaw Bay Wetlands Nature Sanctuary and Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Michigan Nature Association and Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 11699 (EO update)

Threats: The primary threats to the prairie include hydrologic alteration from ditching, fire suppression, woody species encroachment, the spread of invasive species, and off-road vehicle activity. Reed (*Phragmites australis* subsp. *australis*) is prevalent in wetter areas of the prairie and in the adjacent Great Lakes marsh.

Management Recommendations: The primary management recommendations are to continue mechanical removal of woody plants and prescribed fire to control woody encroachment and control invasive species. Patches of reed within the prairie and adjacent Great Lakes marsh should be treated. Monitoring should be implemented to assess efforts to control woody encroachment and non-native plant populations and evaluate the success of fire management. Water table fluctuations should be monitored to help determine the frequency and intensity of prescribed fire and mechanical thinning.

Geiger to Haist Rds. lakeplain wet prairie. Photo by Bradford S. Slaughter.



Aerial photograph of Geiger to Haist Rds. lakeplain wet prairie.

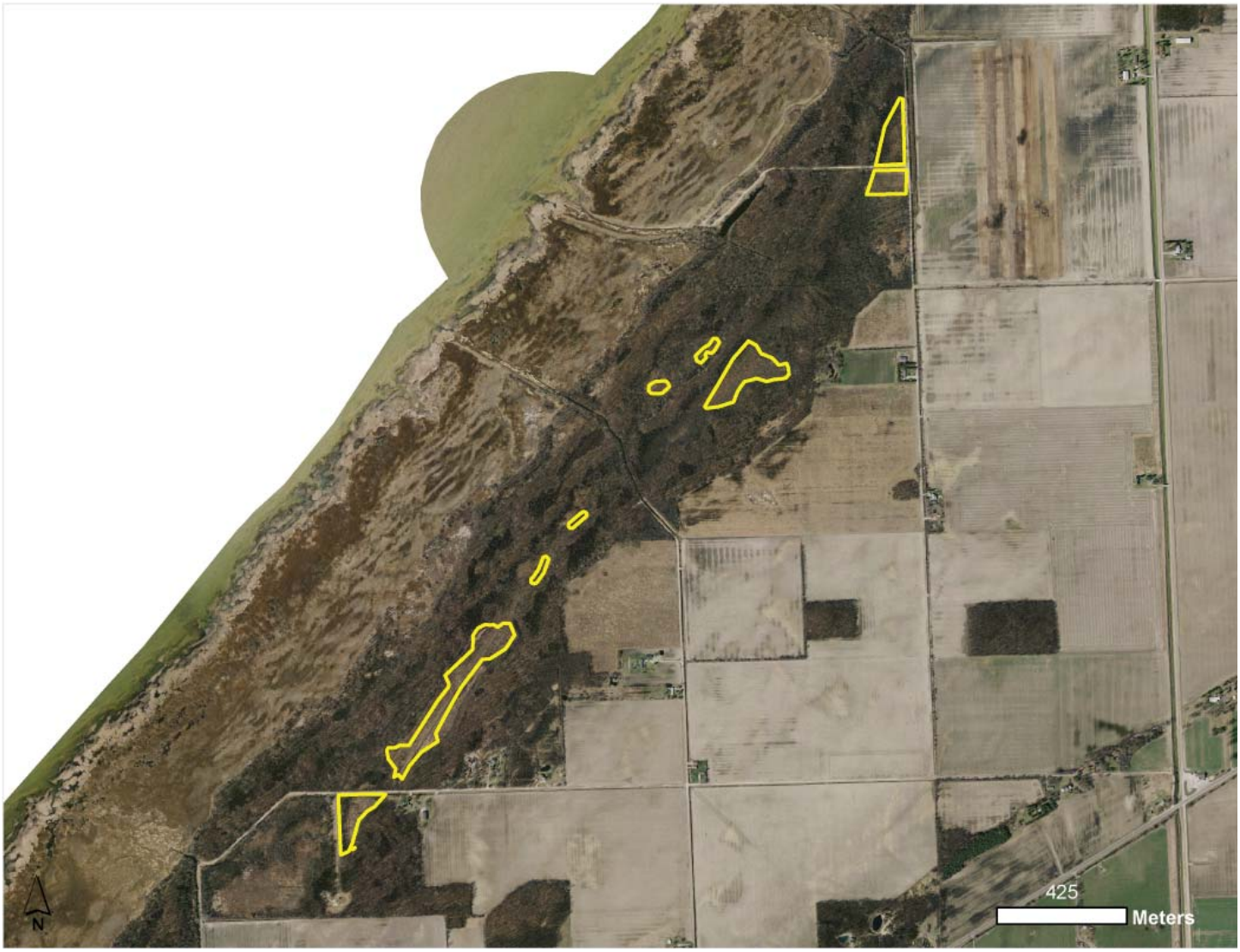
Geiger to Haist Rds. lakeplain wet prairie. Photo by Bradford S. Slaughter.

42. King to Dickerson Rds.
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: CD
Size: 26 acres
Location: Fish Point Wildlife Area, Tuscola County
Land Manager: Wildlife Division, Department of Natural Resources Element Occurrence Identification Number: 12438

Threats: This lakeplain wet prairie has been degraded by ditches, roads, historic tilling, fire suppression, and invasive plants. Prevalent invasives within this prairie include reed (*Phragmites australis* subsp. *australis*) and glossy buckthorn (*Frangula alnus*). Woody species encroachment due to fire suppression has reduced the area of open prairie.

Management Recommendations: The primary management recommendations are to implement prescribed fire and control invasive species. The entire site requires aggressive management, particularly invasive and woody species control, targeting glossy buckthorn and reed. In addition to prescribed fire, mechanical thinning and herbiciding are recommended to control woody species encroachment and expand prairie areas, which have apparently contracted since the last surveys. Monitoring should be implemented to assess efforts to control non-native plant populations and evaluate the success of fire management.

King to Dickerson Rds. lakeplain wet prairie. Photo by Bradford S. Slaughter.



Aerial photograph of King to Dickerson Rd. lakeplain wet prairie.

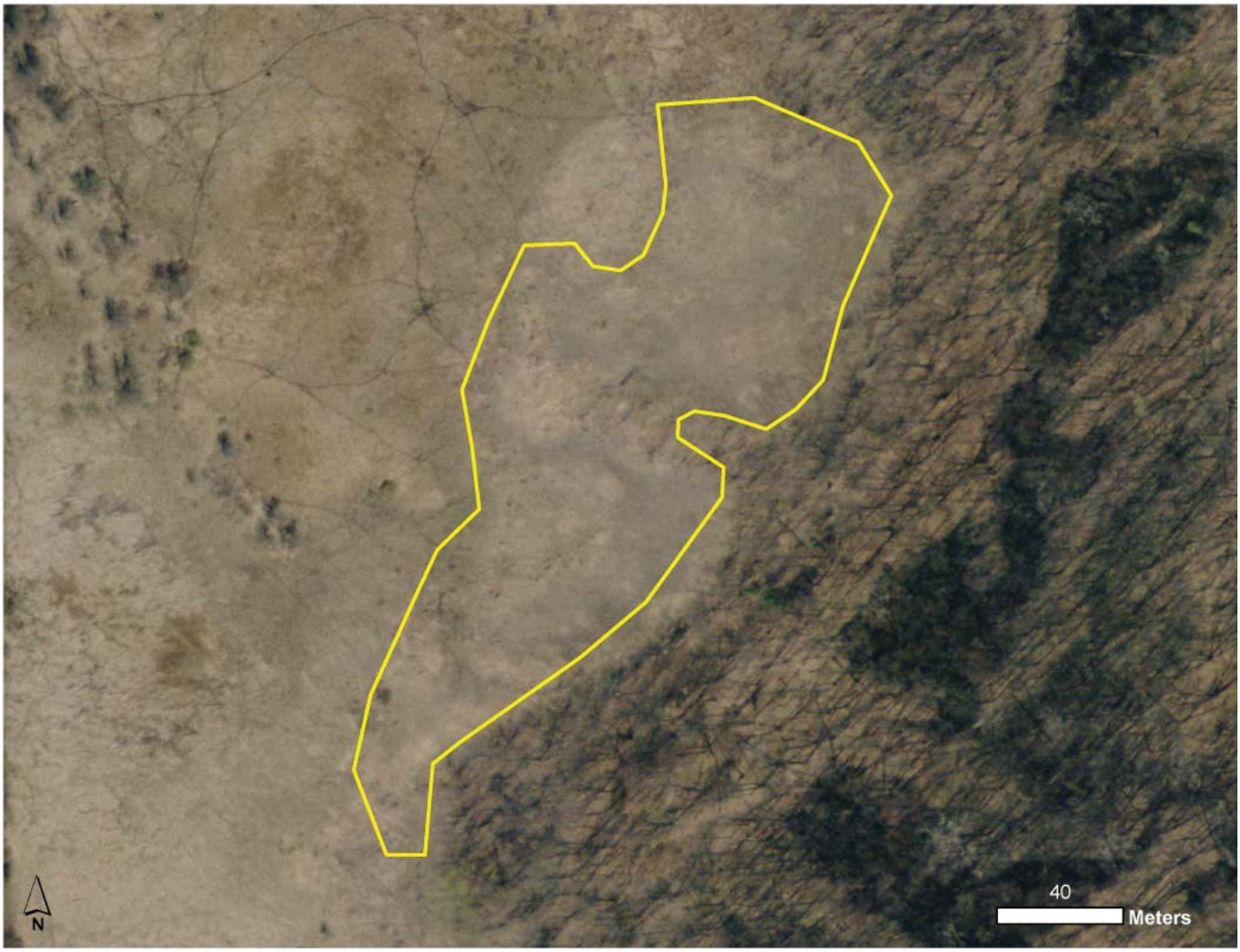
King to Dickerson Rds. lakeplain wet prairie. Photo by Bradford S. Slaughter.

43. Pigeon Rd. North
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: CD
Size: 4 acres
Location: Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20435 (New EO)

Threats: The primary threat to this lakeplain wet prairie is invasive species infestation, with reed (*Phragmites australis* subsp. *australis*) prevalent along the shore and glossy buckthorn (*Frangula alnus*) and other woody species encroaching along the inland margin of the prairie.

Management Recommendations: The primary management recommendations are to implement prescribed fire and control invasive species. Monitoring should be implemented to assess efforts to control non-native plant populations and evaluate the success of fire management.

Pigeon Rd. North lakeplain wet prairie. Photo by Bradford S. Slaughter.



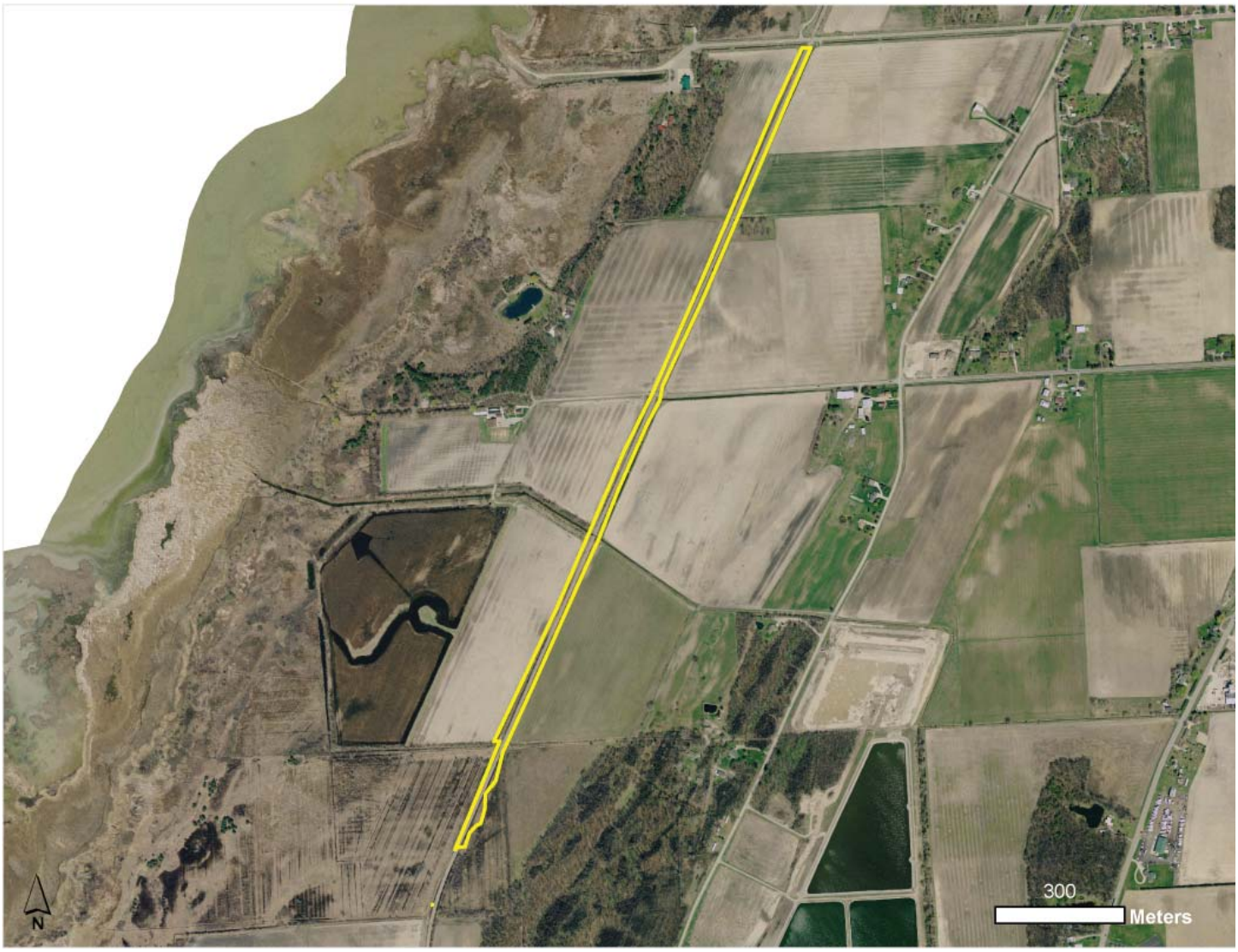
Aerial photograph of Pigeon Rd. North lakeplain wet prairie.

Pigeon Rd. North lakeplain wet prairie. Photo by Bradford S. Slaughter.

44. Sebewaing Railroad
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: X (extirpated)
Size: 11 acres
Location: Huron and Tuscola Counties
Land Manager: Private
Element Occurrence Identification Number: 10756 (EO update)

The 2015 survey found this former lakeplain wet prairie was extirpated due to trenching, bulldozing, and herbiciding. The small remaining stretch of relatively intact prairie adjacent to state land was included within the Berger Rd. lakeplain wet-mesic prairie (EO ID 2053).

The Sebewaing Railroad lakeplain wet prairie was extirpated by trenching, bulldozing, and herbiciding. Photo by Bradford S. Slaughter.



Aerial photograph of extirpated Sebewaing Railroad lakeplain wet prairie.

45. Thomas Rd. North
Natural Community Type: Lakeplain Wet Prairie
Rank: G2? S1, globally imperiled and critically imperiled in the state
Element Occurrence Rank: D
Size: 0.9 acres
Location: Fish Point Wildlife Area, Tuscola County
Land Manager: Wildlife Division, Department of Natural Resources Element Occurrence
Element Occurrence Identification Number: 5651 (EO update)

Threats: This degraded lakeplain wet prairie is negatively impacted by fire suppression, invasive species, and off-road vehicle activity. Reed (*Phragmites australis* subsp. *australis*) is locally common in wetter areas of prairie and common invasives in drier areas include reed canary grass (*Phalaris arundinacea*), autumn-olive (*Elaeagnus umbellata*), and spotted knapweed (*Centaurea stoebe*).

Management Recommendations: The primary management recommendations are to implement prescribed fire, control invasive species, and prevent off-road vehicle activity. Monitoring should be implemented to assess efforts to control non-native plant populations and evaluate the success of fire management. During the course of management, efforts should be made to avoid soil disturbance (i.e., minimize the creation of new ruts by limiting use of vehicles and establishment of new fire lines).

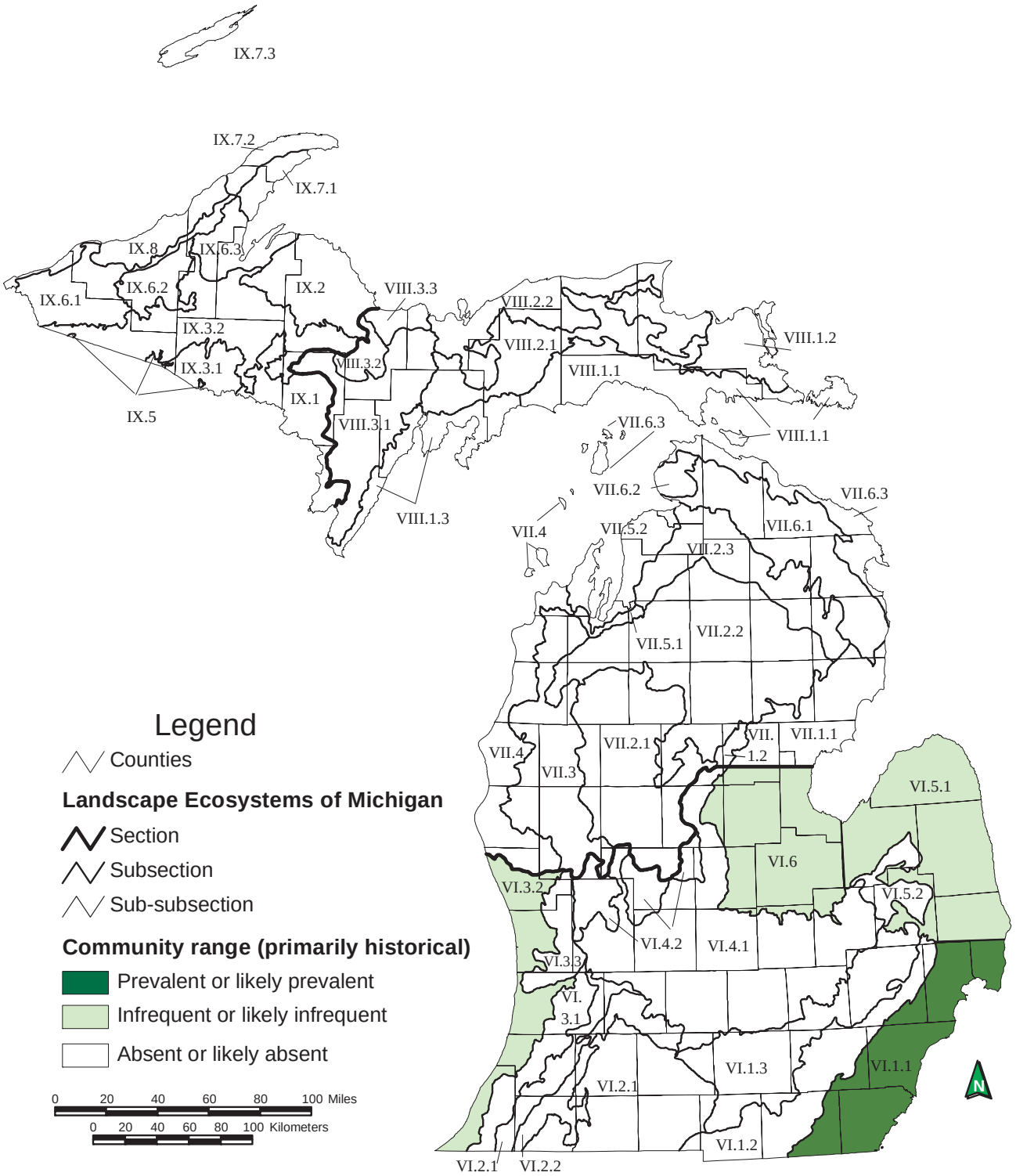
Thomas Rd. North lakeplain wet prairie. Photo by Bradford S. Slaughter.

Aerial photograph of Thomas Rd. North lakeplain wet prairie.

Thomas Rd. North lakeplain wet prairie. Photo by Bradford S. Slaughter.

LAKEPLAIN WET-MESIC PRAIRIE

Overview: Lakeplain wet-mesic prairie is a species-rich, lowland prairie community that occurs on moist, level, seasonally inundated glacial lakeplains of the Great Lakes. Soils of this natural community are fine-textured, slightly acid to moderately alkaline sands, sandy loams, or silty clays with poor to moderate water-retaining capacity. Seasonal flooding, cyclic changes in Great Lakes water levels, beaver flooding, and fire historically maintained the species composition and community structure of lakeplain wet-mesic prairies (Kost et al. 2007, Cohen et al. 2014).



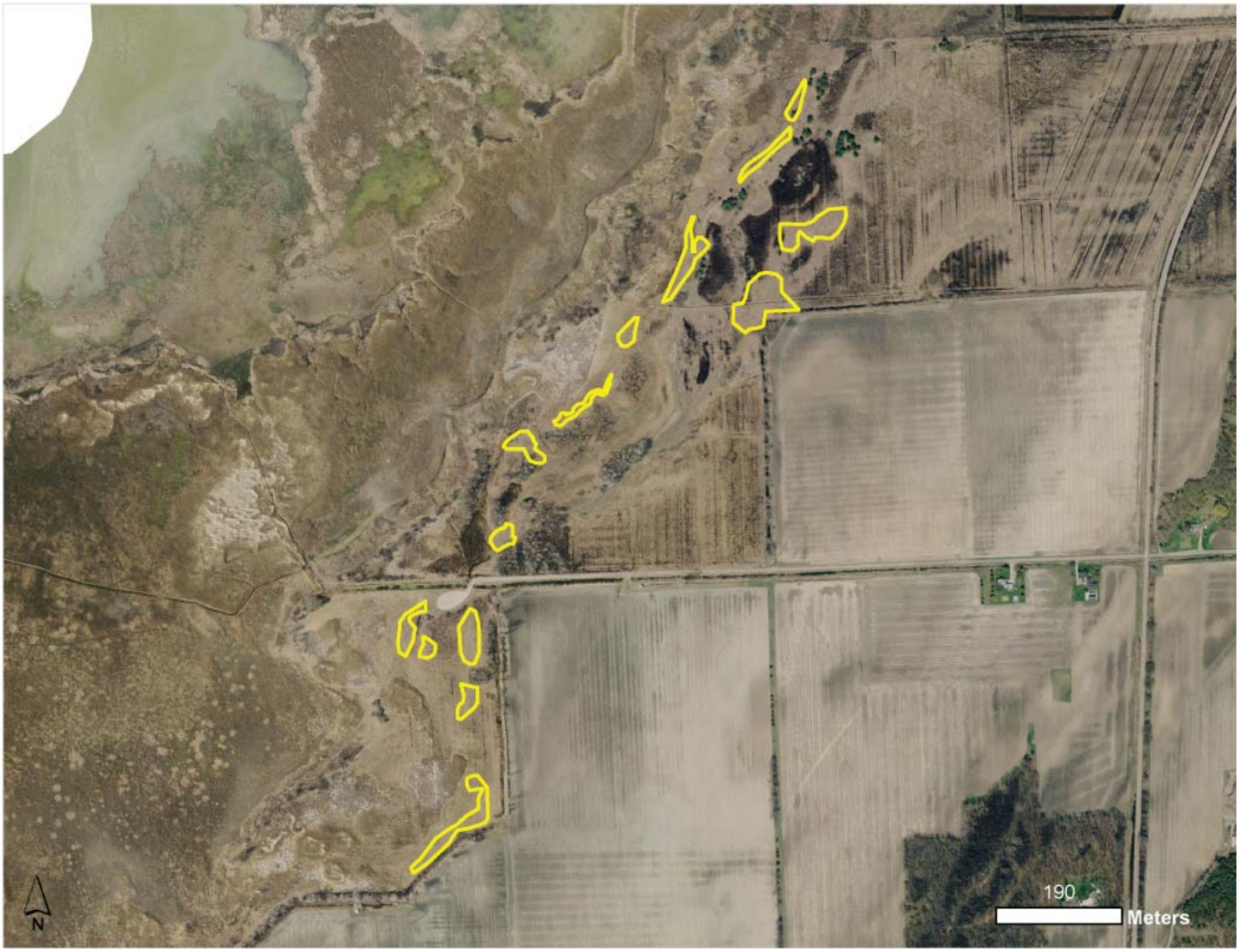
Map 14. Distribution of lakeplain wet-mesic prairie in Michigan (Albert et al. 2008).

46. Berger Rd.
Natural Community Type: Lakeplain Wet-Mesic Prairie
Rank: G1? S1, critically imperiled globally and in the state
Element Occurrence Rank: C
Size: 5.7 acres
Location: Fish Point Wildlife Area, Tuscola County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 2053 (EO update)

Threats: The primary threats to the prairie include fire suppression, woody species encroachment, the spread of invasive species, and off-road vehicle activity. Reed (*Phragmites australis* subsp. *australis*) is prevalent in wetter areas of the prairie and in the adjacent Great Lakes marsh.

Management Recommendations: The primary management recommendations are to continue mechanical removal of woody plants and prescribed fire to control woody encroachment, control invasive species, and prevent off-road vehicle activity. Patches of reed within the prairie and in the adjacent Great Lakes marsh should be treated. Monitoring should be implemented to assess efforts to control woody encroachment and non-native plant populations and evaluate the success of fire management. Water table fluctuations should be monitored to help determine the frequency and intensity of prescribed fire and mechanical thinning.

Berger Rd. lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.



Aerial photograph of Berger Rd. lakeplain wet-mesic prairie.

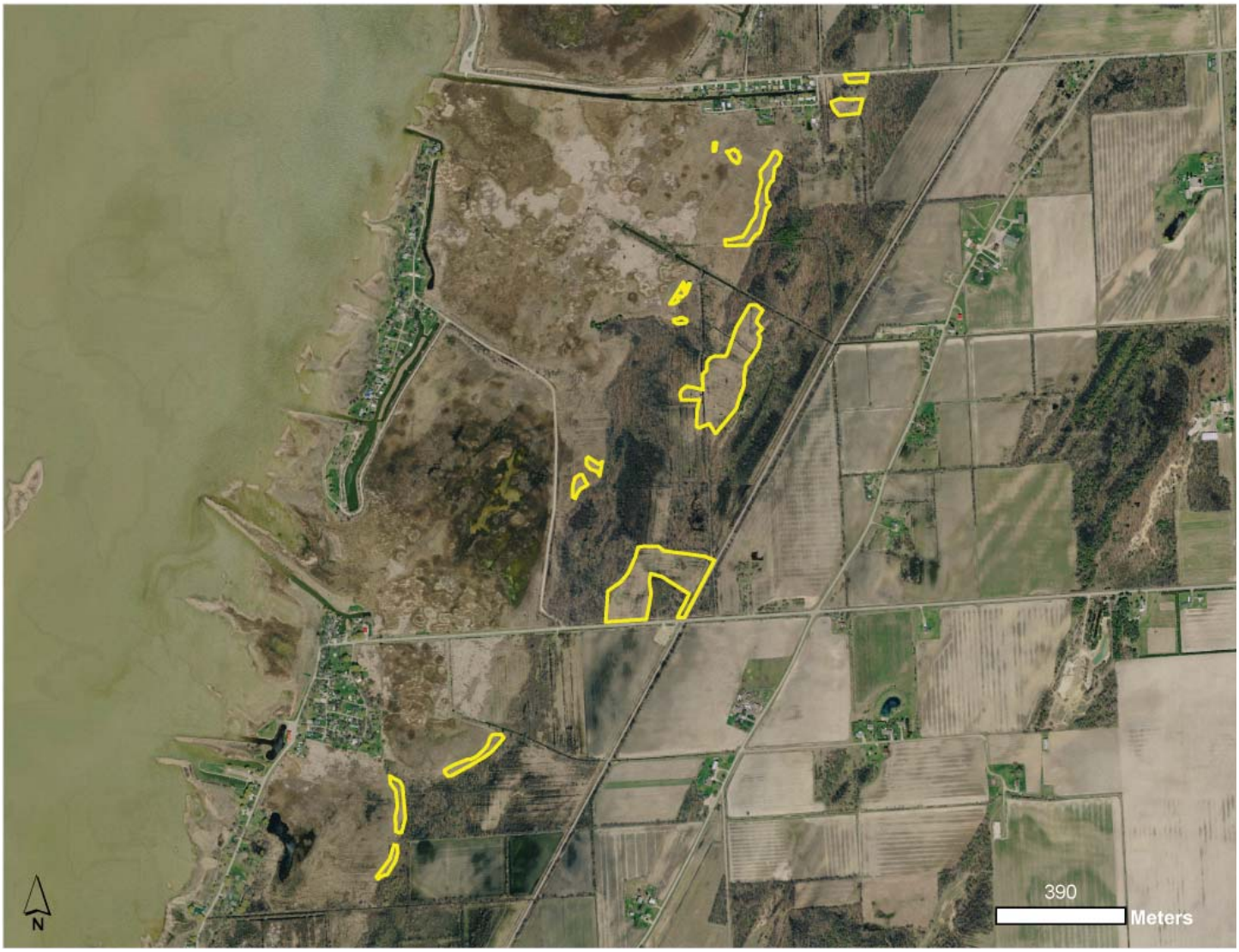
Berger Rd. lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.

47. Geiger to Haist Rds.
Natural Community Type: Lakeplain Wet-Mesic Prairie
Rank: G1? S1, critically imperiled globally and in the state
Element Occurrence Rank: C
Size: 26 acres
Location: Saginaw Bay Wetlands Nature Sanctuary and Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Michigan Nature Association and Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 3795 (EO update)

Threats: The primary threats to the prairie include hydrologic alteration from ditching, fire suppression, woody species encroachment, the spread of invasive species, and off-road vehicle activity. Reed (*Phragmites australis* subsp. *australis*) is prevalent in wetter areas of the prairie and in the adjacent Great Lakes marsh.

Management Recommendations: The primary management recommendations are to continue mechanical removal of woody plants and prescribed fire to control woody encroachment and control invasive species. Patches of reed within the prairie and adjacent Great Lakes marsh should be treated. Monitoring should be implemented to assess efforts to control woody encroachment and non-native plant populations and evaluate the success of fire management. Water table fluctuations should be monitored to help determine the frequency and intensity of prescribed fire and mechanical thinning.

Geiger to Haist Rds. lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.



Aerial photograph of Geiger to Haist Rds. lakeplain wet-mesic prairie.

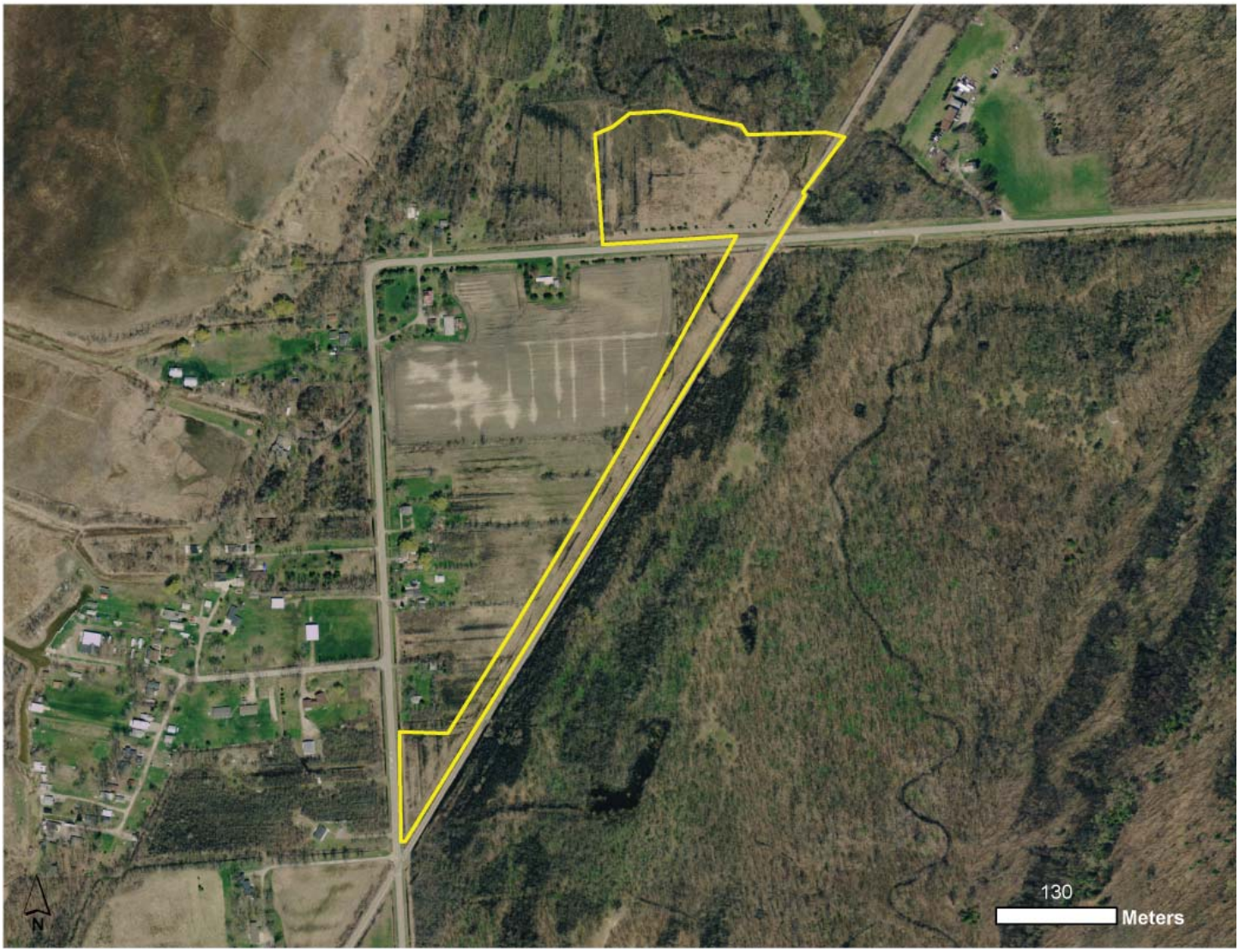
Geiger to Haist Rds. lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.

48. Weale Road
Natural Community Type: Lakeplain Wet-Mesic Prairie
Rank: G1? S1, critically imperiled globally and in the state
Element Occurrence Rank: D
Size: 12 acres
Location: Huron County
Land Manager: Private
Element Occurrence Identification Number: 9648 (EO update)

Threats: This degraded lakeplain wet prairie is negatively impacted by hydrologic alteration, fire suppression, railroad right-of-way maintenance and management, historic tilling, and invasive species. Reed (*Phragmites australis* subsp. *australis*) and autumn-olive (*Elaeagnus umbellata*) are locally common in the prairie.

Management Recommendations: The primary management recommendations are to continue mechanically reducing woody encroachment, implement prescribed fire, and control invasive species, especially reed and autumn olive. Monitoring should be implemented to assess efforts to control non-native plant populations and evaluate the success of fire management.

Weale Road lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.

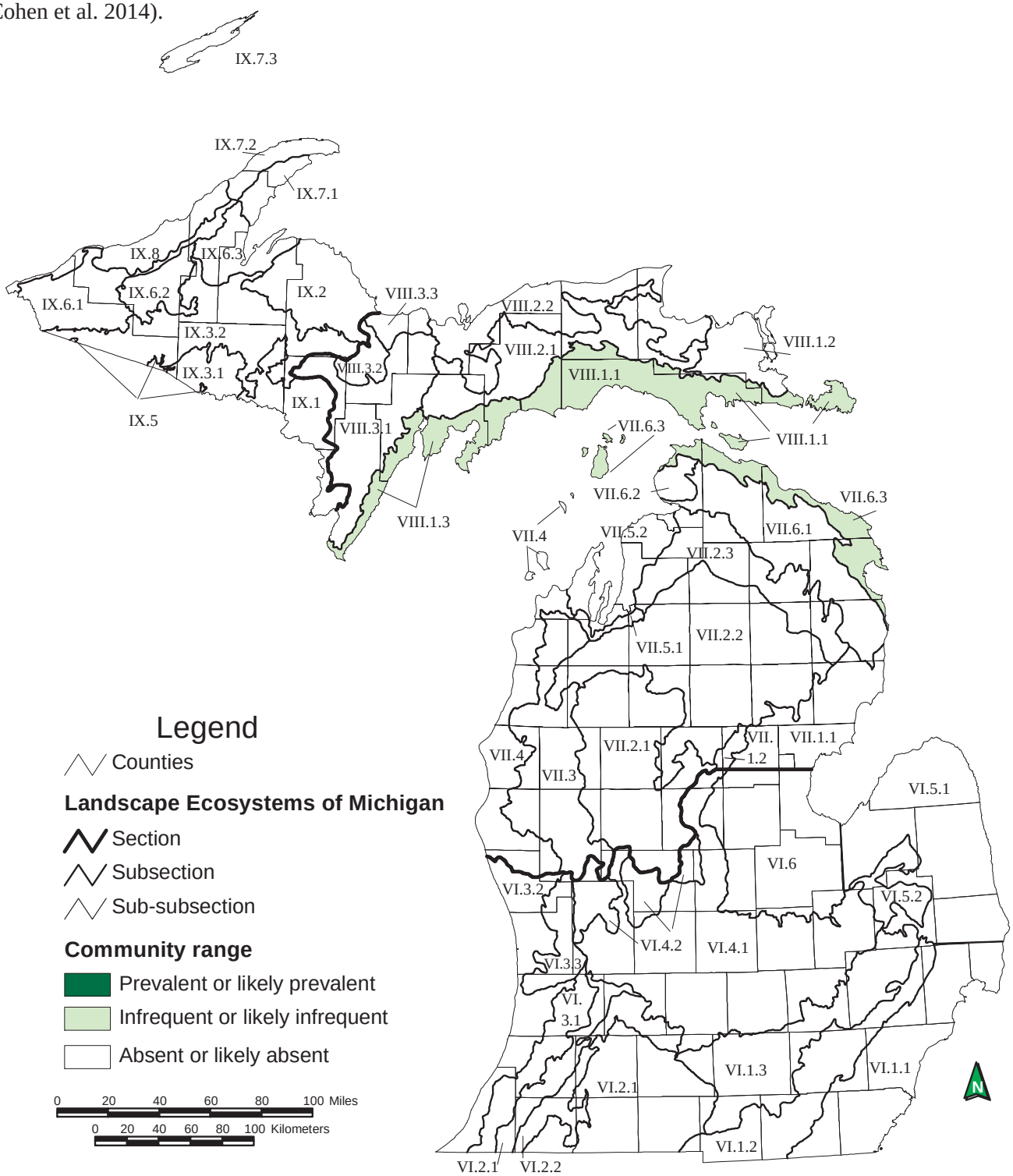


Aerial photograph of Weale Road lakeplain wet-mesic prairie.

Weale Road lakeplain wet-mesic prairie. Photo by Bradford S. Slaughter.

LIMESTONE BEDROCK GLADE

Overview: Limestone bedrock glade consists of an herb- and graminoid-dominated plant community with scattered clumps of stunted trees and shrubs growing on thin soil over limestone or dolomite. Tree cover is typically 10 to 25%, but occasionally as high as 60%. Shrub and herb cover is variable, and there are typically areas of exposed bedrock. Mosses, lichens, and algae can be abundant on the exposed limestone bedrock or thin organic soils. Seasonal flooding and summer drought maintain the open conditions. In Michigan, limestone bedrock glade occurs in the Upper Peninsula near the shorelines of Lakes Huron and Michigan, concentrated in a band from Drummond Island to Cedarville and from Gould City to the Garden Peninsula. In the northern Lower Peninsula, limestone bedrock glade occurs along the Lake Huron shoreline near Rogers City, Alpena, and Thompson's Harbor. This community is also referred to as alvar glade (Kost et al. 2007, Cohen et al. 2014).



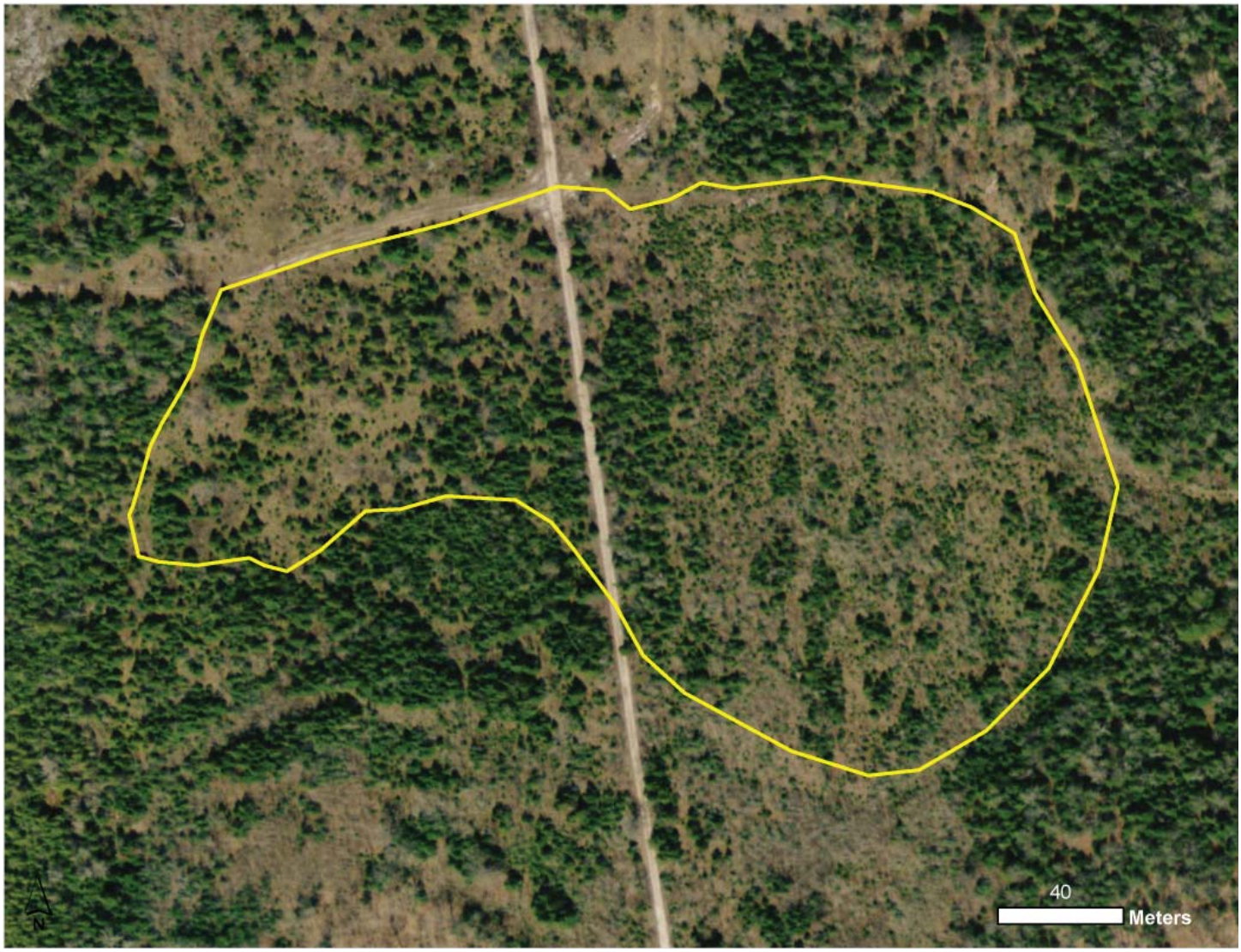
Map 15. Distribution of limestone bedrock glade in Michigan (Albert et al. 2008).

49. Fox Point Glade
Natural Community Type: Limestone Bedrock Glade
Rank: G3 S2, vulnerable globally and imperiled in the state
Element Occurrence Rank: C
Size: 9.4 acres
Location: Sault Sainte Marie Forest Management Unit, Mackinac County
Land Manager: Forest Resource Division, Department of Natural Resources
Element Occurrence Identification Number: 20386 (New EO)

Threats: The site has been impacted by historic fires and deer browse. Non-native species are scattered throughout the glade and include common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), spotted knapweed (*Centaurea stoebe*), timothy (*Phleum pratense*), common hemp nettle (*Galeopsis tetrahit*), and silvery cinquefoil (*Potentilla argentea*). Northern white-cedar (*Thuja occidentalis*) is noticeably absent from this glade.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered (i.e., let wildfires burn), to control populations of non-native species, and to maintain a natural community buffer surrounding the glades to prevent the increase of the weedy seed source. Monitoring should be implemented for non-native plant populations and to gauge the impact of deer herbivory. Reducing deer densities in the general landscape is recommended.

Fox Point Glade limestone bedrock glade. Photo by Joshua G. Cohen.



Aerial photograph of Fox Point Glade limestone bedrock glade.

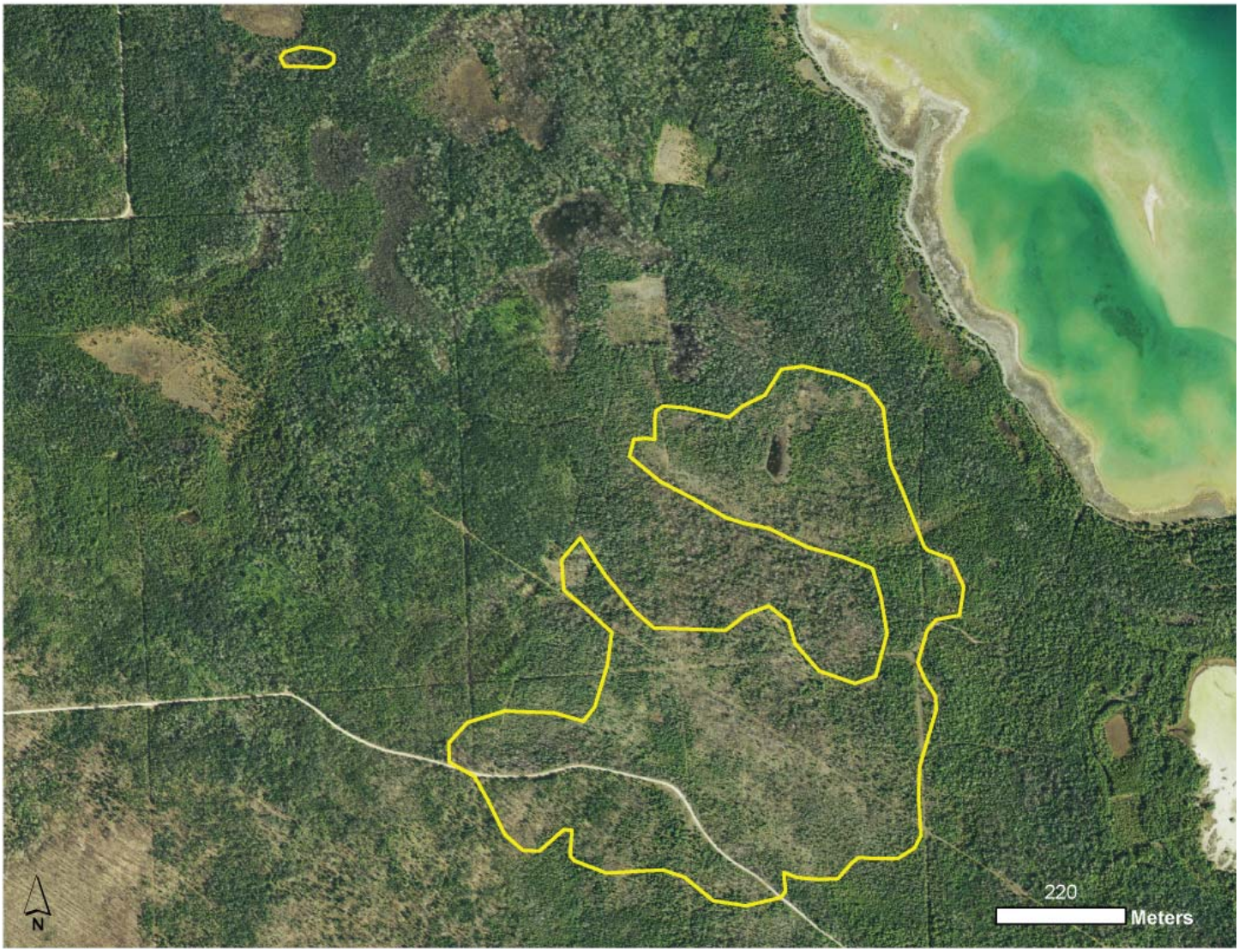
Fox Point Glade limestone bedrock glade. Photo by Joshua G. Cohen.

50. Thompson's Harbor Observatory
Natural Community Type: Limestone Bedrock Glade
Rank: G3 S2, vulnerable globally and imperiled in the state
Element Occurrence Rank: CD
Size: 98 acres
Location: Thompson's Harbor State Park, Presque Isle County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 9418 (EO update)

Threats: Numerous roads and trails cross the site and act as pathways for invasive species. Invasives concentrated along road and trail margins include common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), and spotted knapweed (*Centaurea stoebe*). Ox-eye daisy, lawn prunella (*Prunella vulgaris*), and common hemp nettle (*Galeopsis tetrahit*) occur throughout the glade but do not appear to threaten species composition or vegetative structure. Deer herbivory is evident but mild. Fire suppression may be a threat, but little is known about fire as a natural disturbance factor of limestone bedrock glades.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered (i.e., let wildfires burn), to control populations of non-native species (especially spotted knapweed and common St. John's-wort), and to maintain a forested buffer surrounding the glade to prevent the increase of the weedy seed source. Monitoring should be implemented for non-native plant populations and to gauge the impact of deer herbivory. Increasing the amount of late-successional habitat in the adjacent landscape will help reduce deer browse pressure. Reducing deer densities in the general landscape is also recommended.

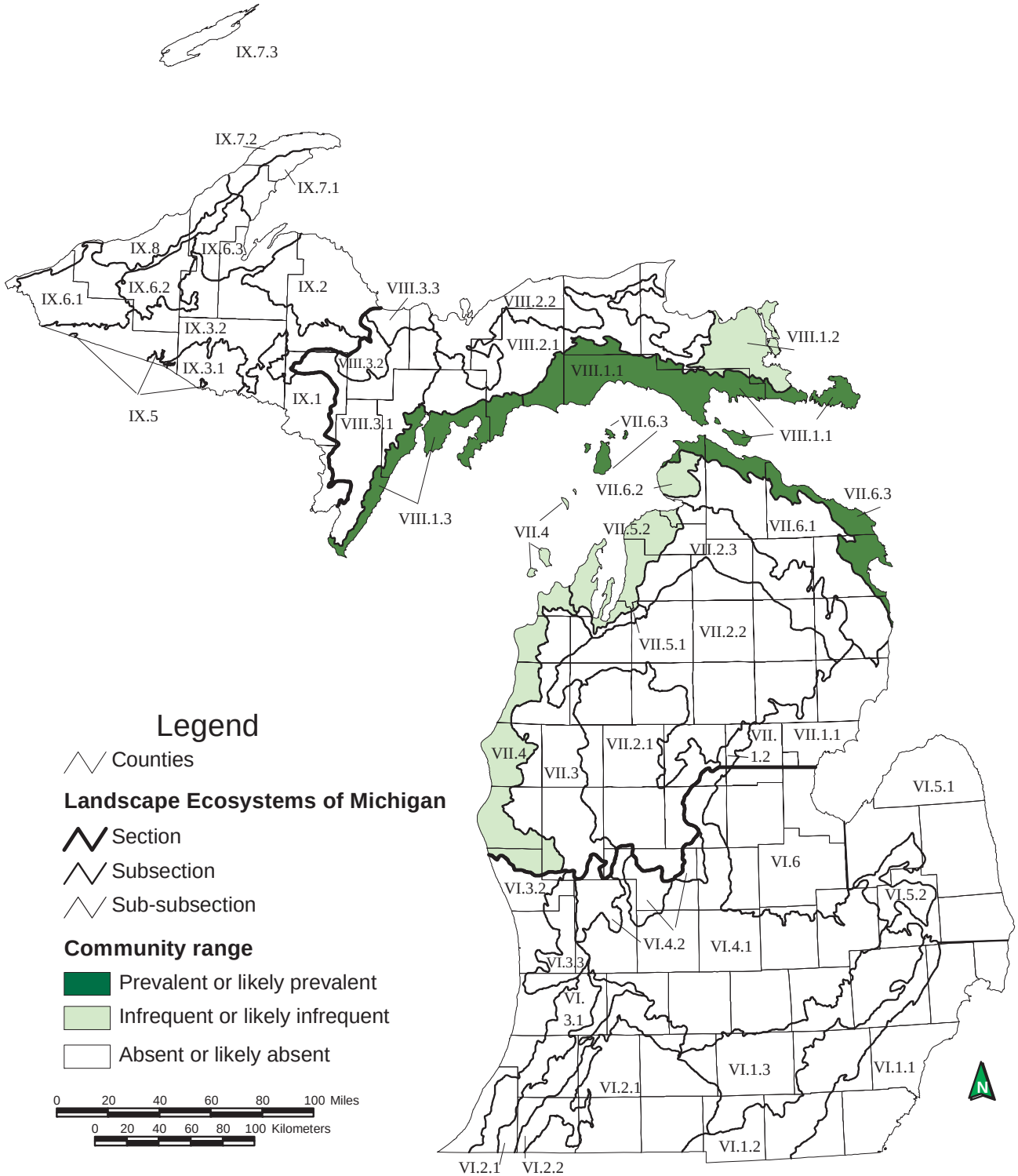
Thompson's Harbor Observatory limestone bedrock glade. Photo by Joshua G. Cohen.



Aerial photograph of Thompson's Harbor Observatory limestone bedrock glade.

LIMESTONE COBBLE SHORE

Overview: Limestone cobble shore occurs along gently sloping shorelines of Lake Michigan and Lake Huron. The community is studded with cobbles and boulders and is frequently inundated by storms and periods of high water. Limestone cobble shore is typically sparsely vegetated, because cobbles cover most of the surface and storm waves prevent the development of a diverse, persistent plant community. Soils are neutral to slightly alkaline mucks and sands that accumulate between cobbles and boulders (Kost et al. 2007, Cohen et al. 2014).



Map 16. Distribution of limestone cobble shore in Michigan (Albert et al. 2008).

51. De Tour Shore
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 42 acres
Location: De Tour Peninsula Nature Preserve, Chippewa County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20472 (New EO)

Threats: Species composition and structure are driven primarily by natural processes. Non-native species are common to locally common and include spotted knapweed (*Centaurea stoebe*), white sweet-clover (*Melilotus albus*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), common mullein (*Verbascum thapsus*), and wild parsnip (*Pastinaca sativa*). Debris is locally scattered along the shore.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, to control populations of non-native species, and to maintain a natural community buffer surrounding the shoreline to prevent the increase of the weedy seed source. Monitoring should be implemented for non-native plant populations. In addition, anthropogenic debris along the shoreline could be cleaned up.

De Tour Shore limestone cobble shore. Photo by Joshua G. Cohen.

Aerial photograph of De Tour Shore limestone cobble shore.

De Tour Shore limestone cobble shore. Photo by Joshua G. Cohen.

52. High Island
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 214 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 6527 (EO update)

Threats: Species composition and structure are driven primarily by natural processes. Non-natives are locally common along the limestone cobble shore and include Canada bluegrass (*Poa compressa*) and mossy stonecrop (*Sedum acre*). Additional invasives found along the shoreline include narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and white sweet-clover (*Melilotus albus*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants within the limestone cobble shore and nearby areas of shoreline. Control efforts should be followed by monitoring for these invasive species.

High Island limestone cobble shore. Photo by Joshua G. Cohen.

Aerial photograph of High Island limestone cobble shore.

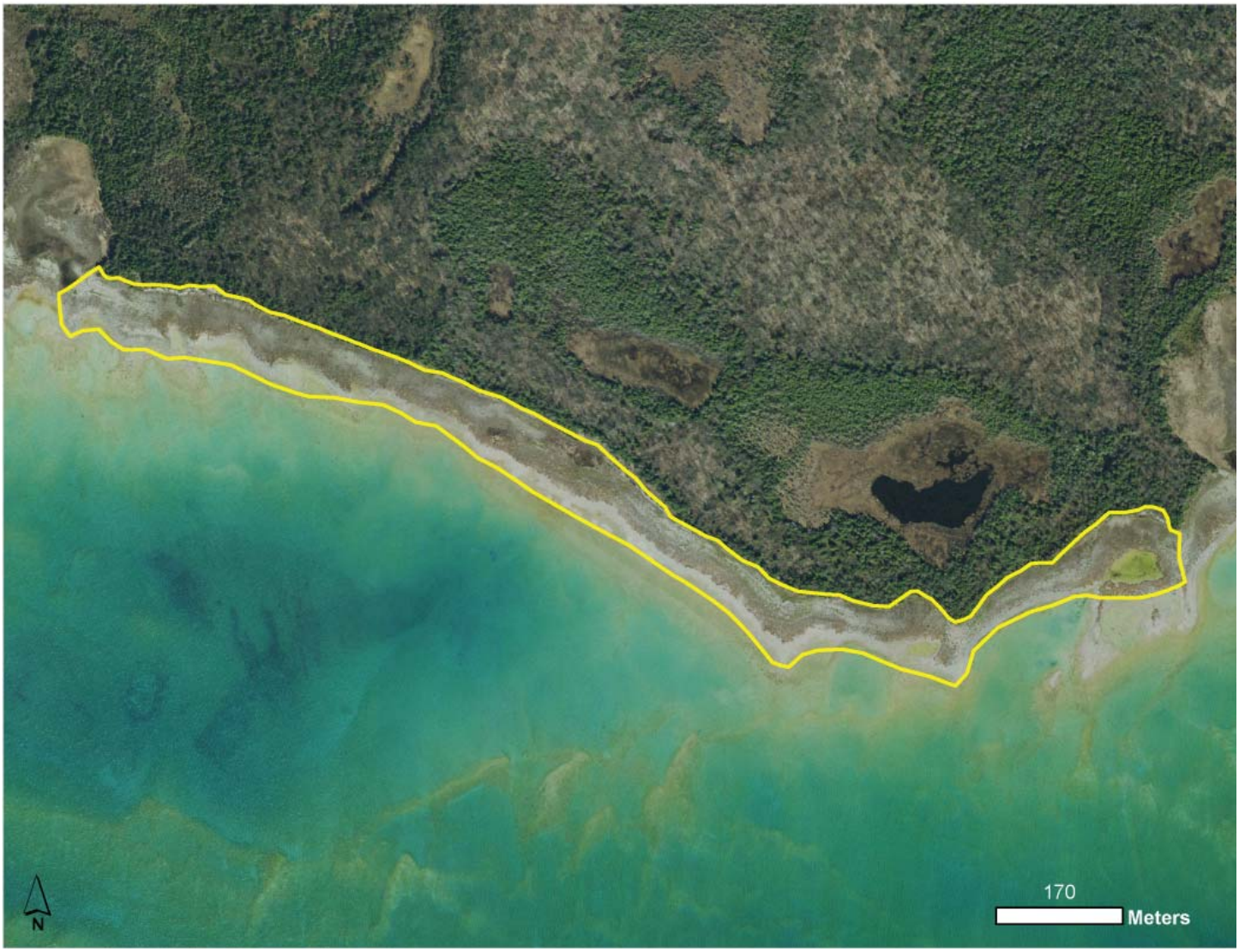
High Island limestone cobble shore. Photo by Joshua G. Cohen.

53. Hog Island
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 33 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20447 (New EO)

Threats: Species composition and structure are driven primarily by natural processes. Canada bluegrass (*Poa compressa*) is locally common within the limestone cobble shore.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, to control invasive species, and to monitor for invasive species.

Hog Island limestone cobble shore. Photo by Joshua G. Cohen.



Aerial photograph of Hog Island limestone cobble shore.

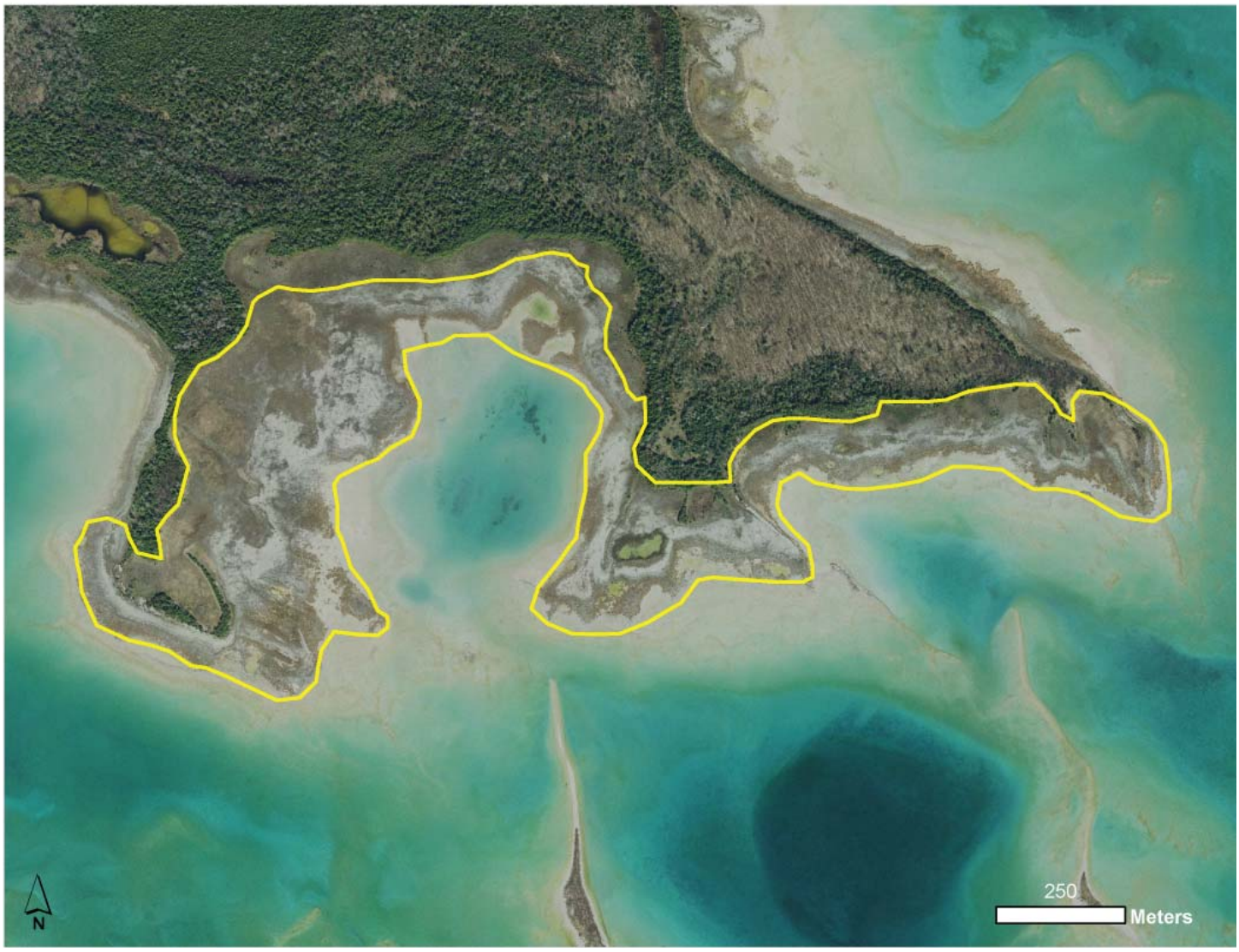
Hog Island limestone cobble shore. Photo by Joshua G. Cohen.

54. Monatou Bay
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: A
Size: 156 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20448 (New EO)

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

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to monitor for invasive species.

Monatou Bay limestone cobble shore. Photo by Joshua G. Cohen.



Aerial photograph of Monatou Bay limestone cobble shore.

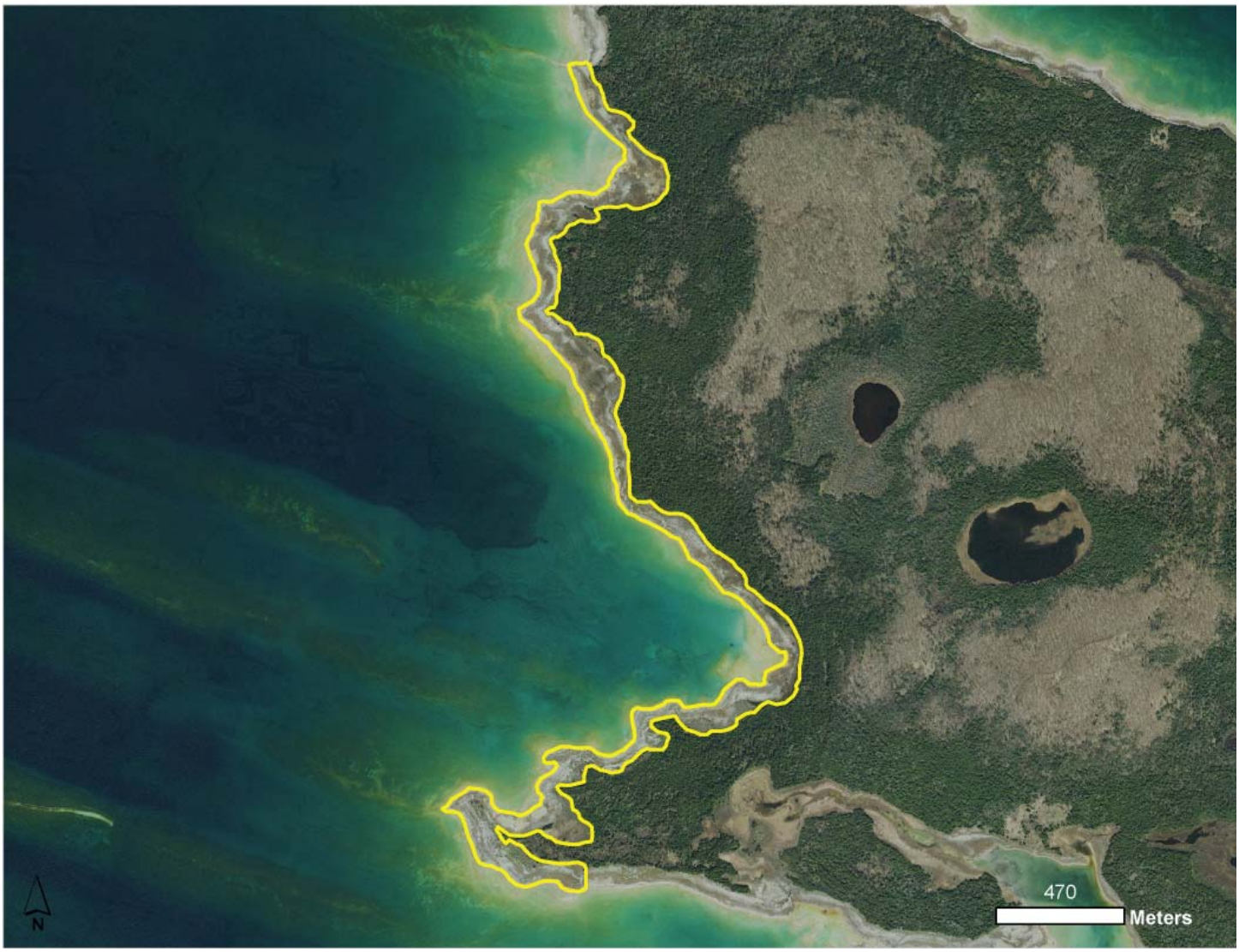
Monatou Bay limestone cobble shore. Photo by Joshua G. Cohen.

55. Taganing Shore
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: B
Size: 117 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20449 (New EO)

Threats: Species composition and structure are driven primarily by natural processes. Non-native species are common to locally abundant and include Canada bluegrass (*Poa compressa*), spotted knapweed (*Centaurea stoebe*), mossy stonecrop (*Sedum acre*), and red clover (*Trifolium pratense*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants within the limestone cobble shore and nearby areas of shoreline. Control efforts should be followed by monitoring for these invasive species.

Taganing Shore limestone cobble shore. Photo by Joshua G. Cohen.



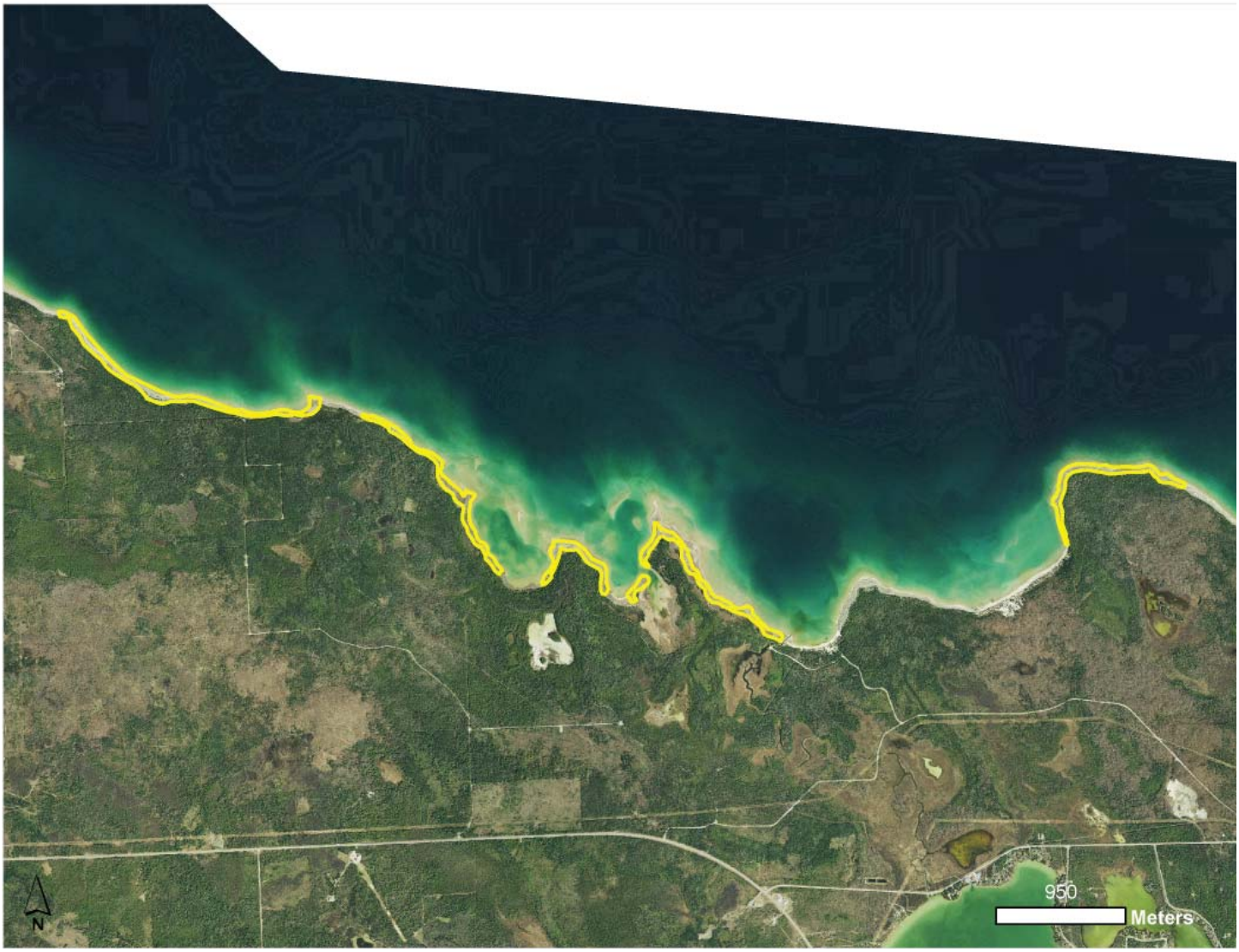
Aerial photograph of Taganing Shore limestone cobble shore.

56. Thompson's Harbor
Natural Community Type: Limestone Cobble Shore
Rank: G2G3 S3, imperiled to vulnerable globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 86 acres
Location: Thompson's Harbor State Park, Presque Isle County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 10477 (EO update)

Threats: The structure and species composition of this limestone cobble shore is determined primarily by the natural processes of wind and wave action and the long-term fluctuation of Great Lakes water levels. Threats are limited to small incursions of non-native species and limited off-road vehicle damage along the upland margin of the occurrence. Invasives noted along the shoreline include Canada bluegrass (*Poa compressa*), spotted knapweed (*Centaurea stoebe*), Siberian elm (*Ulmus pumila*), and reed canary grass (*Phalaris arundinacea*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, prevent off-road vehicle activity, and eliminate clusters of non-native plants within the limestone cobble shore and nearby areas of shoreline. Siberian elm should be immediately cut and herbicided. Control efforts should be followed by monitoring for these invasive species.

Thompson's Harbor limestone cobble shore. Photo by Joshua G. Cohen.

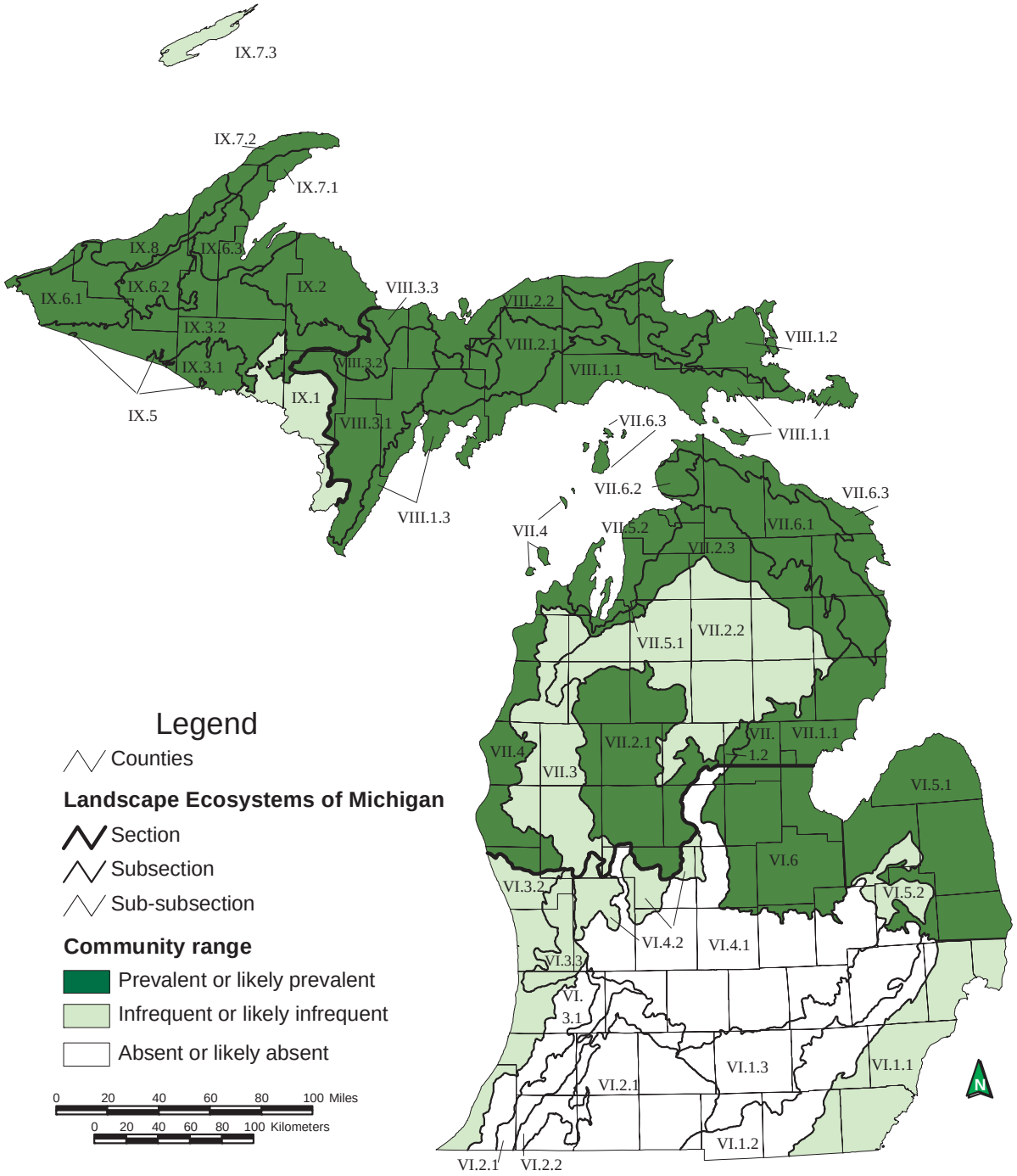


Aerial photograph of Thompson's Harbor limestone cobble shore.

Thompson's Harbor limestone cobble shore. Photo by Joshua G. Cohen.

MESIC NORTHERN FOREST

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



Map 17. Distribution of mesic northern forest in Michigan (Albert et al. 2008).

57. Hog Island
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: B
Size: 895 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 7843 (EO update)

Threats: Species composition and vegetative structure are patterned by natural processes. Mesic northern forest ranges from mature to old-growth to some pockets of younger forest. No threats were observed during the course of the survey. The younger portions of mesic northern forest were likely selectively logged over 150 years ago.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the mesic northern forest, and monitor for invasive species.

Hog Island mesic northern forest. Photo by Joshua G. Cohen.

Aerial photograph of Hog Island mesic northern forest.

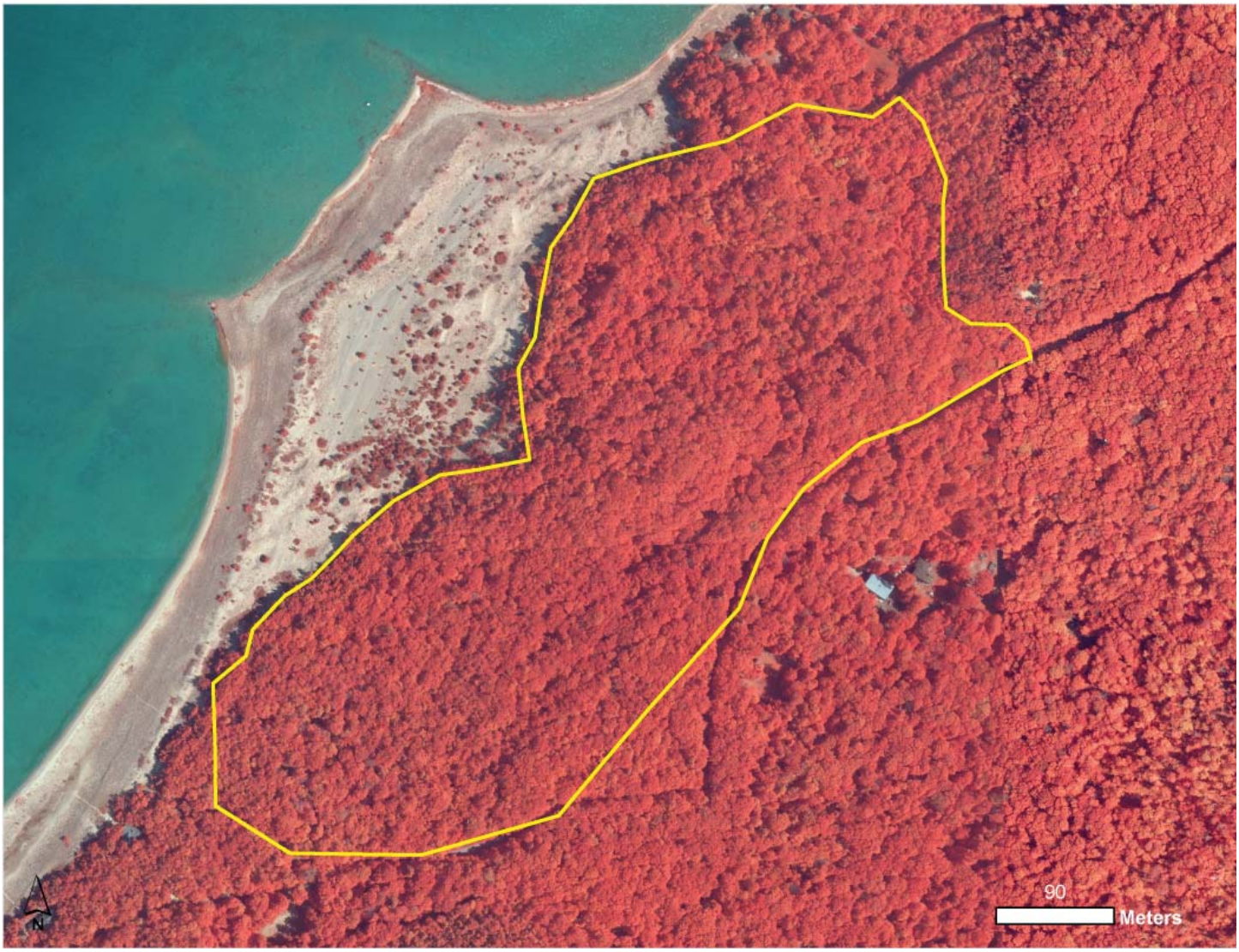
Hog Island mesic northern forest. Photo by Joshua G. Cohen.

58. McCort Hill
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: CD
Size: 41 acres
Location: Woollam Family Nature Preserve, Emmet County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20443 (New EO)

Threats: Species composition and structure are primarily influenced by natural disturbance factors, past logging, deer herbivory, and beech bark disease, which has recently killed the overstory beech, generating numerous light gaps and snags and coarse woody debris. Cut stumps occur throughout the forest. The understory and ground cover is notably sparse due to deer browse. The forest is intersected by roads, a powerline, and an old logging trail. Canada bluegrass (*Poa compressa*) is locally dominant.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, monitor for deer browse, retain an intact buffer of natural communities surrounding the mesic northern forest and control and monitor for invasive species.

McCort Hill mesic northern forest. Photo by Joshua G. Cohen.



Aerial photograph of McCort Hill mesic northern forest.

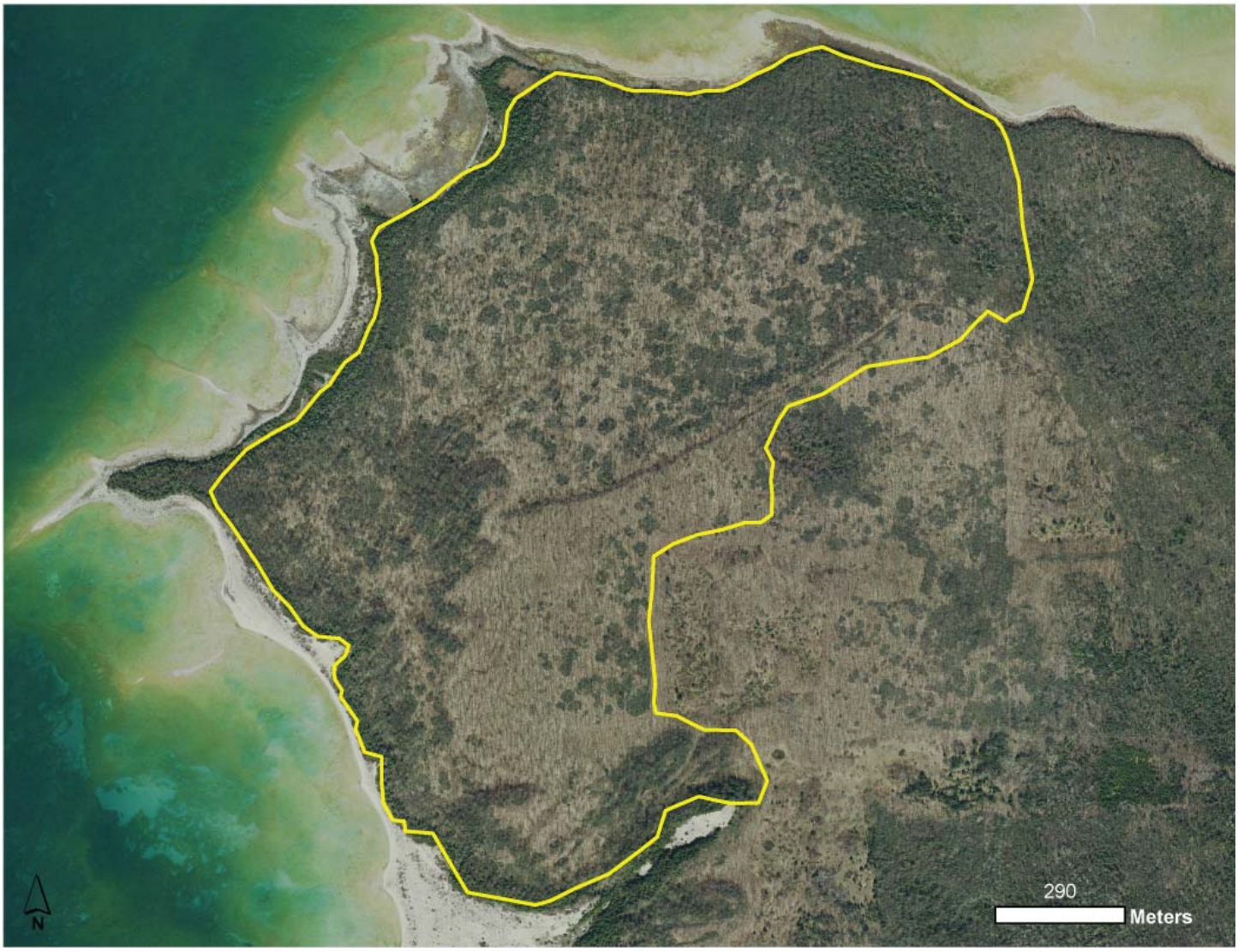
McCort Hill mesic northern forest. Photo by Joshua G. Cohen.

59. Nezewabegon Forest
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 456 acres
Location: Beaver Island State Wildlife Research Area, High Island, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20452 (New EO)

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

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the mesic northern forest, and monitor for invasive species.

Nezewabegon mesic northern forest. Photo by Joshua G. Cohen.



Aerial photograph of Nezewabegon mesic northern forest.

Nezewabegon mesic northern forest. Photo by Joshua G. Cohen.

60. Point Betsie
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: BC
Size: 210 acres
Location: Zetterberg Preserve at Point Betsie, Benzie County
Land Manager: The Nature Conservancy
Element Occurrence Identification Number: 3786 (EO update)

Threats: Concentrated deer activity and severe browse are the primary threats to the mesic northern forest, threatening to alter successional pathways and reduce or eliminate populations of sensitive plant species. Portions of this forest with heavy hemlock (*Tsuga canadensis*) cover likely function as a winter deer yard with hemlock providing thermal cover. The understory and ground cover is sparse to locally absent due to high deer browse pressure. Garlic mustard (*Alliaria petiolata*) and other invasive species are also a threat, particularly in the vicinity of homes and M-22. In addition, baby's breath (*Gypsophila paniculata*) is locally dominant in the adjacent open dunes.

Management Recommendations: The primary management recommendations are to allow natural processes (i.e., windthrow and fire) to operate unhindered, reduce deer densities to facilitate woody regeneration and recovery of sensitive ground layer species, and control invasive species (i.e., garlic mustard and baby's breath in the adjacent open dunes).

Point Betsie mesic northern forest. Photo by Joshua G. Cohen.

Aerial photograph of Point Betsie mesic northern forest.

Point Betsie mesic northern forest. Photo by Joshua G. Cohen.

61. Portage Point Forest
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: CD
Size: 29 acres
Location: Elberta-Portage Point Easement, Manistee County
Land Owner: The Nature Conservancy
Element Occurrence Identification Number: 20458 (New EO)

Threats: Species composition and structure are primarily influenced by natural disturbance factors, past logging, deer herbivory, and beech bark disease, which has recently killed overstory beech, generating numerous light gaps and snags and coarse woody debris. The understory and ground cover is notably sparse due to deer browse. Non-native species occur locally and include Japanese barberry (*Berberis thunbergii*), Canada bluegrass (*Poa compressa*), common speedwell (*Veronica officinalis*), and common mullein (*Verbascum thapsus*).

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, monitor for deer browse, retain an intact buffer of natural communities surrounding the mesic northern forest, and control and monitor for invasive species.

Portage Point mesic northern forest. Photo by Joshua G. Cohen.

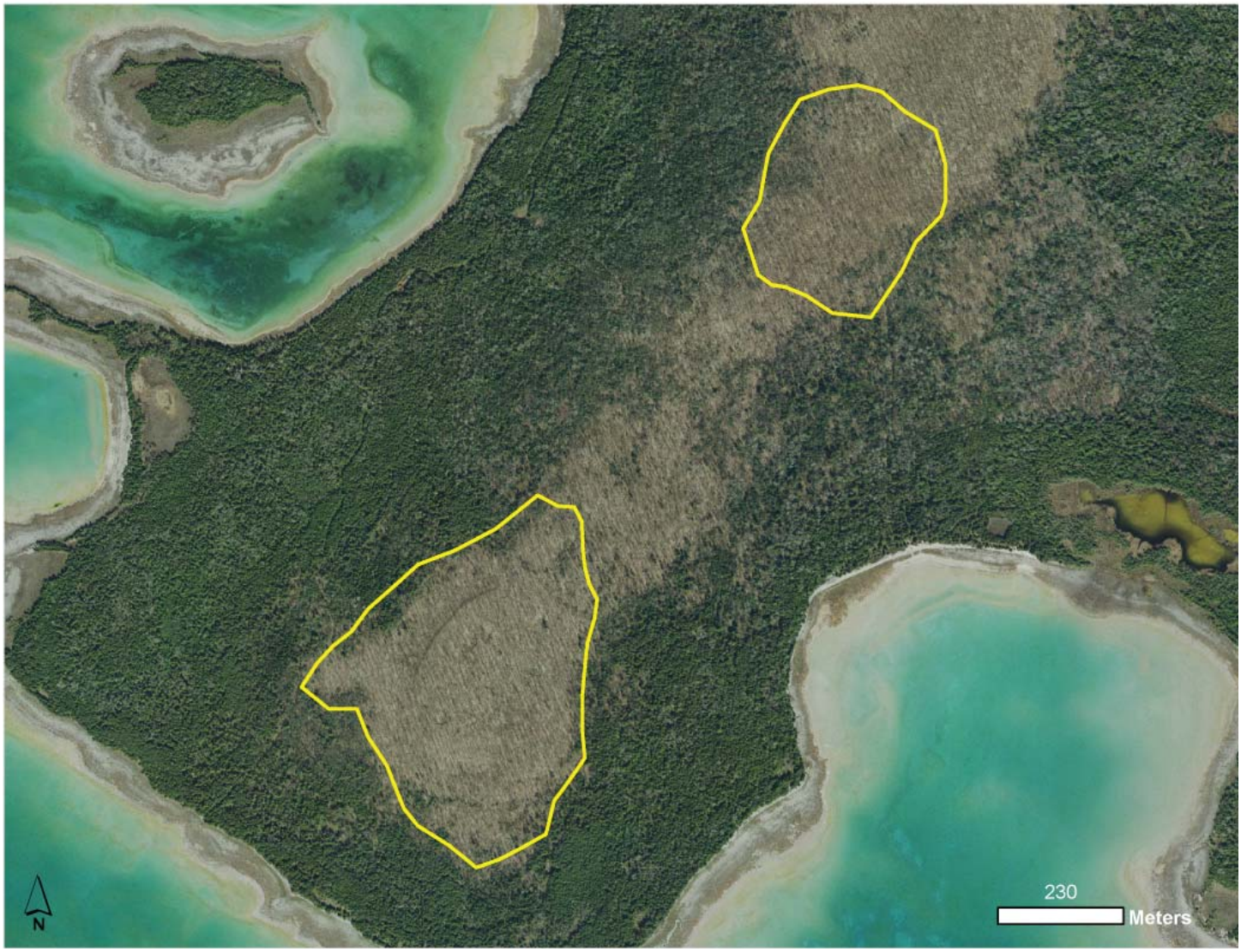
Aerial photograph of Portage Point mesic northern forest.

62. Red Oak Garden
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: C
Size: 81 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 10496 (EO Update)

Threats: Species composition and vegetative structure are patterned by natural processes and past logging history (cut stumps occur within the forest). No current threats were observed during the course of the survey. A trail passes through the northern portion of the occurrence.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, to retain an intact buffer of natural communities surrounding the mesic northern forest, and monitor for invasive species.

Red Oak Garden mesic northern forest. Photo by Joshua G. Cohen.

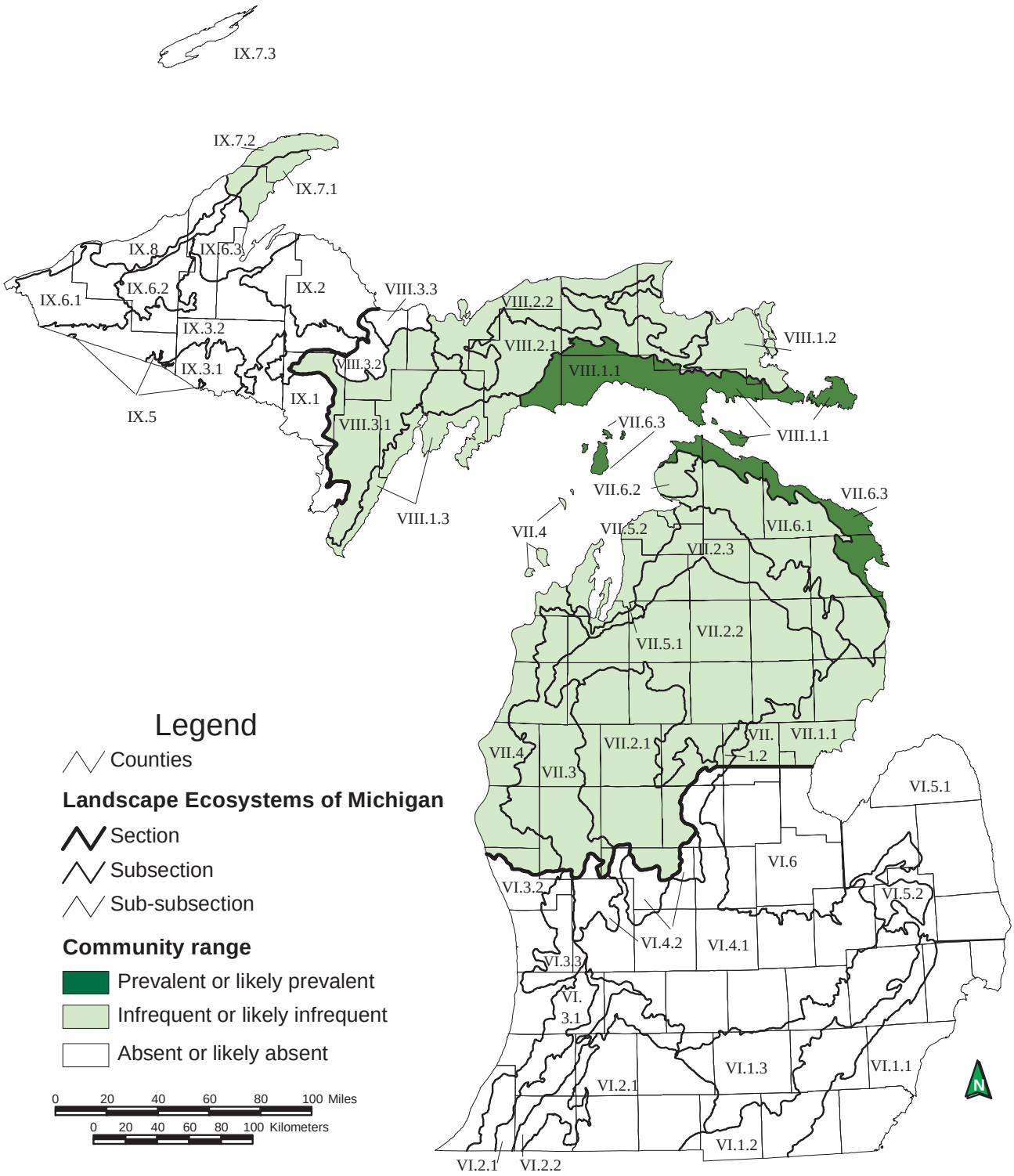


Aerial photograph of Red Oak Garden mesic northern forest.

Red Oak Garden mesic northern forest. Photo by Joshua G. Cohen.

NORTHERN FEN

Overview: Northern fen is a sedge- and rush-dominated wetland occurring on neutral to moderately alkaline saturated peat and/or marl influenced by groundwater rich in calcium and magnesium carbonates. The community occurs north of the climatic tension zone and is found primarily where calcareous bedrock underlies a thin mantle of glacial drift on flat areas or shallow depressions of glacial outwash and glacial lakeplains and also in kettle depressions on pitted outwash and moraines (Kost et al. 2007, Cohen et al. 2014).



Map 18. Distribution of northern fen in Michigan (Albert et al. 2008).

63. Hog Island
Natural Community Type: Northern Fen
Rank: G3G5 S3, vulnerable to secure globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 21 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20446 (New EO)

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

Management Recommendations: The main management recommendations are to retain an intact buffer of natural communities surrounding the wetland and to monitor for invasive species.

Hog Island northern fen. Photo by Joshua G. Cohen.

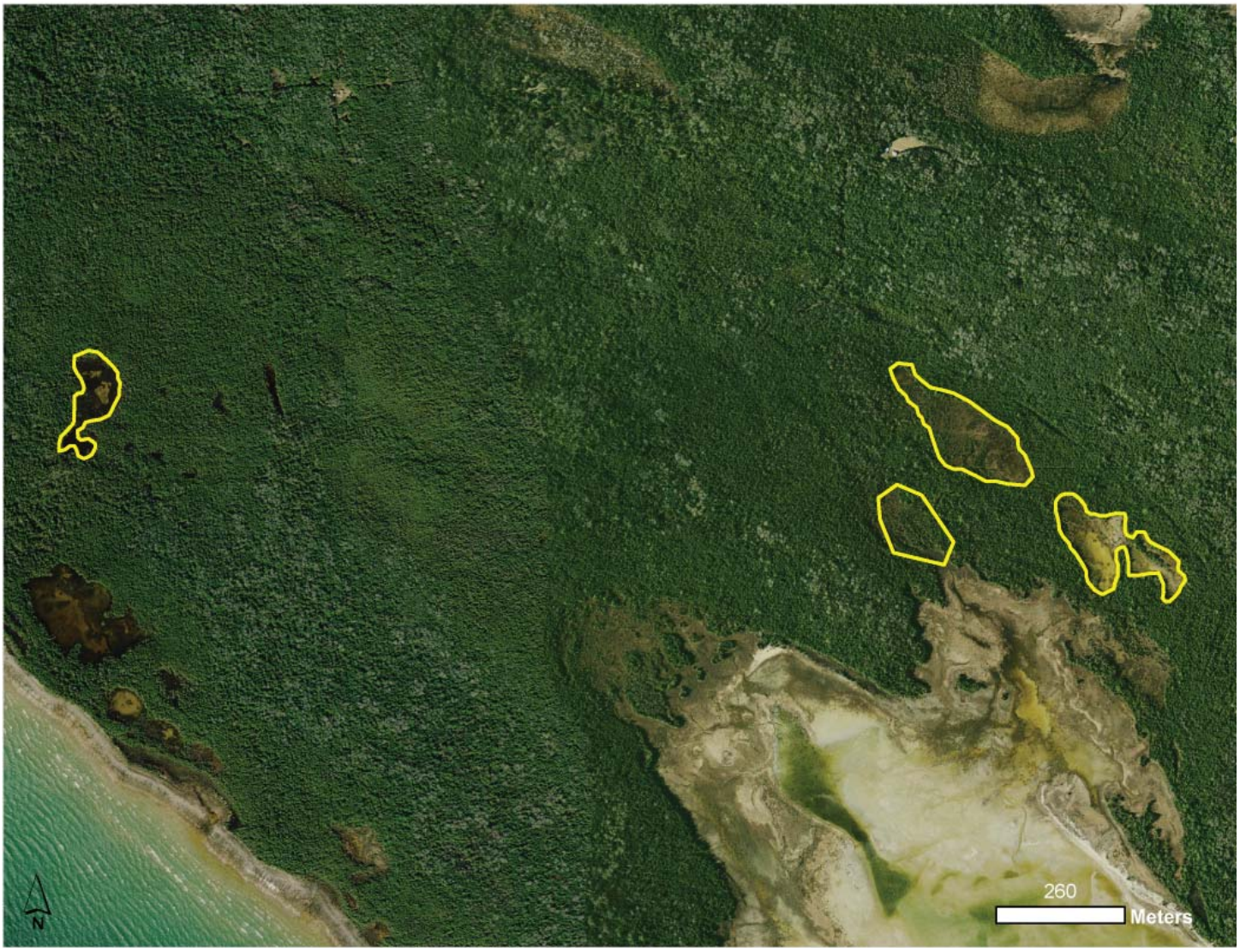
Aerial photograph of Hog Island northern fen.

64. Leopold's Fen
Natural Community Type: Northern Fen
Rank: G3G5 S3, vulnerable to secure globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 21 acres
Location: Aldo Leopold Nature Preserve, Mackinac County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20482 (New EO)

Threats: Species composition and zonation are patterned by natural processes. The fen is characterized by high floristic diversity and distinct ecological zonation due to gradients in soil and water chemistry. No threats were observed.

Management Recommendations: The main management recommendations are to retain an intact buffer of natural communities surrounding the wetland and to monitor for invasive species.

Leopold's Fen northern fen. Photo by Joshua G. Cohen.



Aerial photograph of Leopold's Fen northern fen.

Leopold's Fen northern fen. Photo by Joshua G. Cohen.

65. Thompson's Harbor
Natural Community Type: Mesic Northern Forest
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 93 acres
Location: Thompson's Harbor State Park, Presque Isle County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 17341 (EO update)

Threats: Threats are limited to localized anthropogenic disturbances. No invasive plant species were noted during the course of the survey. Invasives may become established near the foot trail that passes by one of the fen openings since there is localized anthropogenic disturbance emanating from the trail. A powerline intersects one of the fen openings and a lone off-road vehicle track was observed coming off of the powerline into the fen. Deer browse may be impacting species composition and structure.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, eliminate illegal off-road vehicle activity, and to reduce deer densities in the surrounding landscape to dampen deer browse pressure. Deer densities could be reduced through direct measures and also by reducing early-successional habitat in the surrounding landscape. Monitoring deer densities and deer herbivory will allow for the assessment of whether deer herbivory impacts species composition and structure. Establishing no-cut buffers around the northern fen polygons can help protect the hydrologic regime. Invasive species occurring in adjacent areas should be controlled and these control efforts should be monitored.

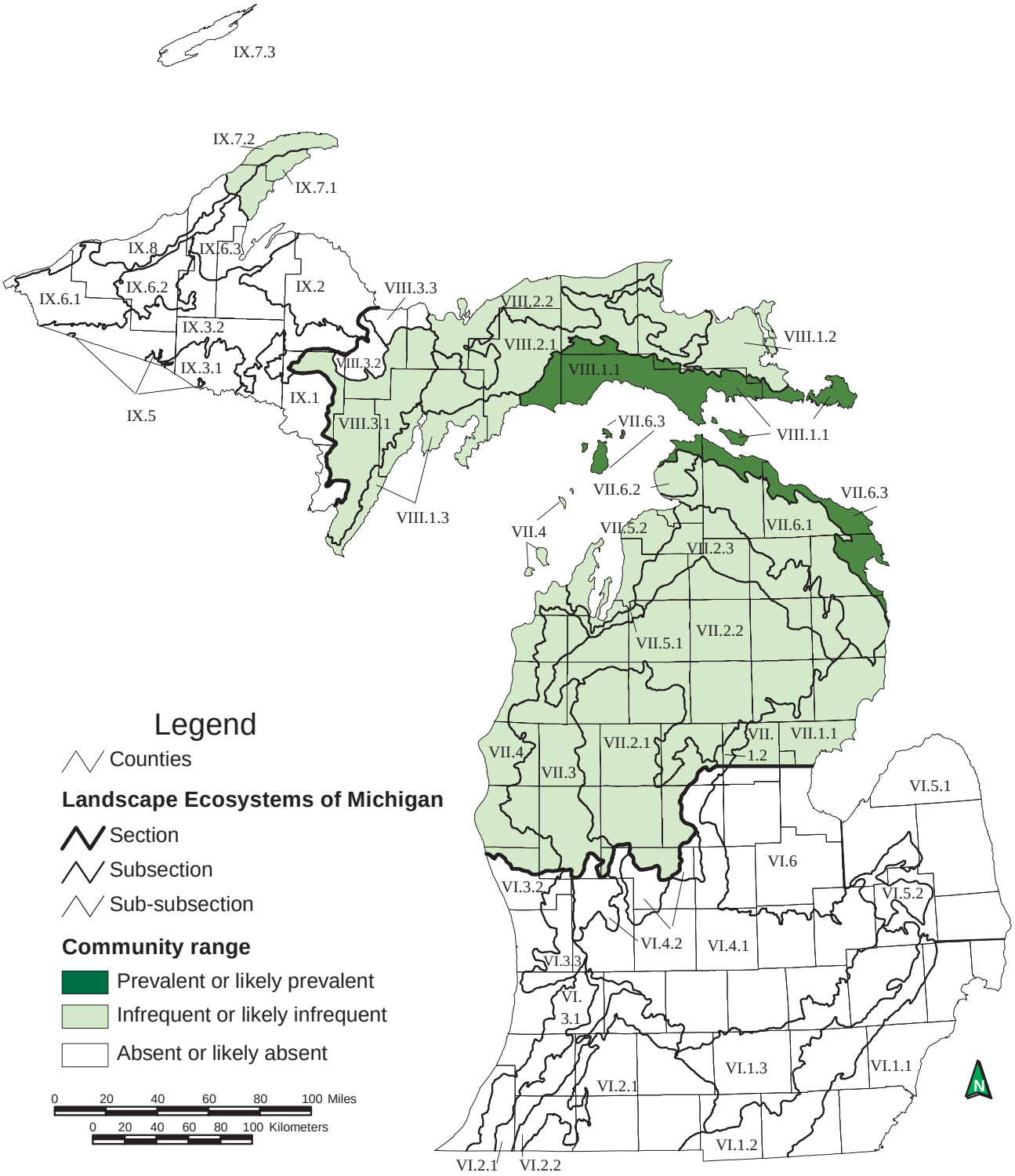
Thompson's Harbor northern fen. Photo by Joshua G. Cohen.

Aerial photograph of Thompson's Harbor northern fen.

Thompson's Harbor northern fen. Photo by Joshua G. Cohen.

OPEN DUNES

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



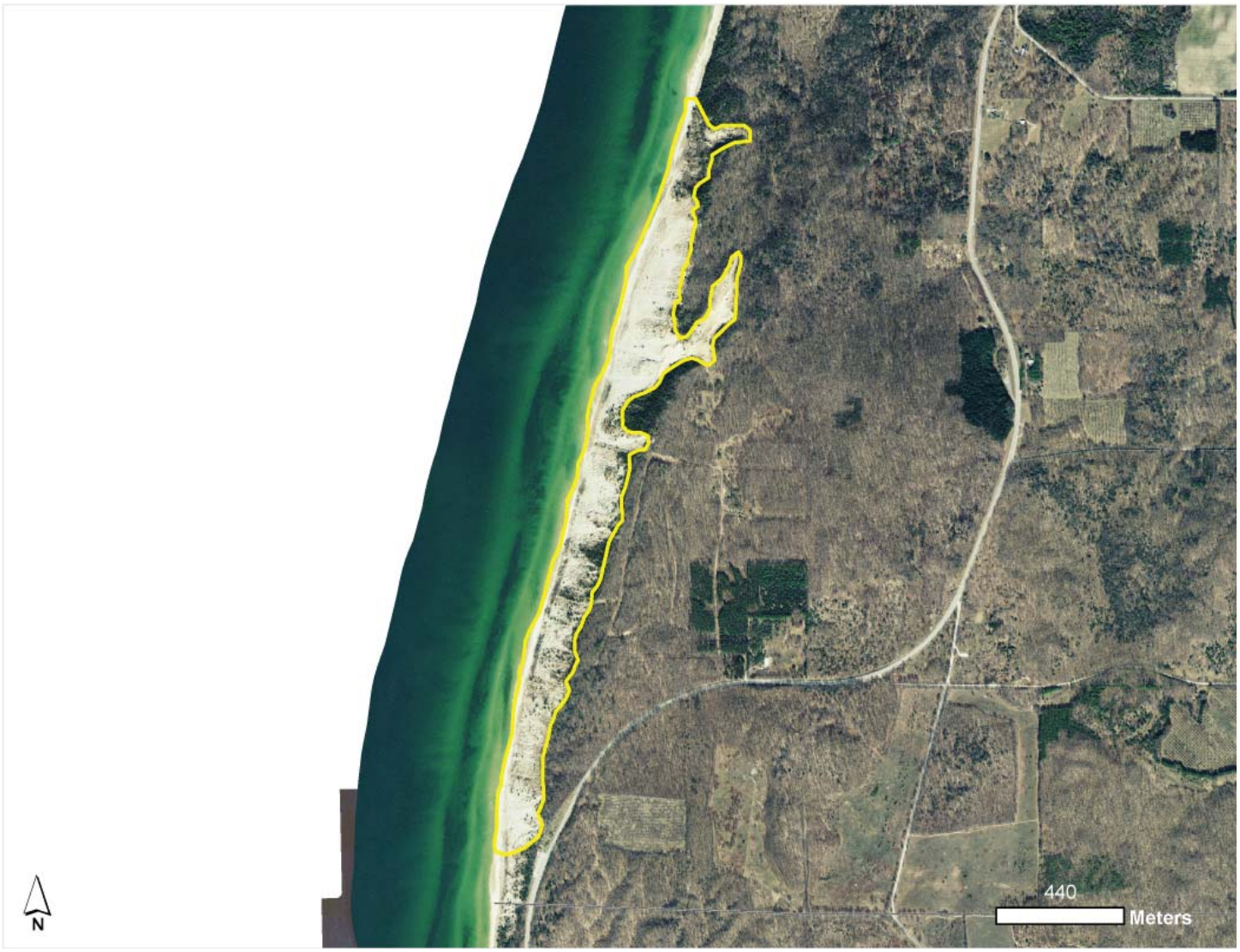
Map 19. Distribution of open dunes in Michigan (Albert et al. 2008).

66. Arcadia Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: BC
Size: 115 acres
Location: The C.S. Mott Nature Preserve, Benzie County
Land Manager: Grand Traverse Land Conservancy
Element Occurrence Identification Number: 20456 (New EO)

Threats: Species composition and structure are driven by natural processes but are influenced by invasive plants, deer browse, and foot traffic and erosion. Foot traffic is concentrated in the perched dune since a hiking trail passes through this portion of the complex. Deer trails also occur throughout the dune complex. Non-native species are locally common in the perched dunes and include Canada bluegrass (*Poa compressa*), spotted knapweed (*Centaurea stoebe*), and bladder campion (*Silene vulgaris*). White sweet-clover (*Melilotus albus*) is locally dominant in the bluff, especially along its lower margins. Silver poplar (*Populus alba*) is locally abundant in the overstory and understory in the southern portion of the bluff, and black locust (*Robinia pseudoacacia*) occurs locally on the bluff.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to continue eliminating clusters of non-native plants in the dune complex. According to a sign within the perched dunes, the Grand Traverse Land Conservancy has been actively treating spotted knapweed, baby's breath (*Gypsophila paniculata*), and lyme grass (*Leymus arenarius*) since 2003. It is important to monitor for invasive species following such control efforts. Foot traffic on the bluffs could be reduced by educating park users about the fragile nature of open dunes. Reducing the deer population in the local area would lower browse pressure on the shoreline ecosystems.

Arcadia Dunes. Photo by Joshua G. Cohen.



Aerial photograph of Arcadia Dunes.

Arcadia Dunes. Photo by Joshua G. Cohen.

67. Duck Lake Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 19 acres
Location: Duck Lake State Park, Muskegon County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20461 (New EO)

Threats: Species composition and structure are driven by natural processes but have been profoundly impacted by invasive species. Threats include invasive plants and foot traffic and erosion. Locally common invasives in the open dunes include black locust (*Robinia pseudoacacia*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), spotted knapweed (*Centaurea stoebe*), and Canada bluegrass (*Poa compressa*). Black locust occurs mostly in the shrub and sapling layers but there are some scattered small tree-sized individuals. Foot trails occur throughout the dunes and areas of localized erosion occur along the upper margins of the dunes where people are establishing hammocks between the trees. The southern portion of the dunes is more degraded from foot traffic and areas of the dunes here are devegetated from foot traffic to and from the adjacent beach.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants in the dune complex. It is important to monitor for invasive species following such control efforts. Foot traffic on the dunes could be reduced by educating park users about the fragile nature of open dunes.

Duck Lake Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Duck Lake Dunes.

68. Green Point Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: BC
Size: 90 acres
Location: Green Point Dunes Nature Preserve, Benzie County
Land Manager: Grand Traverse Land Conservancy
Element Occurrence Identification Number: 20481 (New EO)

Threats: Species composition and structure are driven by natural processes but are impacted by invasive plants, deer browse, and foot traffic and erosion. Infrequent foot traffic from hikers along the bluffs has resulted in localized erosion. Non-native species are locally common along the bluff and include autumn-olive (*Elaeagnus umbellata*), spotted knapweed (*Centaurea stoebe*), Canada bluegrass (*Poa compressa*), and white sweet-clover (*Melilotus albus*) (locally prevalent along the base of the dunes). Deer trails were noted along the bluffs and northern white-cedar (*Thuja occidentalis*) has been browsed by deer.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants in the dune complex. It is important to monitor for invasive species following such control efforts. Foot traffic on the bluffs could be reduced by educating park users about the fragile nature of open dunes. The deer population in the local area could be decreased to reduce the deer browse pressure on the shoreline ecosystems.

Green Point Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Green Point Dunes.

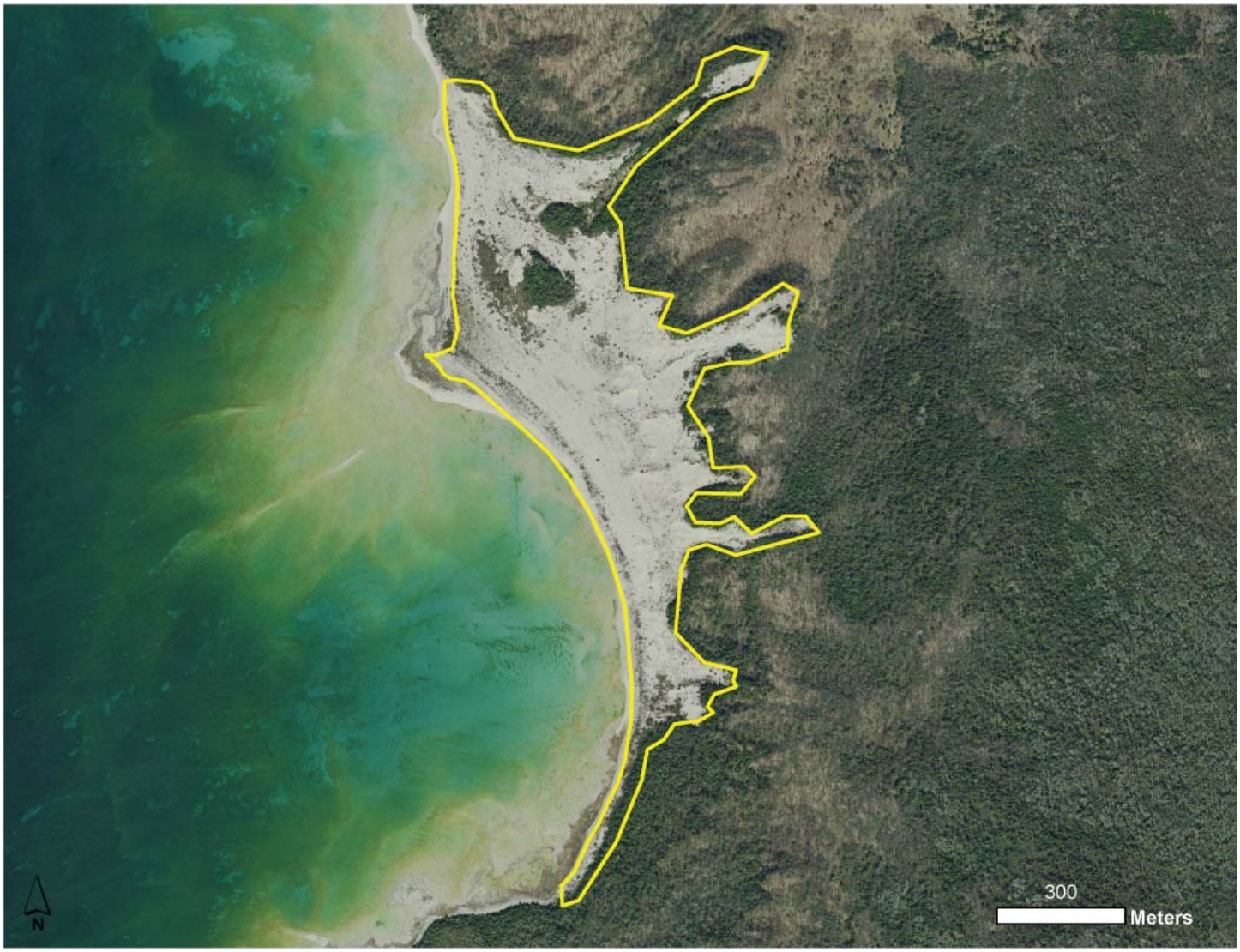
Green Point Dunes. Photo by Joshua G. Cohen.

69. High Island
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: A
Size: 142 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 10698 (EO update)

Threats: Species composition and structure are driven by natural processes. Invasives found along the shoreline include mossy stonecrop (*Sedum acre*), narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and white sweet-clover (*Melilotus albus*).

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

High Island open dunes. Photo by Joshua G. Cohen.



Aerial photograph of High Island open dunes.

High Island open dunes. Photo by Joshua G. Cohen.

70. Kirk Park Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: CD
Size: 11 acres
Location: Kirk Park, Ottawa County
Land Manager: Ottawa County Parks
Element Occurrence Identification Number: 20463 (New EO)

Threats: Species composition and structure are driven by natural processes but are impacted by invasive plants and foot traffic and erosion. Non-native species locally common in the dunes include black locust (*Robinia pseudoacacia*), scotch pine (*Pinus sylvestris*), Lombardy poplar (*Populus nigra*), Canada bluegrass (*Poa compressa*), and common mullein (*Verbascum thapsus*). Black locust has been treated within the dune complex.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to continue eliminating clusters of non-native plants in the dune complex. It is important to monitor for invasive species following such control efforts.

Kirk Park Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Kirk Park Dunes.

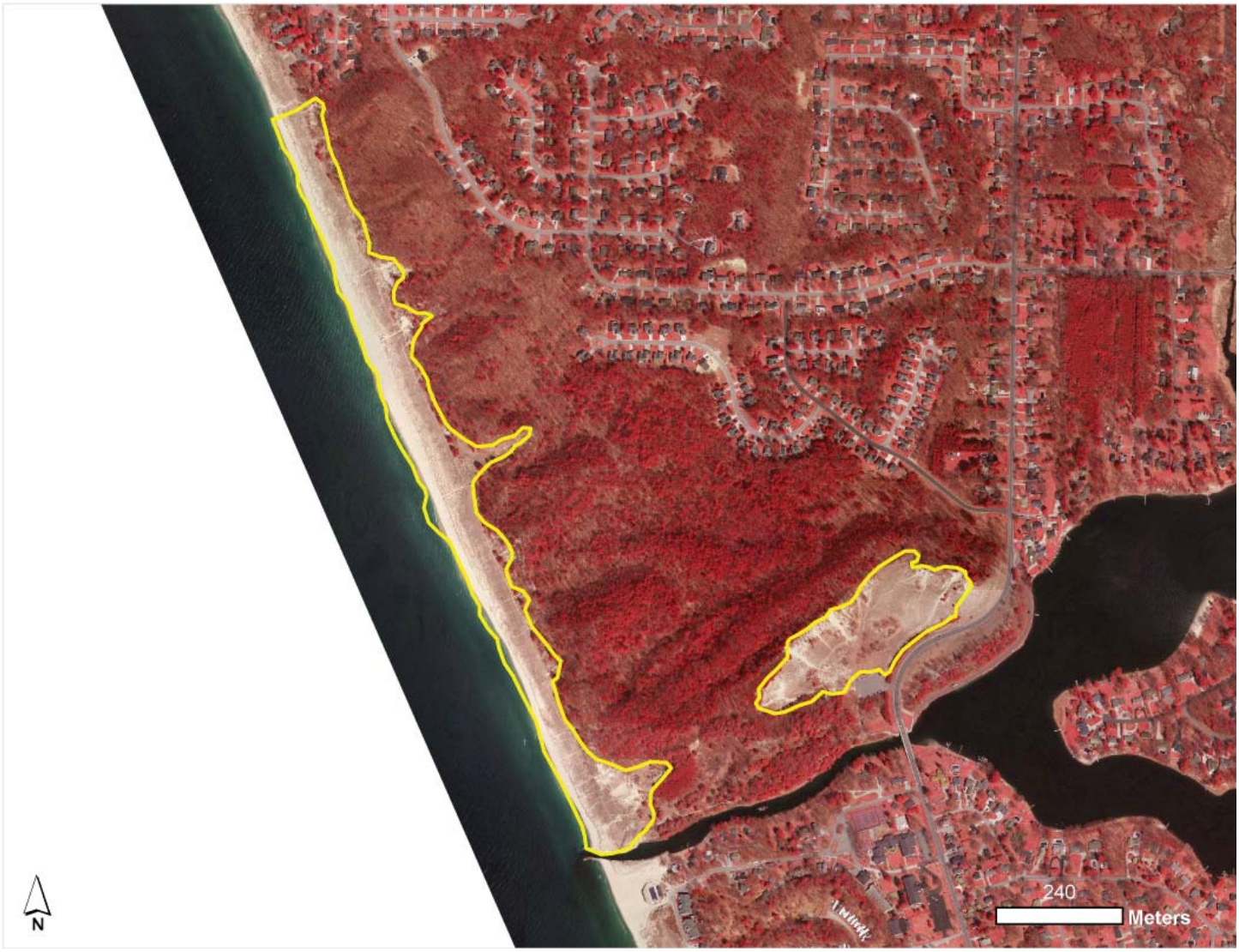
Lombardy poplar in Kirk Park Dunes. Photo by Joshua G. Cohen.

71. Lake Harbor Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: CD
Size: 49 acres
Location: Lake Harbor Park, Muskegon County
Land Manager: City of Norton Shores
Element Occurrence Identification Number: 20462 (New EO)

Threats: Species composition and structure are driven by natural processes but have been profoundly impacted by invasive species and anthropogenic activity. Threats include invasive plants, foot traffic and erosion, and tree planting. Much of the area that formerly supported open dunes is now pine plantation with the pines having been planted to stabilize the shifting dune sands. Locally common invasives in the open dunes include black locust (*Robinia pseudoacacia*), Austrian pine (*Pinus nigra*), scotch pine (*P. sylvestris*), and Oriental bittersweet (*Celastrus orbiculatus*). In addition to foot trails, old off-road vehicle tracks were observed in the blow out that is set back from the lakeshore. This blow out occurs adjacent to a paved road and a paved parking lot. A wooded stairway occurs along the long narrow blow out in the central portion of the dune complex.

Management Recommendations: The primary management recommendations are to eliminate clusters of non-native plants in the dune complex and remove the pine plantations to expand the area of open dunes. It is important to monitor for invasive species following such control efforts. Foot and vehicle traffic on the dunes could be reduced by educating park users about the fragile nature of open dunes.

Lake Harbor Dunes. Photo by Joshua G. Cohen.



Aerial photograph of Lake Harbor Dunes.

72. Lookout Point
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: CD
Size: 20 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 6701 (EO Update)

Threats: Species composition and structure are driven by natural processes but are impacted by invasive plants and foot traffic and erosion. Bladder campion (*Silene vulgaris*) is common and spotted knapweed (*Centaurea stoebe*) occurs occasionally, especially in stabilized areas. Moist beach flats are often weedy with Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), and white sweet-clover (*Melilotus albus*) among the characteristic species.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered, eliminate clusters of non-native plants in the dune complex, and restrict foot traffic to sanctioned trails. It is important to monitor for invasive species following such control efforts.

Lookout Point open dunes. Photo by Bradford S. Slaughter.

Aerial photograph of Lookout Point open dunes.

73. Maple Bay Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 9 acres
Location: Maple Bay Natural Area, Grand Traverse County
Land Manager: Grand Traverse Land Conservancy
Element Occurrence Identification Number: 20484 (New EO)

Threats: Species composition and structure are driven by natural processes but are impacted by invasive plants and foot traffic and erosion. A bulldozer passed through the upper margin of the dunes. Non-native species locally common in the dunes include Lombardy poplar (*Populus nigra*), silver poplar (*P. alba*), Siberian elm (*Ulmus pumila*), spotted knapweed (*Centaurea stoebe*), Canada bluegrass (*Poa compressa*), and bladder campion (*Silene vulgaris*). Narrow-leaved cat-tail (*Typha angustifolia*) was noted locally within slivers of interdunal wetland along the shoreline. Lombardy poplar has been cut and likely herbicided.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to continue eliminating clusters of non-native plants in the dune complex. It is important to monitor for invasive species following such control efforts.

Maple Bay Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Maple Bay Dunes.

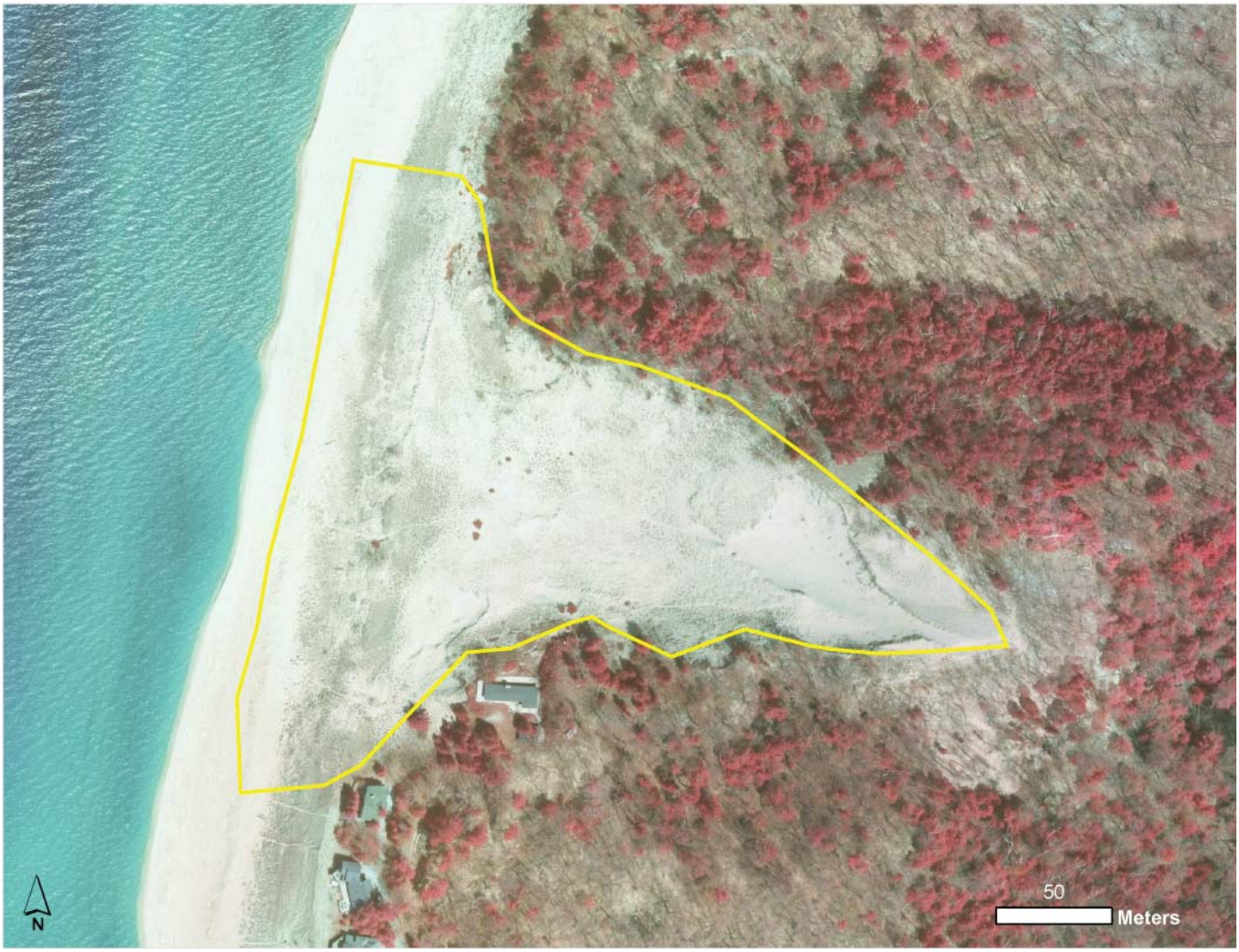
Silver poplar is locally common in Maple Bay Dunes. Photo by Joshua G. Cohen.

74. Portage Point Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 12 acres
Location: Elberta-Portage Point Easement, Manistee County
Land Owner: The Nature Conservancy
Element Occurrence Identification Number: 20457 (New EO)

Threats: Species composition and structure are driven by natural processes. No invasive species were noted during the course of the survey. A fair amount of foot traffic was noted within this open dune. A residence occurs on the southwestern edge of the dunes and much of the foot traffic is likely associated with this house. Deer browse was prevalent within the surrounding forest and was also noted within the dunes.

Management Recommendations: The primary management recommendations are to maintain a forested buffer surrounding the dunes, monitor for invasive species and deer herbivory, and limit erosion from foot traffic. Foot traffic on the dunes could be reduced by educating preserve users and adjacent residents about the fragile nature of open dunes.

Portage Point Dunes. Photo by Joshua G. Cohen.



Aerial photograph of Portage Point Dunes.

Portage Point Dunes. Photo by Joshua G. Cohen.

75. Saugatuck Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: BC
Size: 336 acres
Location: Mount Baldhead and Oval Beach Recreation Area, Saugatuck Dunes State Park, Allegan County
Land Manager: City of Saugatuck and Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 6702 (EO update)

Threats: Within the Oval Beach portion of the dunes, species composition and structure are driven by natural processes but have been profoundly impacted by invasive species and anthropogenic activity. Threats include invasive plants, foot traffic and erosion, and tree planting. Some of the area that formerly supported open dunes is now pine plantation with the pines having been planted to stabilize the shifting dune sands. Locally common invasives in the open dunes include black locust (*Robinia pseudoacacia*), Austrian pine (*Pinus nigra*), Lombardy poplar (*Populus nigra*), Tartatian honeysuckle (*Lonicera tatarica*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), and spotted knapweed (*Centaurea stoebe*). Lombardy poplar is locally abundant in the dune field, constituting approximately 5% canopy cover. Some of the smaller blowouts within the dune complex have been completely denuded of vegetation due to foot traffic. In addition, deer trails, pellets, and browse were observed throughout the site.

Management Recommendations: The primary management recommendations are to eliminate clusters of non-native plants in the dune complex and remove the pine plantations to expand the area of open dunes. It is important to monitor for invasive species following such control efforts. Foot traffic on the dunes could be reduced by educating park users about the fragile nature of open dunes.

Saugatuck Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Saugatuck Dunes.

Japanese barberry is locally common in the Saugatuck Dunes. Photo by Joshua G. Cohen.

76. Tawas Dunes
Natural Community Type: Open Dunes
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 18 acres
Location: Tawas Point State Park, Iosco County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20483 (New EO)

Threats: Species composition and structure are driven by natural processes but are impacted by invasive plants and foot traffic and erosion. Spotted knapweed (*Centaurea stoebe*) occurs locally in the open dunes and reed (*Phragmites australis* subsp. *australis*) is locally dominant in the interdunal wetland inclusions within the open dunes.

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to continue eliminating clusters of non-native plants in the dune complex. It is important to monitor for invasive species following such control efforts. Foot traffic on the dunes could be reduced by educating park users about the fragile nature of open dunes.

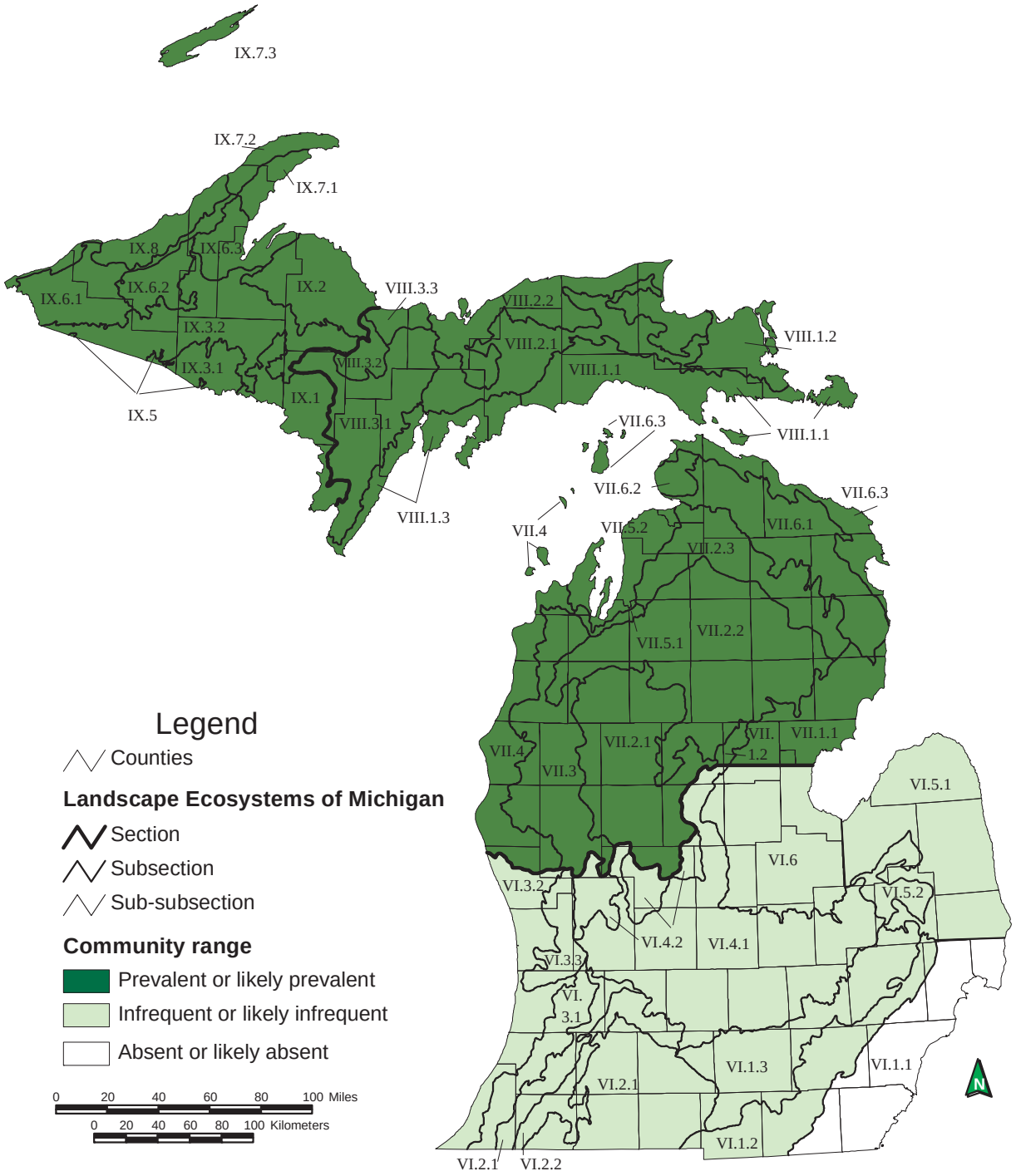
Tawas Dunes. Photo by Joshua G. Cohen.

Aerial photograph of Tawas Dunes.

Tawas Dunes. Photo by Joshua G. Cohen.

RICH CONIFER SWAMP

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



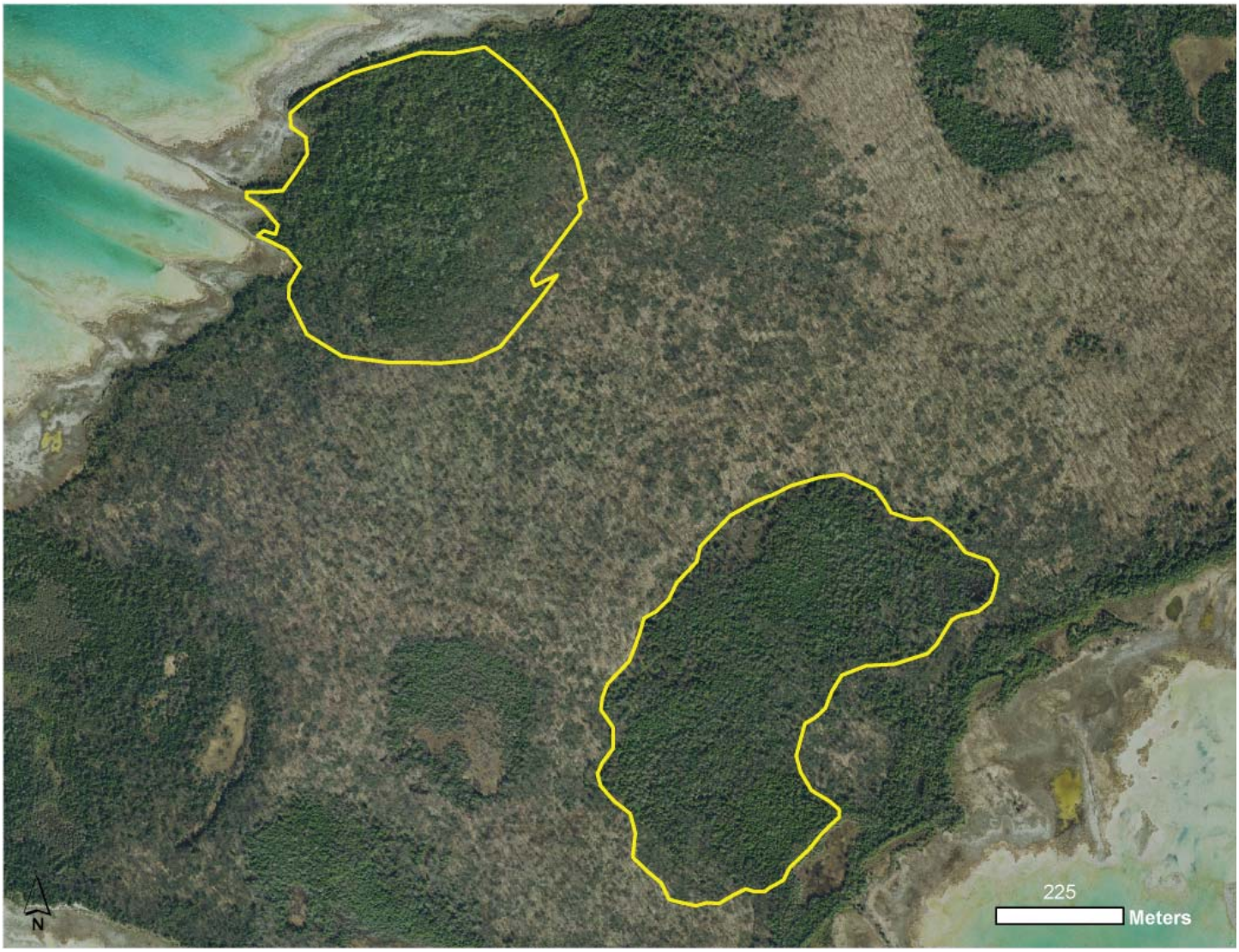
Map 20. Distribution of rich conifer swamp in Michigan (Albert et al. 2008).

77. Hog Island
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: AB
Size: 129 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 9639 (EO update)

Threats: Species composition and vegetative structure are patterned by natural processes. No current threats were observed during the course of the survey. Scattered cut stumps occur within the swamp.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the rich conifer, and monitor for invasive species and deer browse.

Hog Island rich conifer swamp. Photo by Joshua G. Cohen.



Aerial photograph of Hog Island rich conifer swamp.

78. Soper Swamp
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: C
Size: 25 acres
Location: Soper Natural Area, Leelanau County
Land Manager: Leelanau Conservancy
Element Occurrence Identification Number: 20467 (New EO)

Threats: Species composition and vegetative structure are patterned by natural processes but are also influenced by invasive species and deer herbivory. Invasives noted within the swamp include autumn-olive (*Elaeagnus umbellata*), multiflora rose (*Rosa multiflora*), and Japanese barberry (*Berberis thunbergii*), which is locally common. Deer trails occur throughout the swamp and deer browse pressure is likely limiting cedar regeneration and impacting floristic composition and vegetative structure.

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

Soper Swamp rich conifer swamp. Photo by Joshua G. Cohen.

Aerial photograph of Soper Swamp rich conifer swamp.

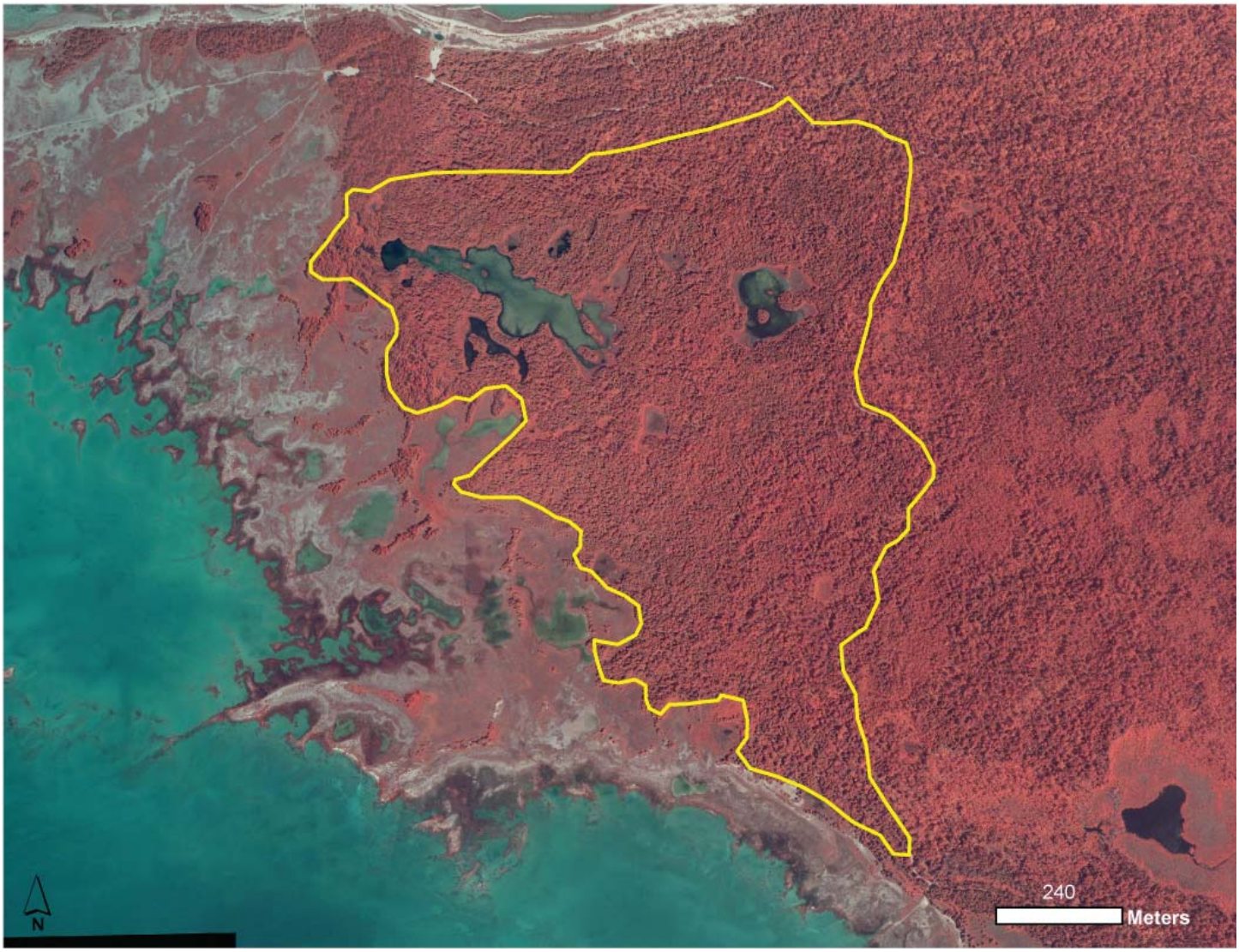
Soper Swamp rich conifer swamp. Photo by Joshua G. Cohen.

79. Waugoshance Swamp
Natural Community Type: Rich Conifer Swamp
Rank: G4 S3, apparently secure globally and vulnerable within the state
Element Occurrence Rank: B
Size: 215 acres
Location: Wilderness State Park, Emmet County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20445 (New EO)

Threats: Species composition and vegetative structure are patterned by natural processes but are also influenced by deer herbivory. Deer trails and browse were noted throughout the swamp. Deer browse pressure is likely limiting cedar regeneration and impacting floristic composition and vegetative structure.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the swamp, and reduce local deer densities to help reduce deer browse pressure.

Waugoshance Swamp rich conifer swamp. Photo by Joshua G. Cohen.

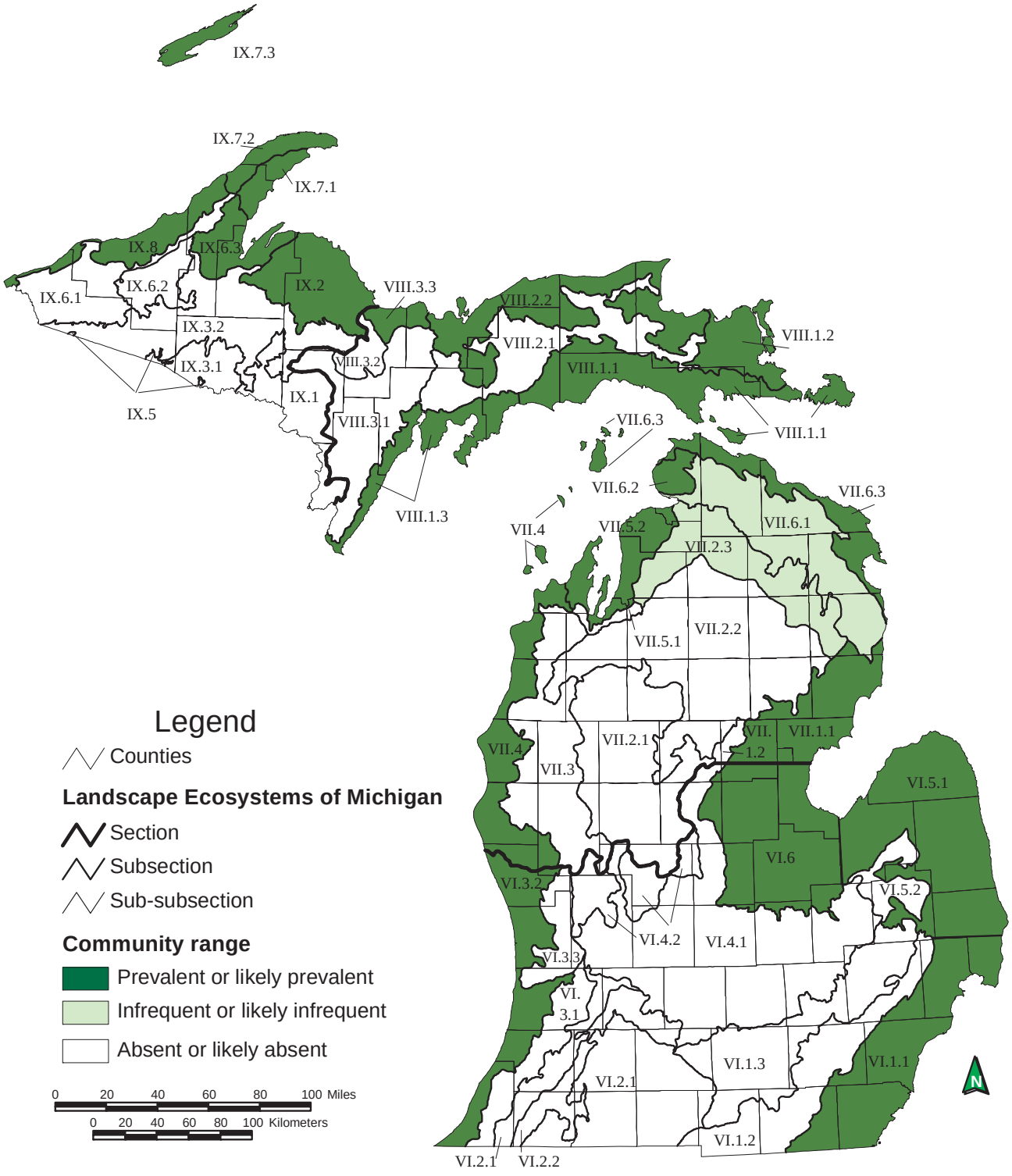


Aerial photograph of Waugoshance Swamp rich conifer swamp.

Waugoshance Swamp rich conifer swamp. Photo by Joshua G. Cohen.

SAND AND GRAVEL BEACH

Overview: Sand and gravel beaches occur along the shorelines of the Great Lakes and on some of Michigan's larger freshwater lakes, where wind, waves, and winter ice cause the shoreline to be too unstable to support aquatic vegetation. Because of the high levels of disturbance, these beaches are typically quite open, with sand and gravel sediments and little or no vegetation (Kost et al. 2007, Cohen et al. 2014).



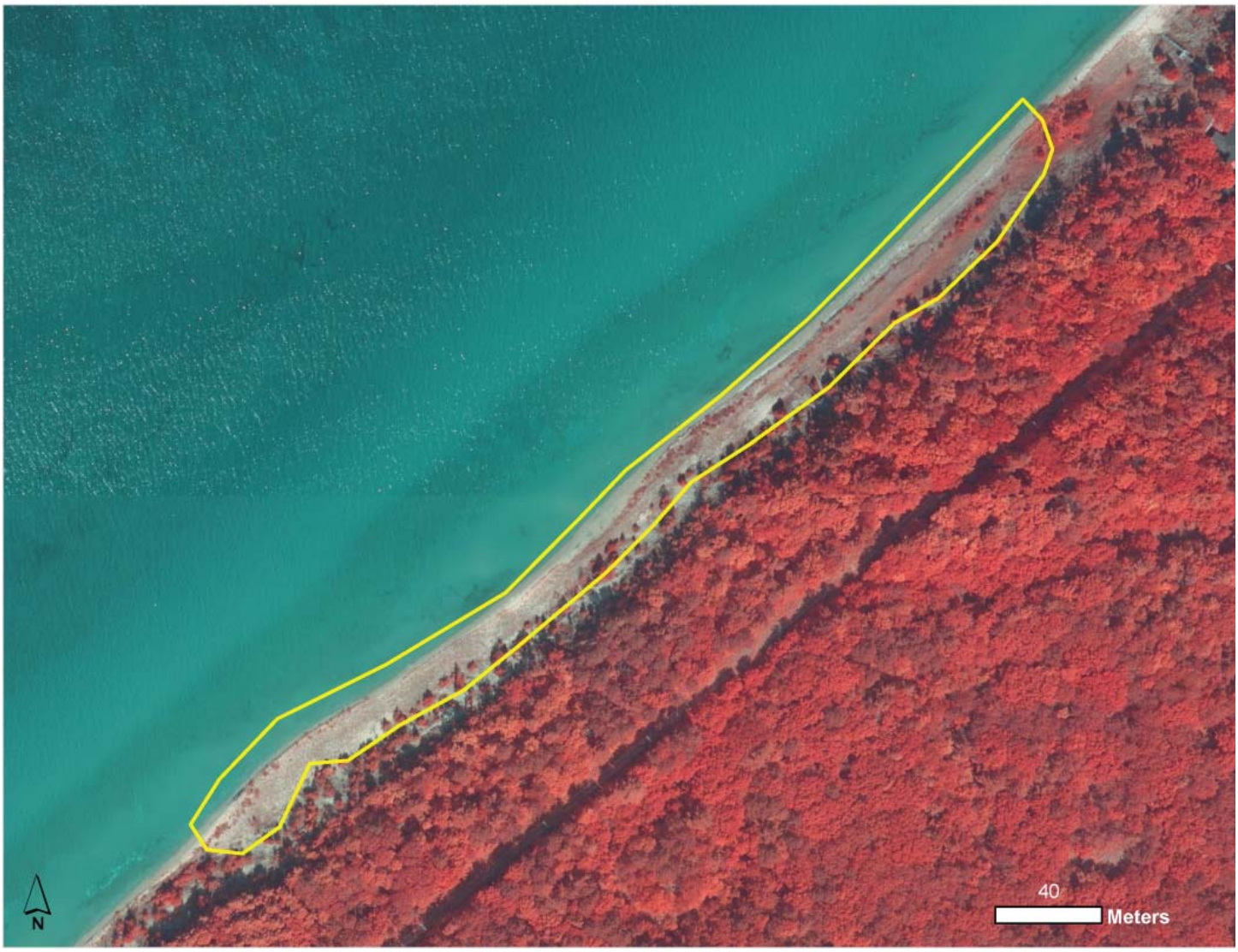
Map 21. Distribution of sand and gravel beach in Michigan (Albert et al. 2008).

80. Fisher Beach
Natural Community Type: Sand and Gravel Beach
Rank: G3? S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 2.4 acres
Location: Fisher Nature Preserve, Emmet County
Land Manager: Little Traverse Conservancy
Element Occurrence Identification Number: 20444 (New EO)

Threats: Species composition and community structure patterned by natural processes. Threats limited to foot traffic and non-native species spread. Spotted knapweed (*Centaurea stoebe*) was noted along the beach.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to maintain a forested buffer surrounding the lakeshore to prevent the increase of a weedy seed source. Spotted knapweed occurring along the shoreline should be removed. Monitoring efforts to detect invasive species and evaluate control efforts should be implemented.

Fisher Beach sand and gravel beach. Photo by Joshua G. Cohen.



Aerial photograph of Fisher beach sand and gravel beach.

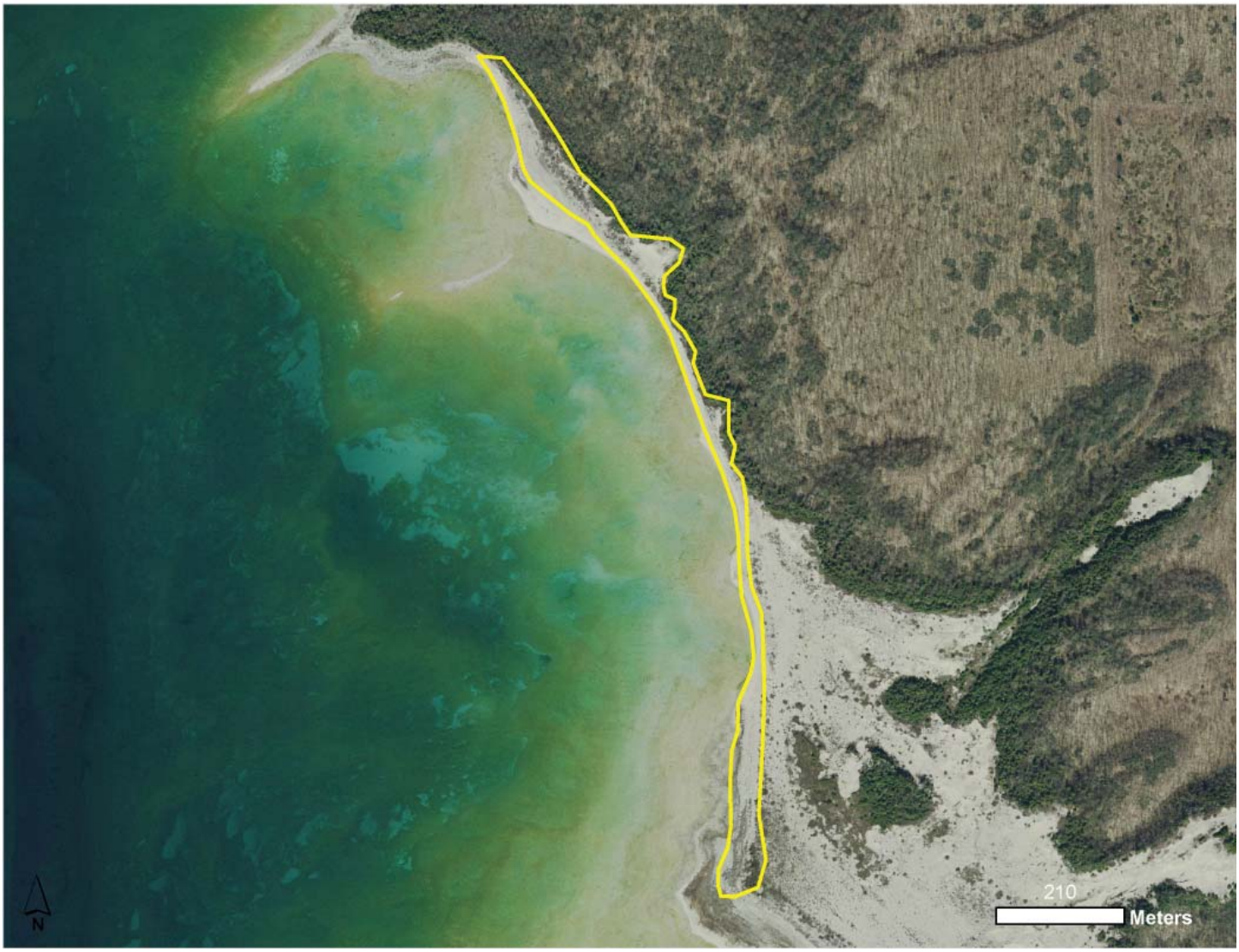
Fisher Beach sand and gravel beach. Photo by Joshua G. Cohen.

81. High Island
Natural Community Type: Sand and Gravel Beach
Rank: G3? S3, vulnerable throughout range
Element Occurrence Rank: A
Size: 15 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 13026 (EO update)

Threats: Species composition and structure are driven by natural processes. Mossy stonecrop (*Sedum acre*) is locally common within the sand and gravel beach. Additional invasives found along the shoreline include Canada bluegrass (*Poa compressa*), spotted knapweed (*Centaurea stoebe*), narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and white sweet-clover (*Melilotus albus*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants along the shoreline. Monitoring for these invasive species within the sand and gravel beach should be implemented and they should be controlled in nearshore areas adjacent to the sand and gravel beach.

High Island sand and gravel beach. Photo by Joshua G. Cohen.



Aerial photograph of High Island sand and gravel beach.

High Island sand and gravel beach. Photo by Joshua G. Cohen.

82. High Island Bay
Natural Community Type: Sand and Gravel Beach
Rank: G3? S3, vulnerable throughout range
Element Occurrence Rank: A
Size: 28 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 10977 (EO update)

Threats: Species composition and structure are driven by natural processes. Mossy stonecrop (*Sedum acre*) and spotted knapweed (*Centaurea stoebe*) are locally common within the sand and gravel beach. Additional invasives found along the shoreline include Canada bluegrass (*Poa compressa*), narrow-leaved cat-tail (*Typha angustifolia*), reed (*Phragmites australis* subsp. *australis*), and white sweet-clover (*Melilotus albus*).

Management Recommendations: The primary management recommendations are to allow natural processes to operate unhindered and to eliminate clusters of non-native plants along the shoreline. Monitoring for these invasive species within the sand and gravel beach should be implemented and they should be controlled in nearshore areas adjacent to the sand and gravel beach.

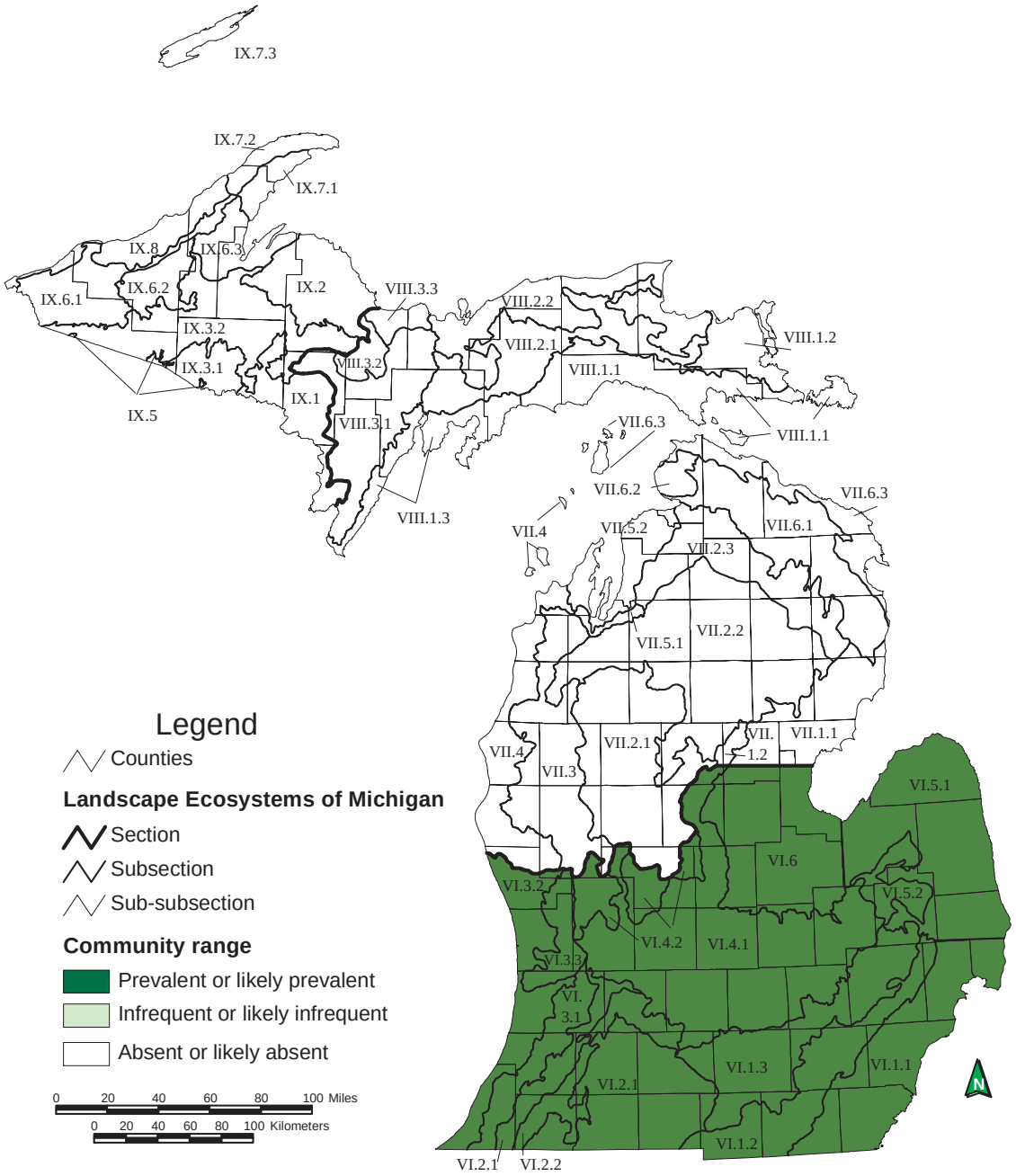
High Island Bay sand and gravel beach. Photo by Joshua G. Cohen.

Aerial photograph of High Island Bay sand and gravel beach.

High Island Bay sand and gravel beach. Photo by Joshua G. Cohen.

SOUTHERN HARDWOOD SWAMP

Overview: Southern hardwood swamp is a minerotrophic forested wetland occurring in southern Lower Michigan on mineral or occasionally organic soils dominated by a mixture of lowland\ hardwoods. Conifers are absent or local. The community occupies shallow depressions and high-order stream drainages on a variety of landforms. Southern hardwood swamp occurs in poorly drained depressions on glacial lakeplain, outwash plains and channels, end moraines, till plains, and perched dunes. Soils are typically loam or silt loam, sometimes sandy loam or clay loam, of neutral to mildly alkaline pH (sandy substrates are more acidic), and sometimes covered by a thin layer of muck. An underlying impermeable clay lens is often present and allows for prolonged pooling of water. Water levels fluctuate seasonally, with standing water typically occurring throughout winter and spring. Due to anaerobic conditions associated with prolonged inundation and a high water table, trees are shallowly rooted and prone to frequent blowdown. The canopy is typically dominated by silver maple (*Acer saccharinum*), red maple (*A. rubrum*), green ash (*Fraxinus pennsylvanica*), and black ash (*Fraxinus nigra*) (Kost et al. 2007, Cohen et al. 2014).



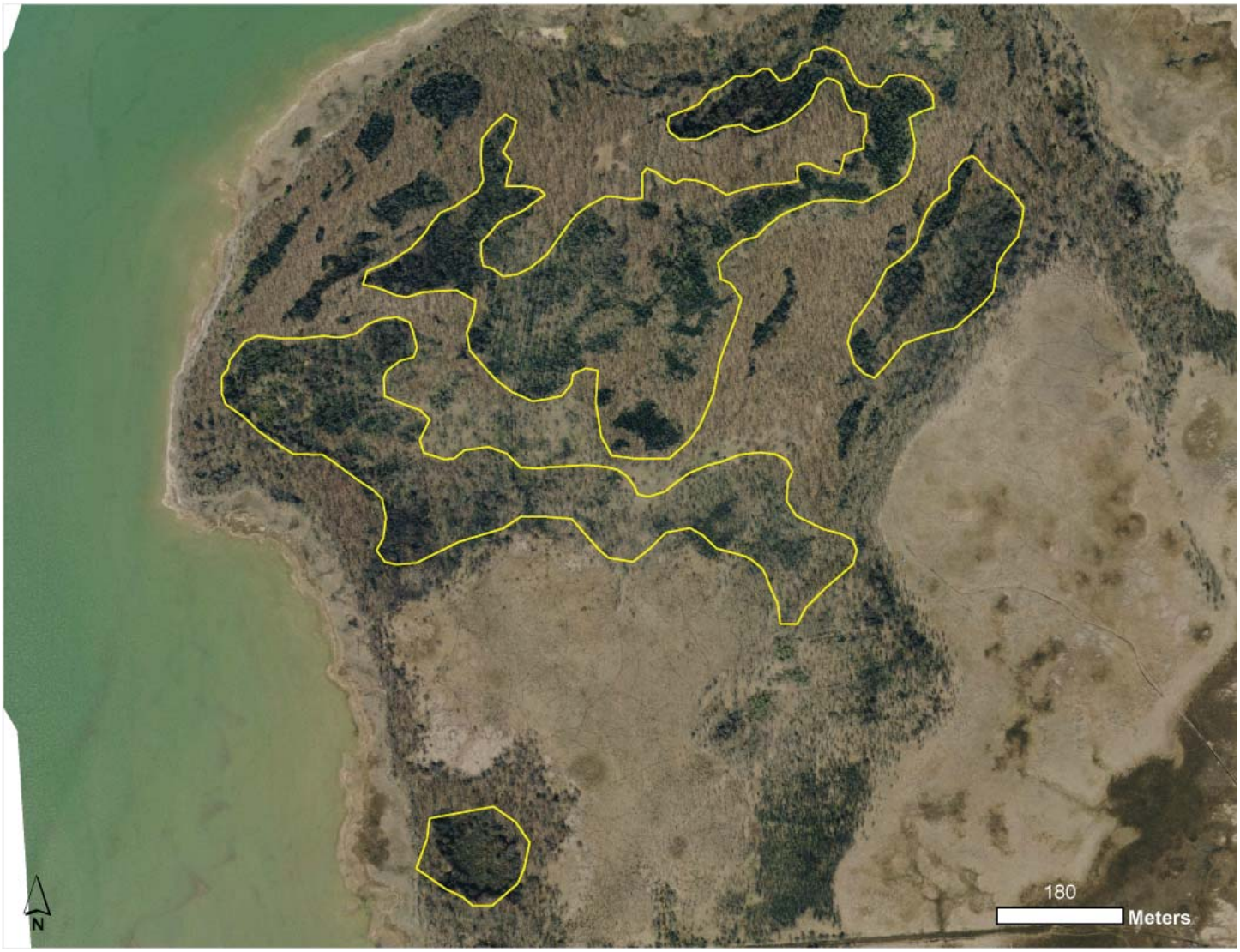
Map 22. Distribution of southern hardwood swamp in Michigan (Albert et al. 2008).

83. Heisterman Swamp
Natural Community Type: Southern Hardwood Swamp
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: BC
Size: 83 acres
Location: Wildfowl Bay State Wildlife Area, Huron County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20470 (New EO)

Threats: The species composition and structure of this swamp are influenced by natural processes. Deer browse was noted as prevalent on Heisterman Island and invasive species occur throughout the surrounding lakeplain oak openings. Canopy ash within the swamp has not yet been impacted by emerald ash borer.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, monitor for invasives and deer browse, and to retain an intact buffer of natural communities surrounding the southern hardwood swamp.

Heisterman Swamp southern hardwood swamp. Photo by Joshua G. Cohen.



Aerial photograph of Heisterman Swamp southern hardwood swamp.

Heisterman Swamp southern hardwood swamp. Photo by Joshua G. Cohen.

SUBMERGENT MARSH

Overview: Submergent marsh is an herbaceous plant community that occurs in deep to sometimes shallow water in lakes and streams throughout Michigan. Soils are characterized by loosely consolidated organics of variable depth that range from acid to alkaline and accumulate over all types of mineral soil, even bedrock. Submergent vegetation is composed of both rooted and non-rooted submergent plants, rooted floating-leaved plants, and non-rooted floating plants. Common submergent plants include common waterweed (*Elodea canadensis*), water star-grass (*Heteranthera dubia*), milfoils (*Myriophyllum* spp.), naiads (*Najas* spp.), pondweeds (*Potamogeton* spp.), stoneworts (*Chara* spp. and *Nitella* spp.), coontail (*Ceratophyllum demersum*), bladderworts (*Utricularia* spp.), and water-celery (*Vallisneria americana*) (Kost et al. 2007, Cohen et al. 2014).

Map 23. Distribution of submergent marsh in Michigan (Albert et al. 2008).

84. Hamlin Lake Marsh
Natural Community Type: Submergent Marsh
Rank: GU S4, globally unrankable and secure within the state
Element Occurrence Rank: B
Size: 29 acres
Location: Ludington State Park, Mason County
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 20460 (New EO)

Threats: The site is shaped by natural processes and is buffered by adjacent uplands and wetlands. The invasive narrow-leaved cat-tail (*Typha angustifolia*) is locally dominant within areas of emergent marsh.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the wetland to minimize the threat of hydrological alteration, and monitor for invasive species.

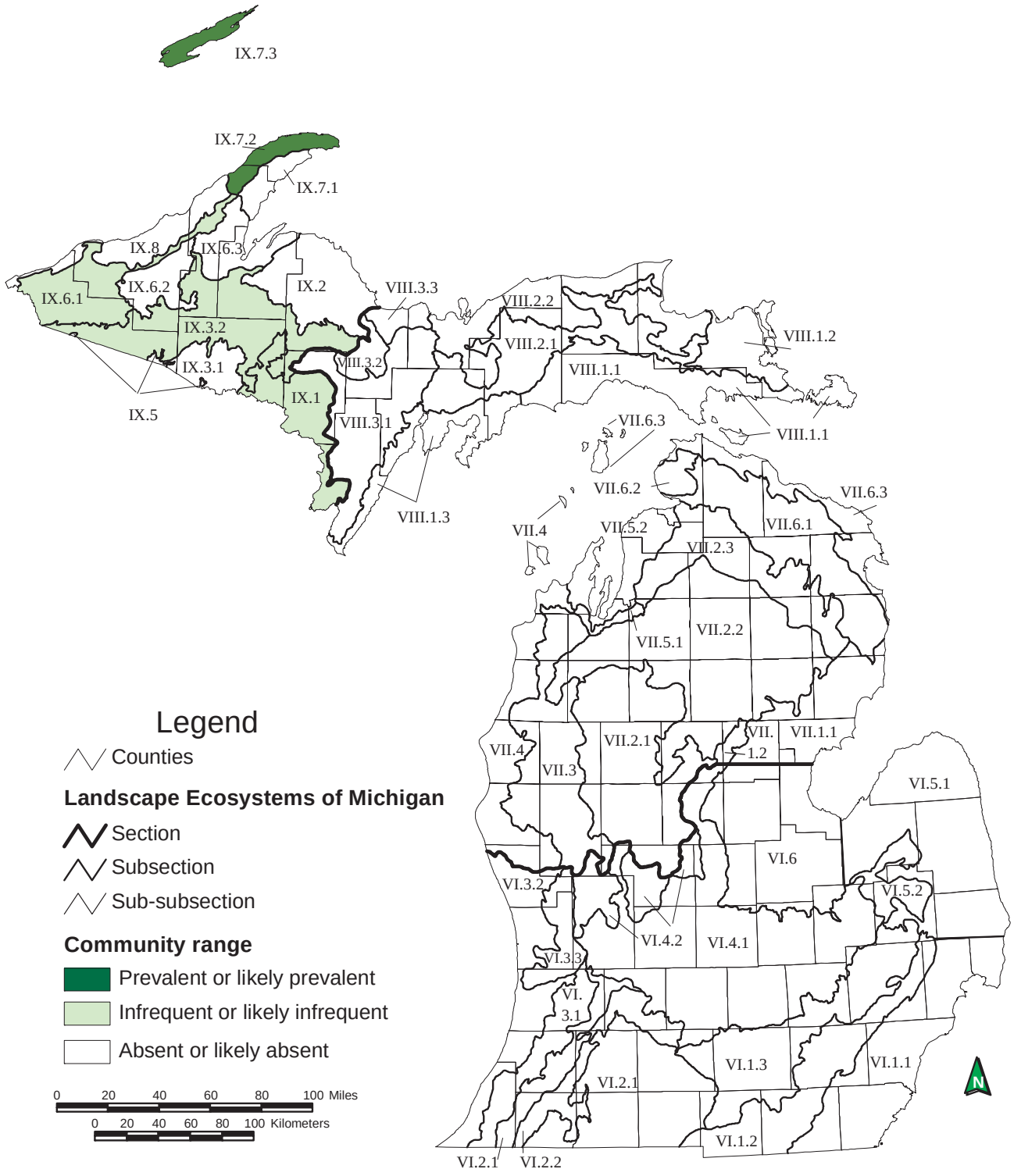
Hamlin Lake Marsh submergent marsh. Photo by Joshua G. Cohen.

Aerial photograph of Hamlin Lake Marsh submergent marsh.

Hamlin Lake Marsh submergent marsh. Photo by Joshua G. Cohen.

VOLCANIC BEDROCK GLADE

Overview: Volcanic bedrock glade consists of an open forested or savanna community found where basaltic bedrock and conglomerates are exposed. The sparse vegetation consists of scattered open-grown trees, scattered shrubs or shrub thickets, and a partial turf of herbs, grasses, sedges, mosses, and lichens. The community occurs in the western Upper Peninsula on Isle Royale and the Keweenaw Peninsula, extending southwest into Houghton, Ontonagon, and Gogebic Counties (Kost et al. 2007, Cohen et al. 2014).



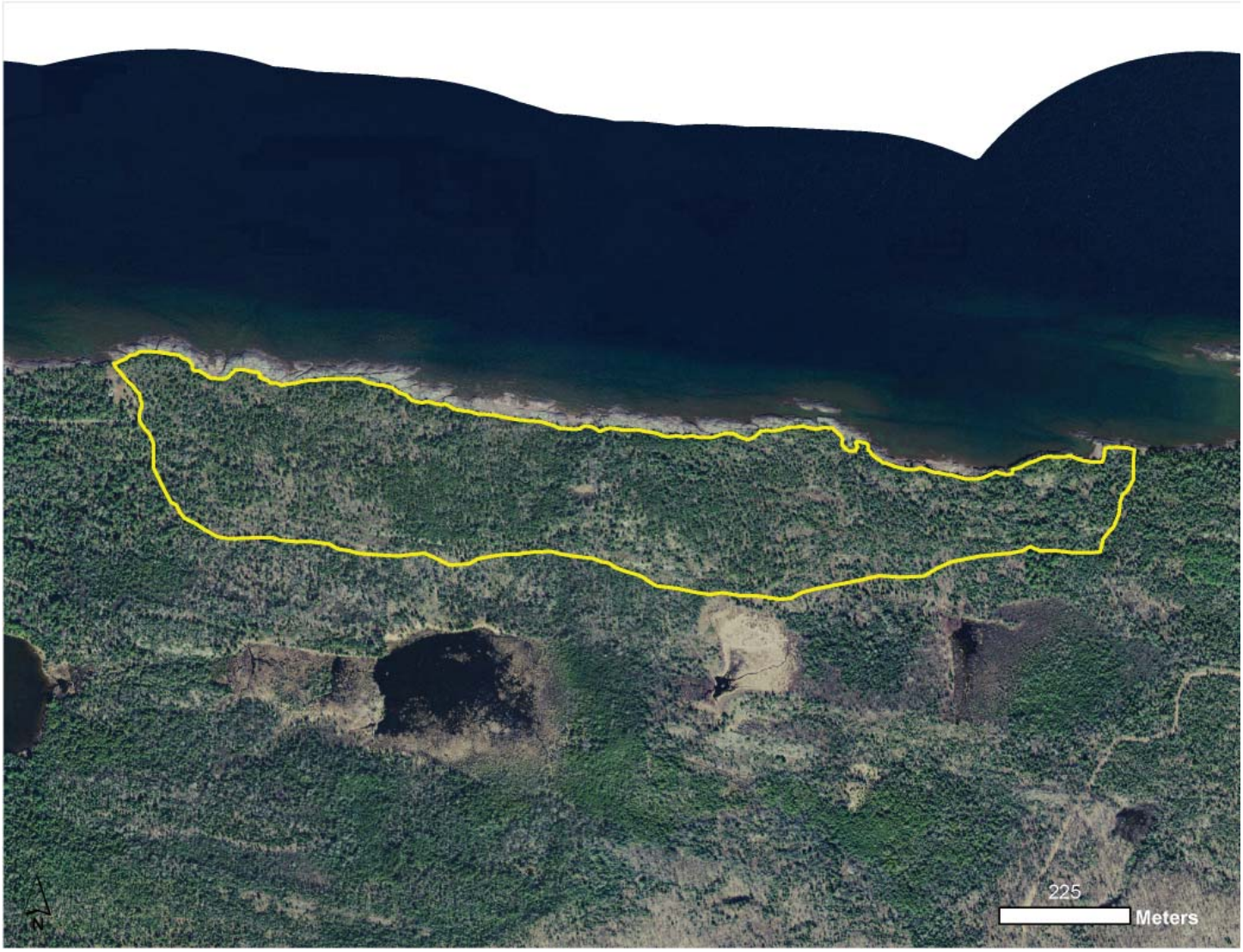
Map 24. Distribution of volcanic bedrock glade in Michigan (Albert et al. 2008).

85. Horseshoe Harbor
Natural Community Type: Volcanic Bedrock Glade
Rank: GU S3, globally unrankable and vulnerable within the state
Element Occurrence Rank: AB
Size: 98 acres
Location: Mary Macdonald Preserve, Keweenaw County
Land Manager: The Nature Conservancy
Element Occurrence Identification Number: 1911 (EO update)

Threats: The species composition and structure of this glade are influenced by natural processes. Non-native species are locally common to dominant and include common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), timothy (*Phleum pratense*), and sheep sorrel (*Rumex acetosella*). Cut stumps occur scattered throughout the glade. Logging of the surrounding forests could increase the seed source for weedy species, which could be windblown or bird-dispersed onto the glades.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered (i.e., let wildfires burn), to control non-native plants, and to maintain a forested buffer surrounding the glade to prevent the increase of a weedy seed source. Monitoring efforts to detect invasive species and evaluate control efforts should be implemented.

Horseshoe Harbor volcanic bedrock glade. Photo by Joshua G. Cohen.

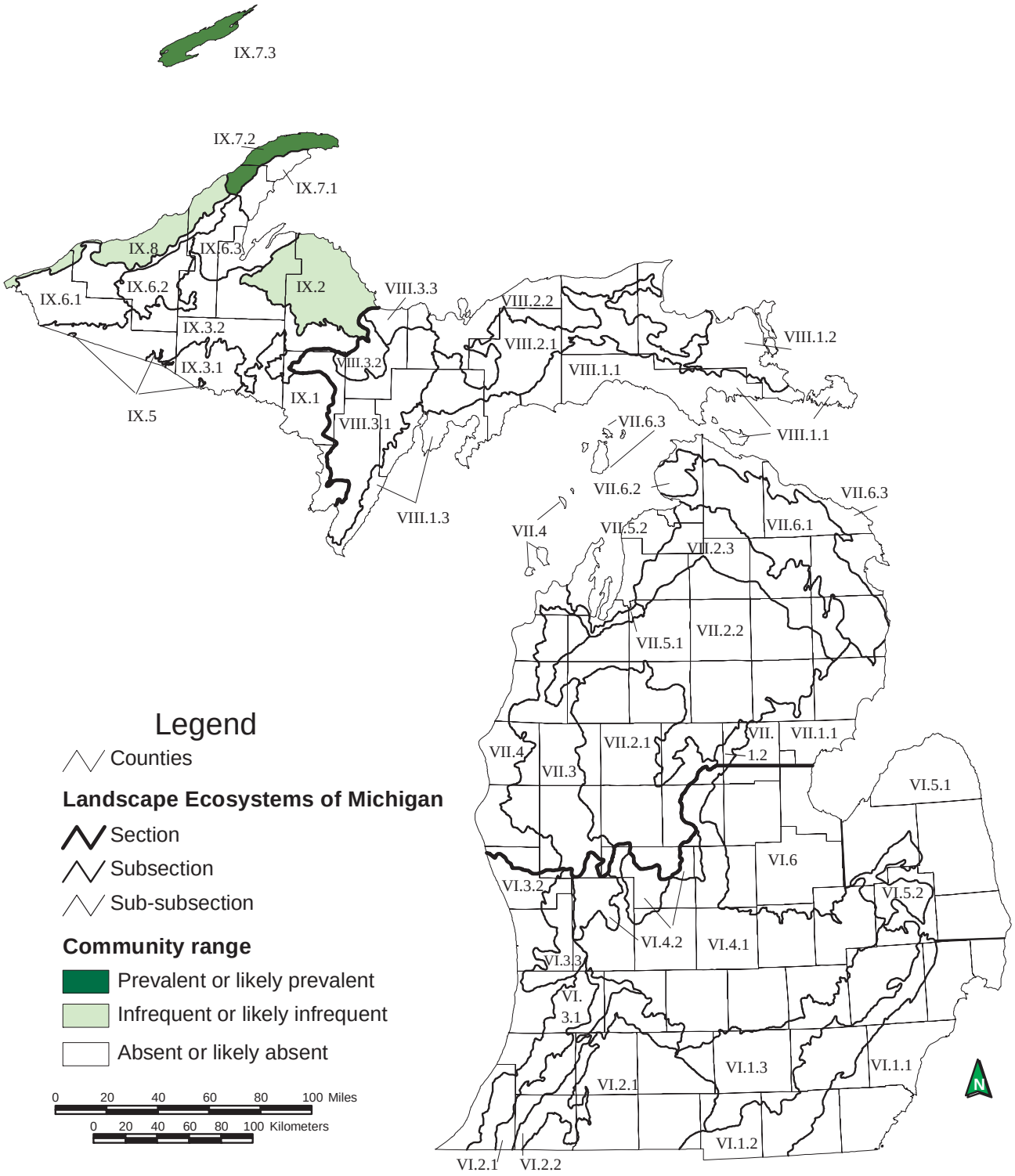


Aerial photograph of Horseshoe Harbor volcanic bedrock glade.

Horseshoe Harbor volcanic bedrock glade. Photo by Joshua G. Cohen.

VOLCANIC BEDROCK LAKESHORE

Overview: Volcanic bedrock lakeshore is a sparsely vegetated community dominated by mosses and lichens, with a scattered coverage of vascular plants. The community is located primarily along the Lake Superior shoreline on the Keweenaw Peninsula and Isle Royale. This Great Lakes coastal community includes all types of volcanic bedrock, including basalt, conglomerate composed of volcanic rock, and rhyolite (Kost et al. 2007, Cohen et al. 2014).



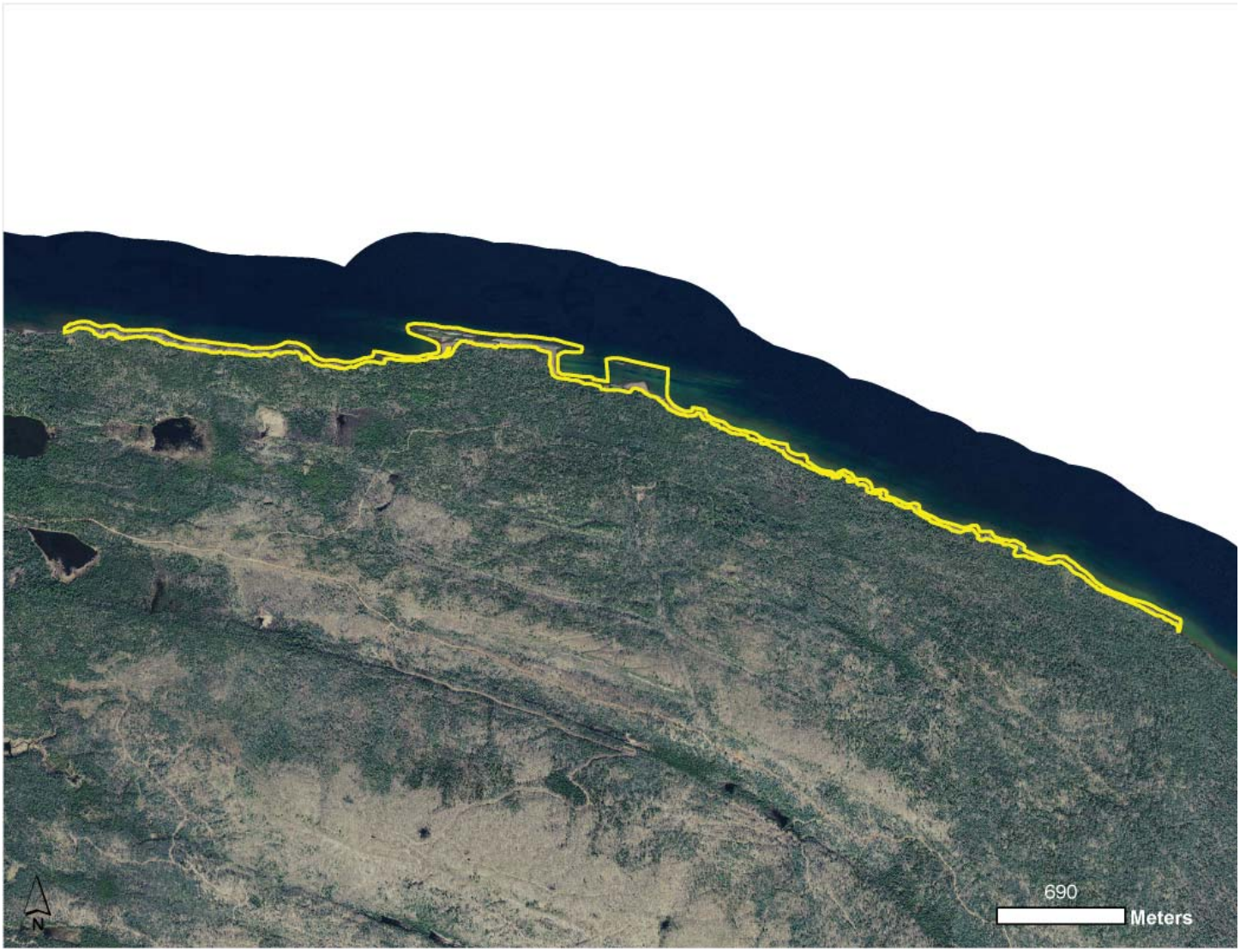
Map 25. Distribution of volcanic bedrock lakeshore in Michigan (Albert et al. 2008).

86. Horseshoe Harbor
Natural Community Type: Volcanic Bedrock Lakeshore
Rank: G4G5 S2, apparently secure globally and imperiled within the state
Element Occurrence Rank: A
Size: 74 acres
Location: Mary Macdonald Preserve, Keweenaw County
Land Manager: The Nature Conservancy
Element Occurrence Identification Number: 3958 (EO update)

Threats: The species composition and structure of this volcanic bedrock shoreline are influenced by natural processes. Non-native species found along the shoreline and in the adjacent volcanic bedrock glade include common St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Leucanthemum vulgare*), timothy (*Phleum pratense*), and sheep sorrel (*Rumex acetosella*). Dispersed foot traffic occurs along the shore.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered and to maintain a natural community buffer surrounding the lakeshore to prevent the increase of a weedy seed source. Current populations of non-native species along this stretch of shoreline should be removed. Monitoring efforts to detect invasive species and evaluate control efforts should be implemented.

Horseshoe Harbor volcanic bedrock lakeshore. Photo by Joshua G. Cohen.

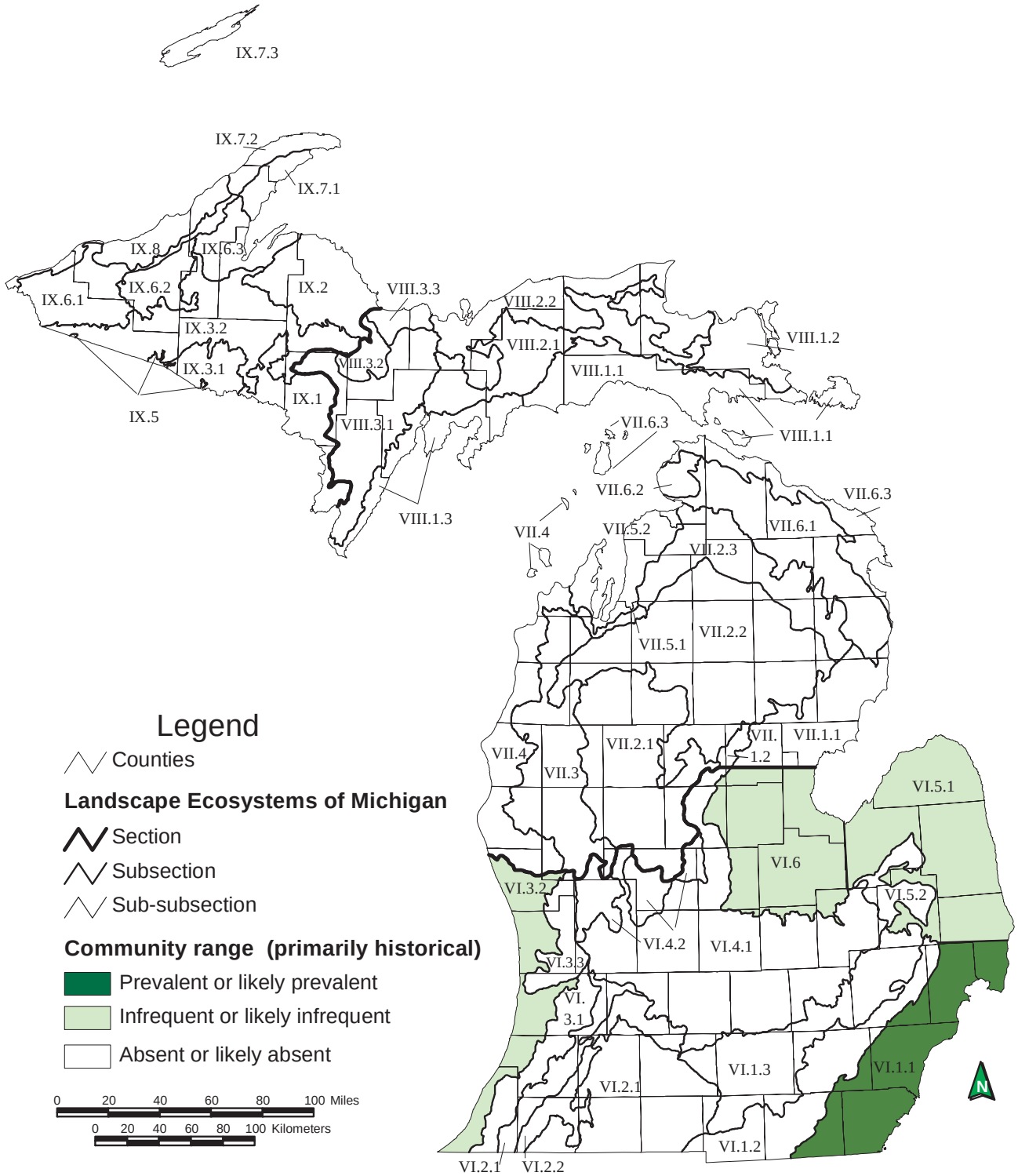


Aerial photograph of Horseshoe Harbor volcanic bedrock lakeshore.

Horseshoe Harbor volcanic bedrock lakeshore. Photo by Joshua G. Cohen.

WET-MESIC FLATWOODS

Overview: Wet-mesic flatwoods is a wet to mesic forest on mineral soils dominated by a highly diverse mixture of upland and lowland hardwoods. The community occurs almost exclusively on poorly drained glacial lakeplain in southeastern Lower Michigan and is typically characterized by the presence of an impervious clay layer. Seasonal inundation is the primary natural disturbance factor influencing wet-mesic flatwoods. Dominant trees may include oaks, hickories, maples, ashes, and basswood (Kost et al. 2007, Cohen et al. 2014).



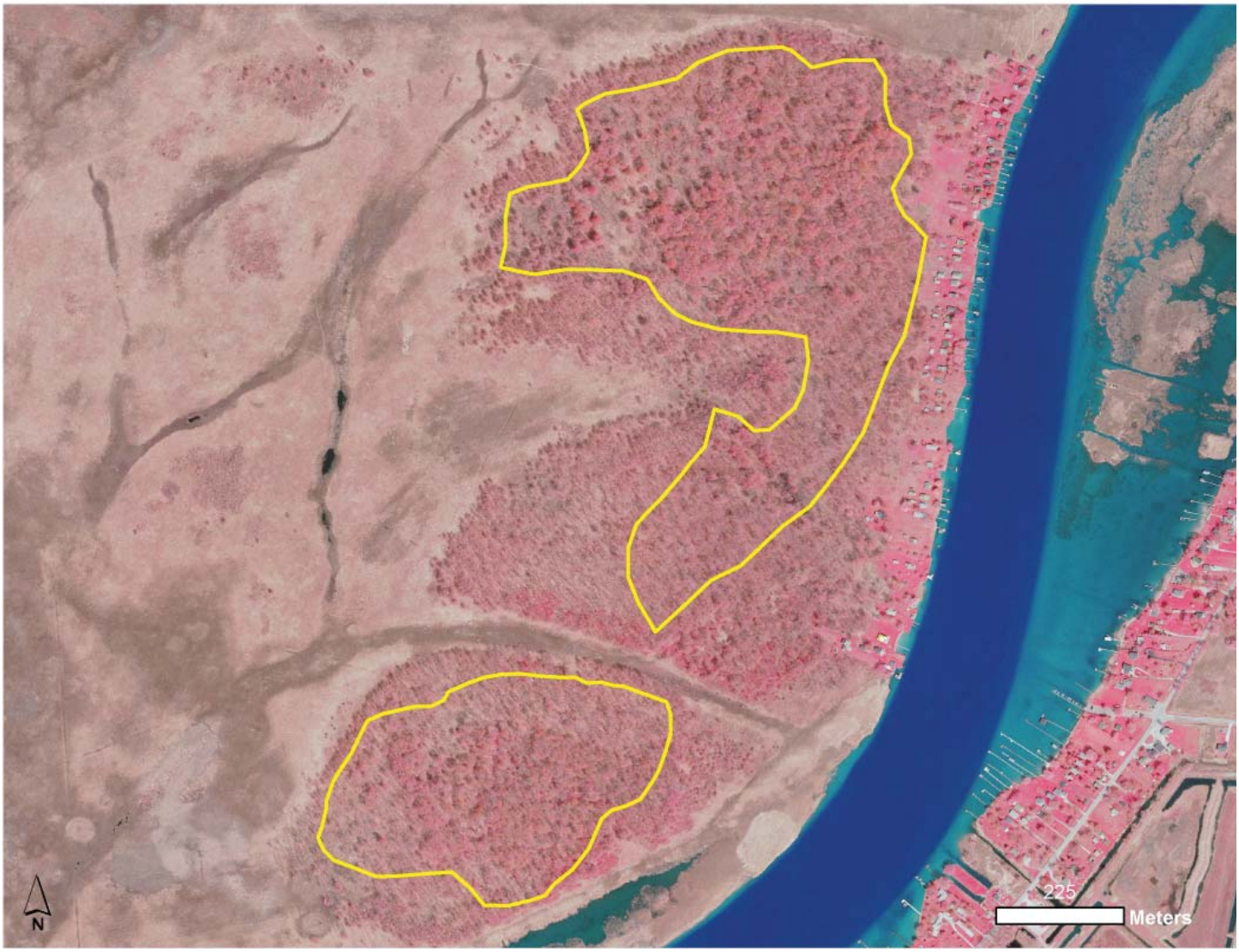
Map 26. Distribution of wet-mesic flatwoods in Michigan (Albert et al. 2008).

87. Dickinson Flatwoods
Natural Community Type: Wet-mesic Flatwoods
Rank: G2G3 S3, vulnerable to imperiled globally and imperiled within the state
Preliminary Element Occurrence Rank: C
Size: 134 acres
Location: St. Clair Flats State Wildlife Area, St. Clair County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20471 (New EO)

Threats: Threats to the wet-mesic flatwoods include fire suppression, invasive species encroachment, and deer browse. Invasive species are locally common in the understory and low shrub layer and include Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), and glossy buckthorn (*Frangula alnus*). Deer browse and trails were noted throughout the island.

Management Recommendations: The main management recommendations are to reintroduce fire as a prevalent disturbance factor within the wet-mesic flatwoods and adjacent lakeplain oak opening to open up the canopy and understory and control invasive species. In addition, control of invasive species through cutting and herbiciding is recommended. Monitoring should be implemented following management to gauge success. The management of the wet-mesic flatwoods and lakeplain oak opening should be coordinated with effort to control the reed (*Phragmites australis* subsp. *australis*) in the surrounding marsh so that the reed does not encroach into the wet-mesic flatwoods and lakeplain oak opening when the canopy is opened up.

Dickinson Flatwoods wet-mesic flatwoods. Photo by Joshua G. Cohen.



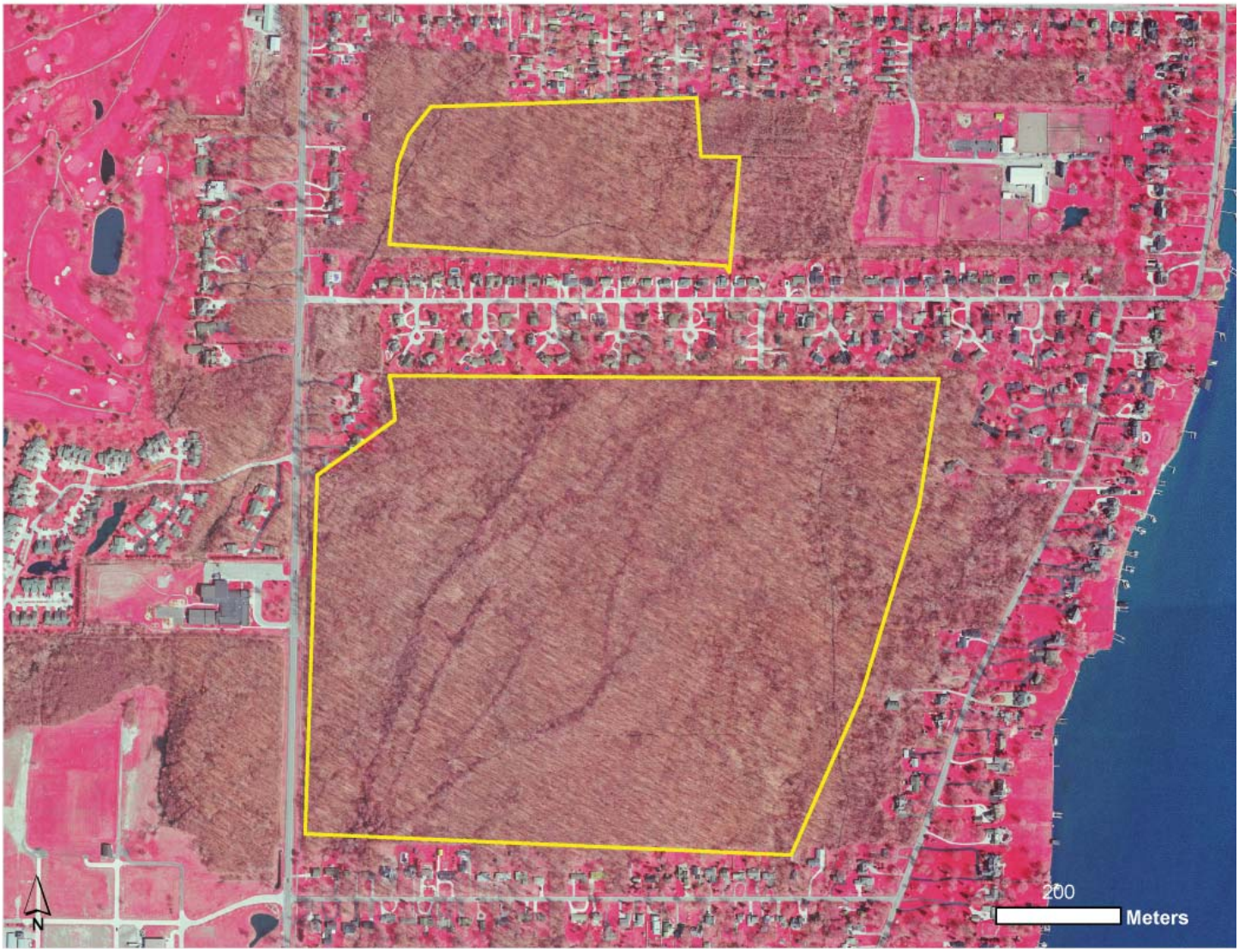
Aerial photograph of Dickinson Flatwoods wet-mesic flatwoods.

88. Grosse Ile South
Natural Community Type: Wet-mesic Flatwoods
Rank: G2G3 S3, vulnerable to imperiled globally and imperiled within the state
Preliminary Element Occurrence Rank: C
Size: 196 acres
Location: Meridian Woods Open Space, Finazzo Preserve, Emily's Way, Wright Woods Preserve, and Centennial Fram and Open Space, Wayne County
Land Manager: Grosse Ile Nature and Land Conservancy
Element Occurrence Identification Number: 20411 (New EO)

Threats: Threats include hydrologic alteration (ditching), deer browse, residential encroachment, and invasive species, including glossy buckthorn (*Frangula alnus*), common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), common privet (*Ligustrum vulgare*), Japanese barberry (*Berberis thunbergii*), and moneywort (*Lysimachia nummularia*). The forest was at least selectively logged, but stumps are uncommon.

Management Recommendations: The primary management needs are the survey, control, and monitoring of invasive plant species and the reduction of deer densities to promote woody regeneration and recovery of ground and shrub layers.

Grosse Ile South wet-mesic flatwoods. Photo by Bradford S. Slaughter.



Aerial photograph of Grosse Ile South wet-mesic flatwoods.

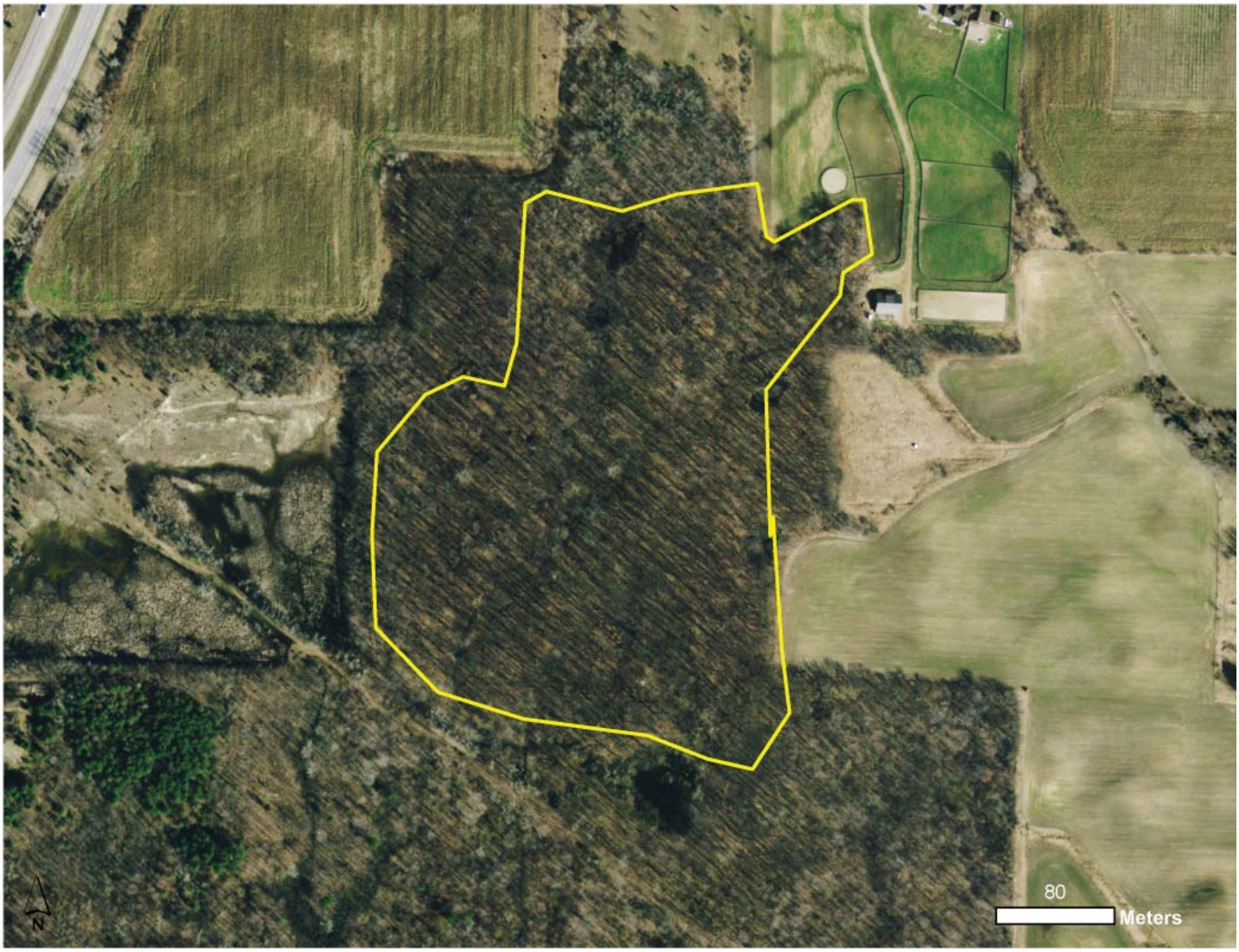
Grosse Ile South wet-mesic flatwoods. Photo by Bradford S. Slaughter.

89. Harbert Road Nature Preserve
Natural Community Type: Wet-Mesic Flatwoods
Rank: G2G3 S3, vulnerable to imperiled globally and imperiled within the state
Preliminary Element Occurrence Rank: C
Size: 21 acres
Location: Harbert Road Nature Preserve, Berrien County
Land Manager: Chikaming Township
Element Occurrence Identification Number: 20495 (New EO)

Threats: This relatively small woodlot has been impacted by logging, fragmentation, and possibly grazing. Among non-native species, multiflora rose (*Rosa multiflora*) is especially common and problematic, particularly at the borders. Japanese barberry (*Berberis thunbergii*) was occasional and garlic mustard (*Alliaria petiolata*) appeared to be uncommon.

Management Recommendations: The primary management needs are the survey, control, and monitoring of invasive plant species and the reduction of deer densities to promote woody regeneration and recovery of ground and shrub layers.

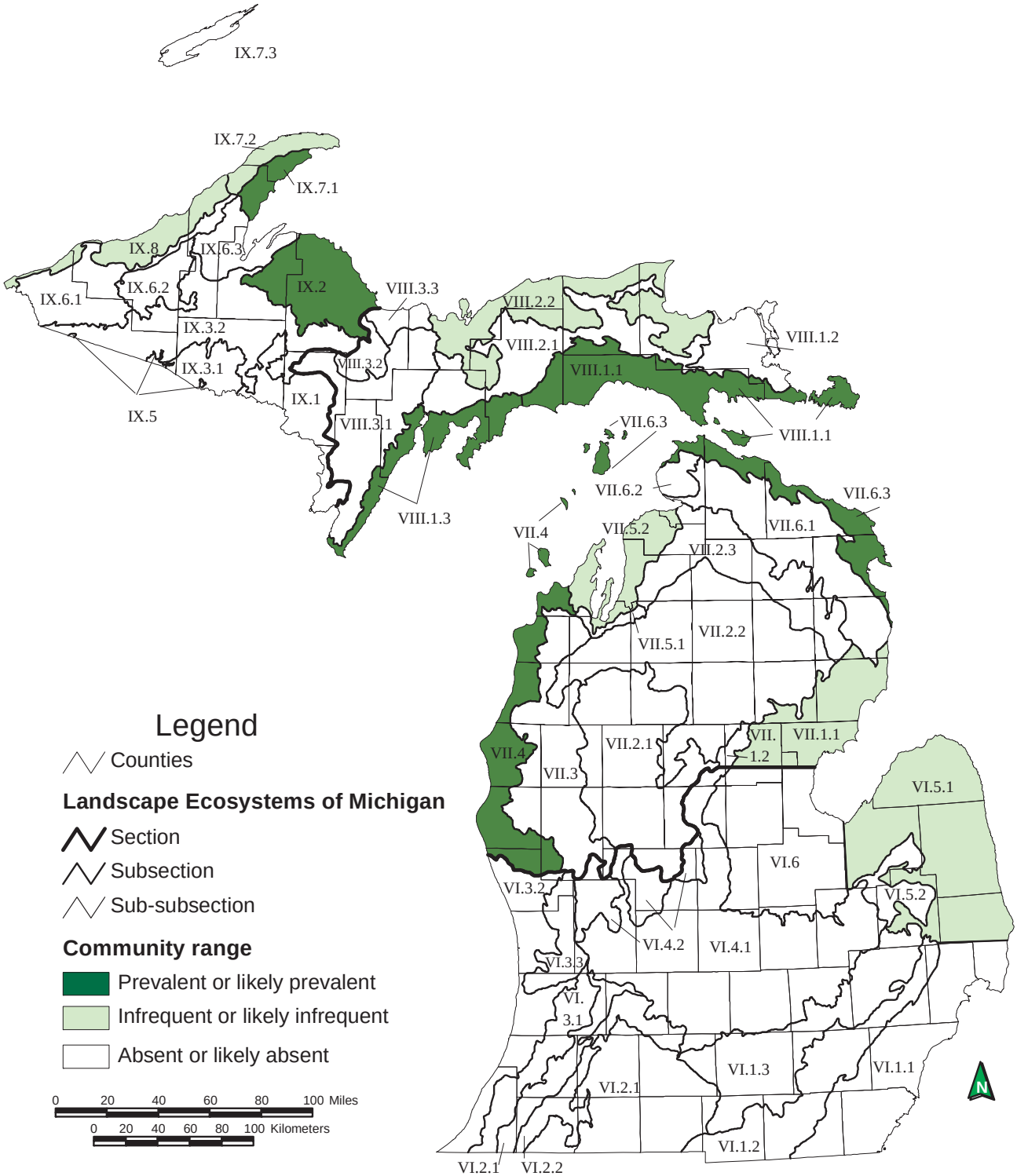
Harbert Road Nature Preserve wet-mesic flatwoods. Photo by Bradford S. Slaughter.



Aerial photograph of Harbert Road Nature Preserve wet-mesic flatwoods.

WOODED DUNE AND SWALE COMPLEX

Overview: Wooded dune and swale complex is a large complex of parallel wetland swales and upland beach ridges (dunes) found in coastal embayments and on large sand spits along the shorelines of the Great Lakes. The upland dune ridges are typically forested, while the low swales support a variety of herbaceous or forested wetland types, with open wetlands more common near the shoreline and forested wetlands more prevalent further from the lake. Wooded dune and swale complexes occur primarily in the northern Lower and Upper Peninsulas and Thumb region (Kost et al. 2007, Cohen et al. 2014).



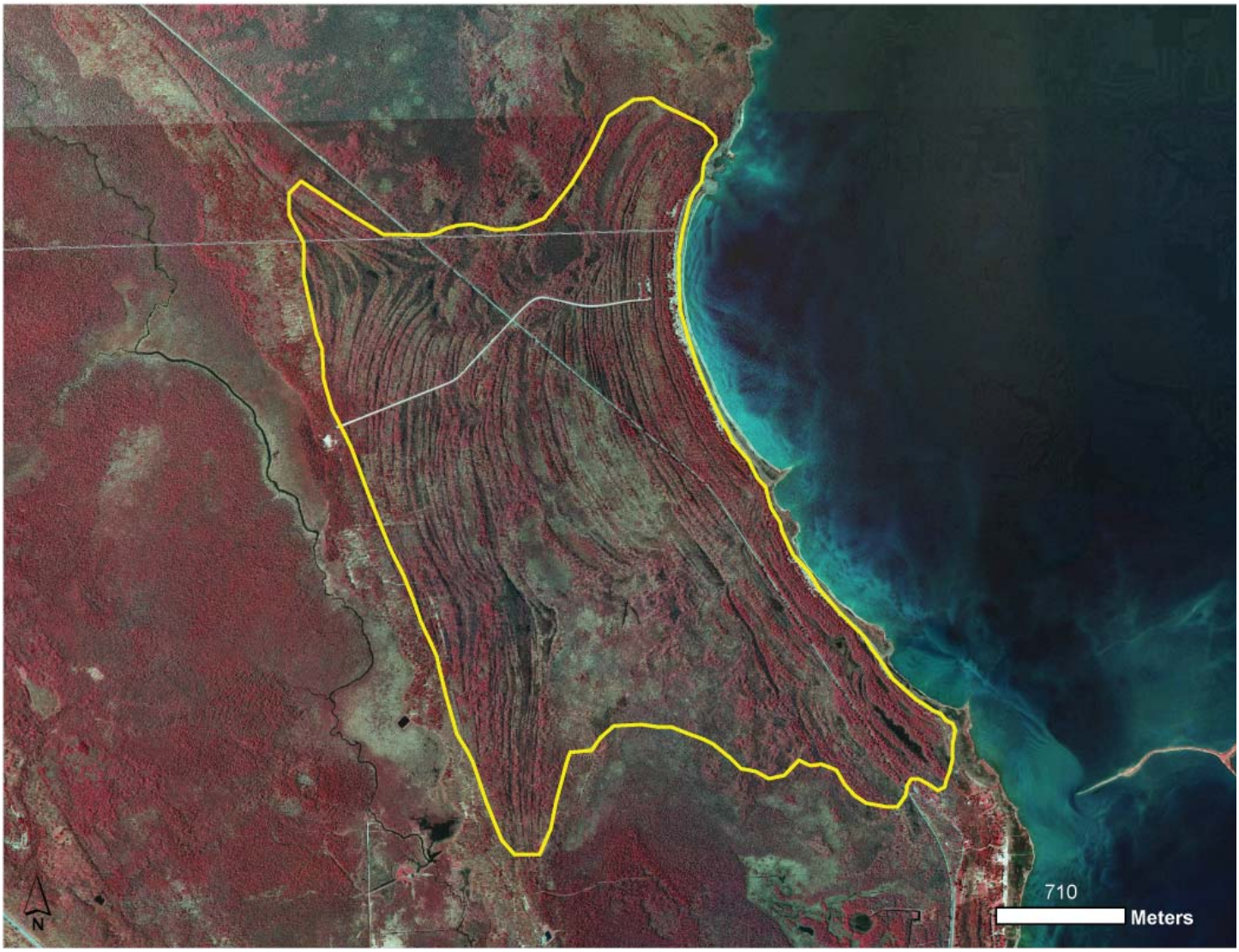
Map 27. Distribution of wooded dune and swale complex in Michigan (Albert et al. 2008).

90. Negwegon Dune and Swale
Natural Community Type: Wooded Dune and Swale Complex
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: B
Size: 1783 acres
Location: Negwegon State Park, Alpena and Alcona Counties
Land Manager: Parks and Recreation Division, Department of Natural Resources
Element Occurrence Identification Number: 409 (EO update)

Threats: The site is characterized by complex ecological patterning that results in high species and community diversity in an area with moderate anthropogenic disturbance. Several linear anthropogenic disturbances have impacted the complex including trails and railroad tracks. Roads and trails have likely provided a conduit for deer. Deer browse is prevalent within this dune and swale complex. Selective logging has occurred in portions of the complex. Invasive species are locally common within the open swales [especially reed canary grass (*Phalaris arundinacea*) and reed (*Phragmites australis* subsp. *australis*)], along the shoreline [including reed and narrow-leaved cat-tail (*Typha angustifolia*)] and on the low foredune [spotted knapweed (*Centaurea stoebe*)].

Management Recommendations: Management recommendations for this site include allowing natural processes to operate unhindered, controlling and monitoring invasive species, and reducing local deer populations to reduce deer browse pressure.

Negwegon Dune and swale wooded dune and swale complex. Photo by Joshua G. Cohen.



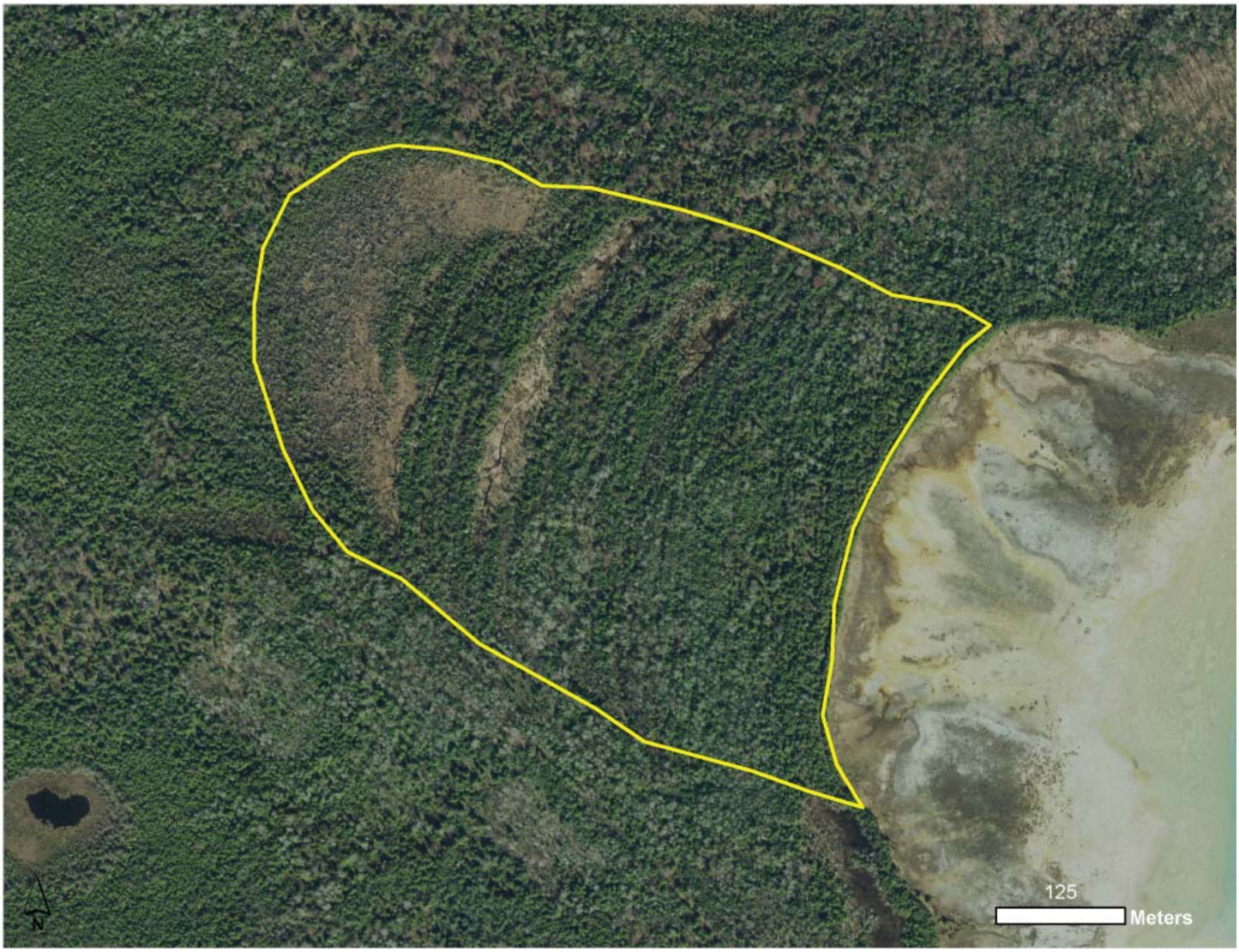
Aerial photograph of Negwegon Dune and Swale wooded dune and swale complex.

91. Taganing Dune and Swale
Natural Community Type: Wooded Dune and Swale Complex
Rank: G3 S3, vulnerable throughout range
Element Occurrence Rank: C
Size: 67 acres
Location: Beaver Island State Wildlife Research Area, Charlevoix County
Land Manager: Wildlife Division, Department of Natural Resources
Element Occurrence Identification Number: 20451 (New EO)

Threats: The site is characterized by complex ecological patterning that results in high species and community diversity in a small area with minimal anthropogenic disturbance. Logging has occurred in portions of the complex on the ridges. Cut and charred stumps occur scattered throughout the wooded dune and swale complex and the diameters of the cut stumps are smaller or similar to the diameter of living trees. No current threats were observed during the course of the survey.

Management Recommendations: The main management recommendations are to allow natural processes to operate unhindered, retain an intact buffer of natural communities surrounding the wooded dune and swale complex, and monitor for invasive species.

Taganing Dune and Swale wooded dune and swale complex. Photo by Joshua G. Cohen.



Aerial photograph of Taganing Dune and Swale wooded dune and swale complex.

STEWARDSHIP PRIORITIZATION RESULTS

Stewardship Prioritization Results and Observations
The stewardship scores for each natural community element occurrence that occurs in the coastal zone are presented in Appendix 1. The highest ranking sites in the state were lakeplain ecosystems found in southeastern Michigan and in the Thumb region. Of the 50 sites with the highest stewardship scores across the state, 16 were lakeplain wet-mesic prairie, 14 were Great Lakes marsh, 11 were lakeplain wet prairie, 6 were lakeplain oak openings, and 3 were wet-mesic flatwoods. These results are not surprising given that this region supports a high concentration of some of Michigan's rarest ecosystems but is also severely impacted by urbanization, fragmentation, hydrologic alteration, fire suppression, and invasive species encroachment.

The stewardship prioritization matrix within this this report is sorted by Michigan's four ecological sections (Southern Lower Peninsula, Northern Lower Peninsula, Eastern Upper Peninsula, and Western Upper Peninsula) (See Appendices 1a-1d and also Figures 3-6). For each ecological section, we sorted the element occurrences by their stewardship prioritization scores and assigned them a high (red), medium (yellow), or low (blue) stewardship priority. Of the 104 coastal natural community element occurrences in the southern Lower Peninsula, 55 were assigned a high stewardship score. These 55 sites included 17 Great Lakes marshes, 16 lakeplain wet-mesic prairies, 12 lakeplain wet prairies, six lakeplain oak openings, and four wet-mesic flatwoods. As noted, this region is characterized by high levels of urban sprawl and associated fragmentation, degradation of hydrologic regimes, sustained and ubiquitous fire suppression, and chronic invasive species infestations. During the course of the surveys in 2015, MNFI ecologists visited many sites that had not been surveyed in over two decades and many of these sites shifted from being categorized as ecologically viable to degraded. Many of these sites experienced a significant decline in Element Occurrence Rank (see Table 1). Much of this degradation is thought to

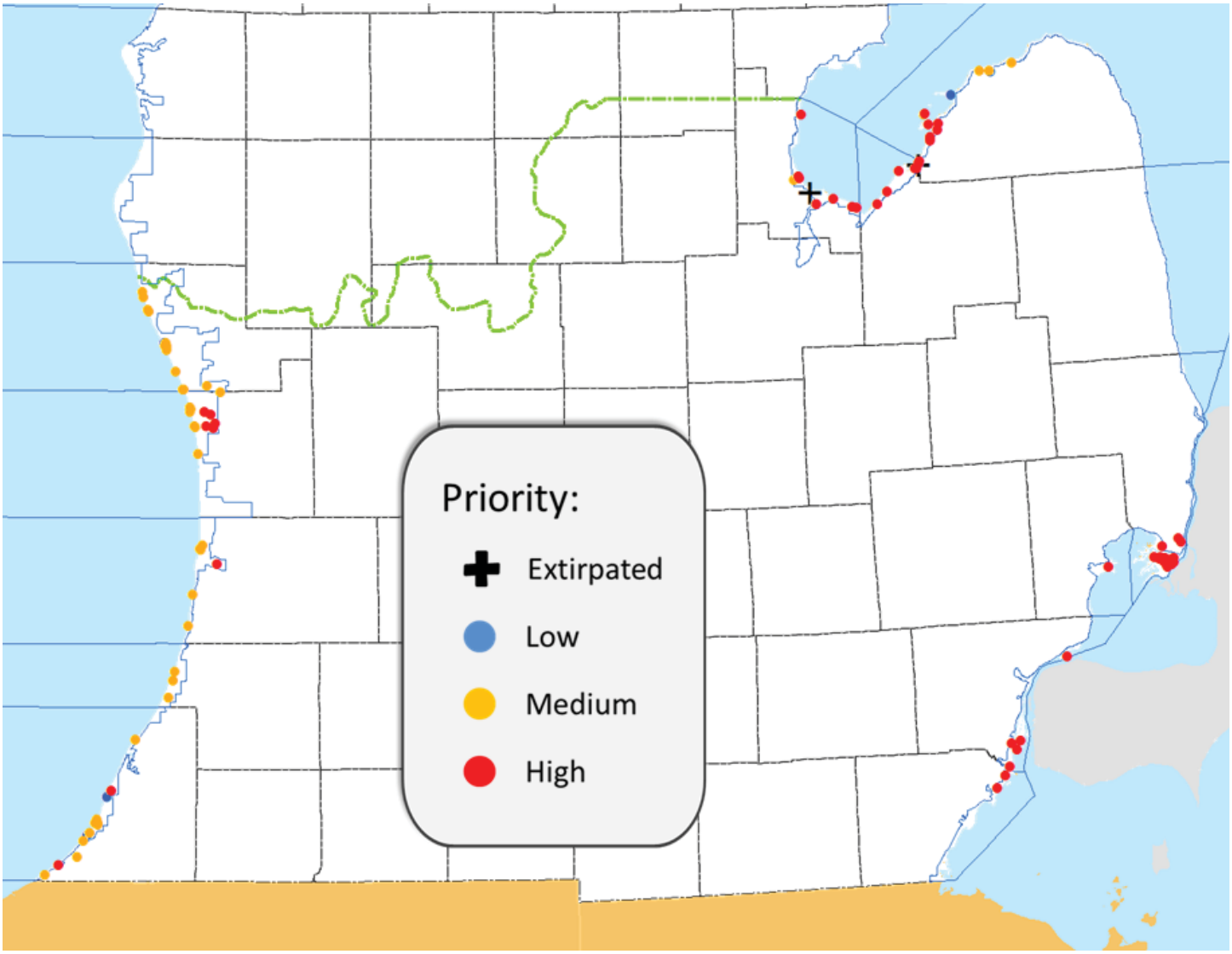


Figure 3. Stewardship prioritization of natural community element occurrences within southern Lower Michigan.

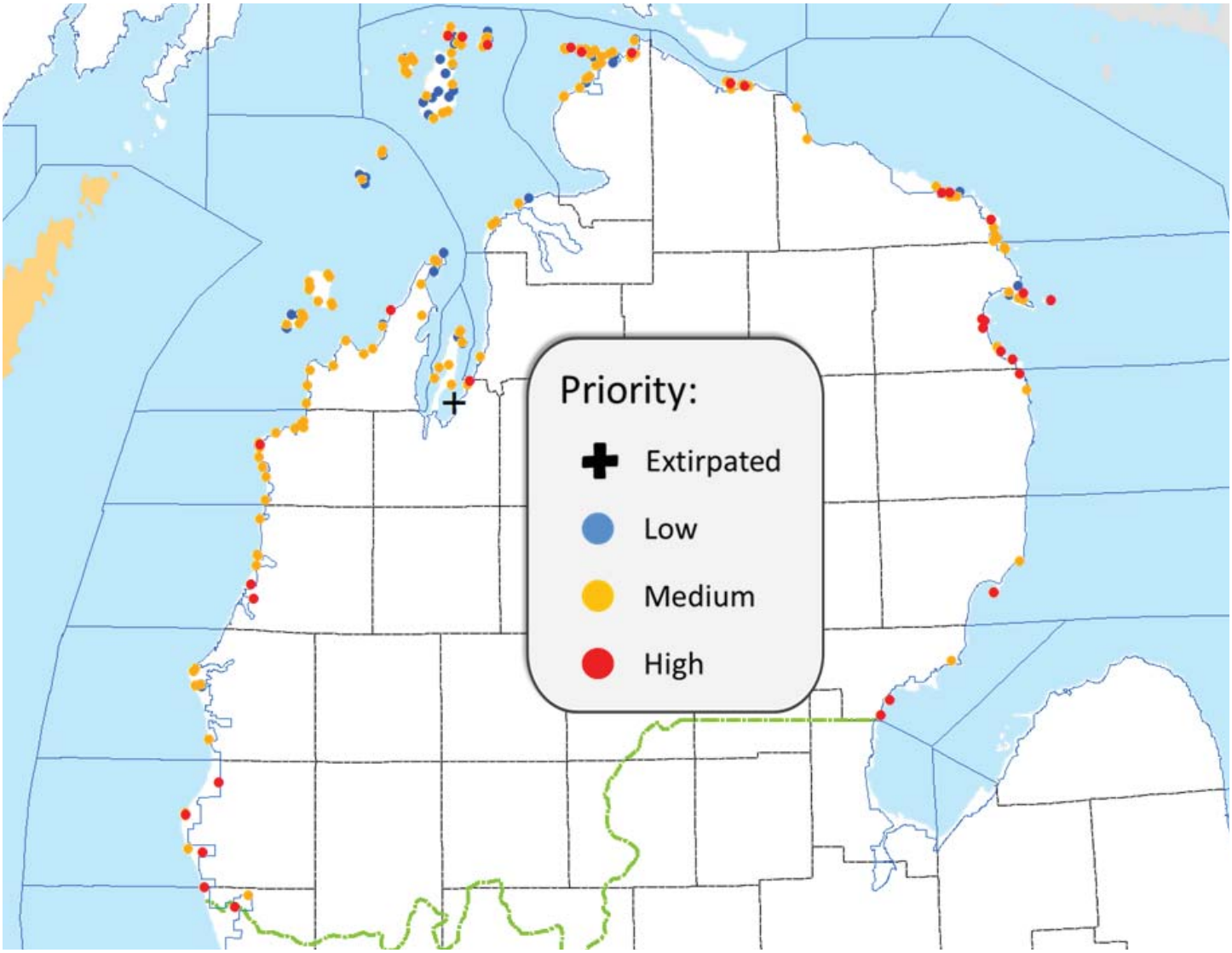


Figure 4. Stewardship prioritization of natural community element occurrences within northern Lower Michigan.

be caused by altered hydrology, fire suppression, and the onslaught of invasive species, especially reed (*Phragmites australis* subsp. *australis*), narrow-leaved cat-tail (*Typha angustifolia*), and glossy buckthorn (*Frangula alnus*).

Of the 230 coastal natural community element occurrences in the northern Lower Peninsula, 34 were assigned a high stewardship score. These 34 sites included 23 Great Lakes marshes, four open dunes, three wooded dune and swale complexes, one clay bluff, one coastal fen, one limestone bedrock glade, and one limestone bedrock lakeshore. These natural community types represent the rarest types found within the coastal zone in northern Michigan. An interesting result across the northern regions was that Great Lakes marsh was consistently the most abundant natural community in the sites categorized as high stewardship priority. This is partially due to the global rarity of this ecosystem that is endemic to the Great Lakes region (Great Lakes marsh has a global rarity ranking of G2, or globally imperiled). In addition, this system is particularly susceptible to infestation by invasive species. The invasives that become established within Great Lakes marsh can quickly expand and dominate, with homogenous beds of reed and invasive cat-tails dramatically altering floristic composition and structure of affected sites. While four open dunes were also identified as having high stewardship priority, the majority of the open dune element occurrences fell within the medium stewardship priority category. This is likely due to the fact that although numerous invasives can become established within open dunes, only a small number have become dominants (e.g., baby's breath and spotted knapweed) in just a fraction of sites.

Of the 192 coastal natural community element occurrences in the eastern Upper Peninsula, 35 were assigned a high stewardship score. These 35 sites included 30 Great Lakes marshes, three limestone bedrock glades, and two alvars.

Of particular note within this section is the identification of alvar and limestone bedrock glade as stewardship priorities. The highest priority site within this section is the Maxton Plains alvar. Alvar is threatened by invasive species infestation and disturbance to the fragile soils from vehicular activity. Limestone bedrock glade is also threatened by invasive species but is also detrimentally impacted by high levels of deer browse. Limestone bedrock glade's distribution falls within the area where deer winter in the southern Upper Peninsula.

Of the 119 coastal natural community element occurrences in the western Upper Peninsula, 12 were assigned a high stewardship score. These 12 sites included five Great Lakes marshes, two northern balds, two sandstone cobble shores, one granite lakeshore cliff, one sandstone bedrock lakeshore, and one wooded dune and swale complex. The top two highest priority sites within this section were northern balds. Northern bald and the other identified bedrock ecosystems are threatened primarily by invasive species infestation.

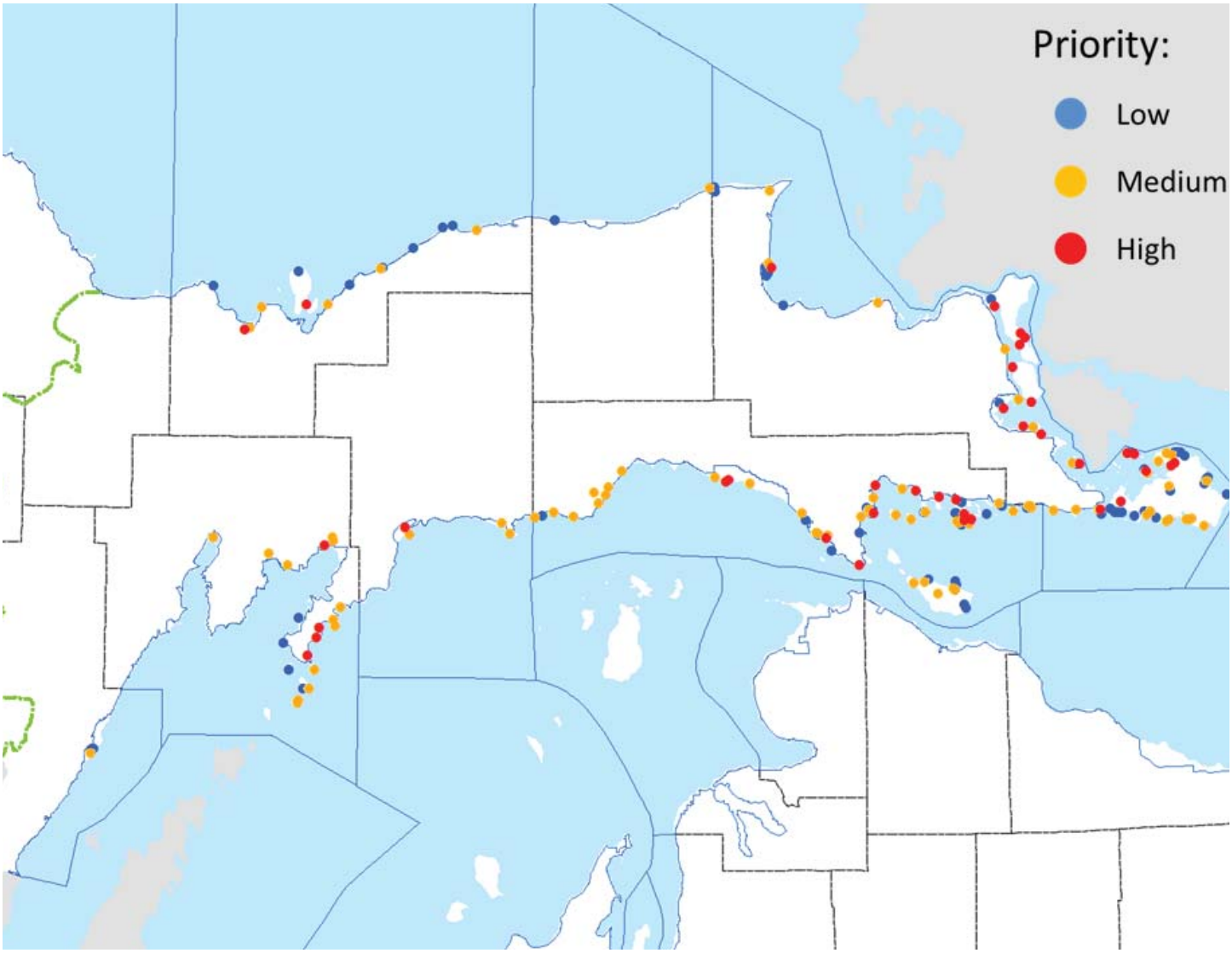


Figure 5. Stewardship prioritization of natural community element occurrences within the eastern Upper Peninsula.

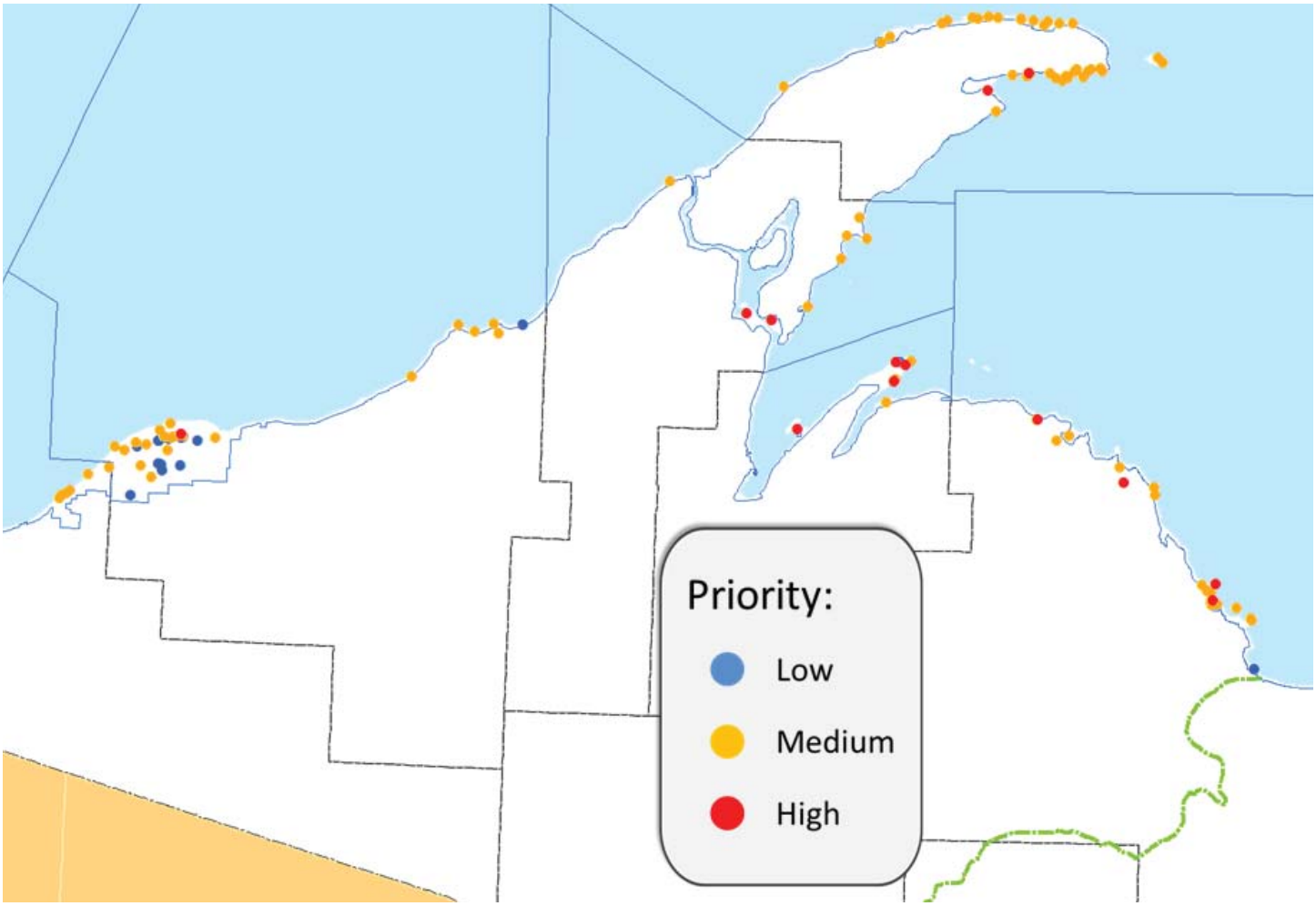


Figure 6. Stewardship prioritization of natural community element occurrences within the western Upper Peninsula.

Lakeplain ecosystems, such as lakeplain wet prairie, were among the highest ranked stewardship priorities within the state. Photo by Bradford S. Slaughter.

DISCUSSION

This report provides site-based assessments of 91 natural community element occurrences within Michigan's coastal zone. Threats, management needs, and restoration opportunities specific to each individual site have been discussed. The baseline information presented in the current report provides resource managers with an ecological foundation for prescribing site-level biodiversity stewardship, monitoring these management activities, and implementing landscape-level biodiversity planning to prioritize management efforts. The framework for prioritizing stewardship efforts across sites within the coastal zone will help facilitate difficult decisions regarding the distribution of finite stewardship resources for site-based management.

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

Open dunes, High Island. Photo by Joshua G. Cohen.

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Northern fen, Aldo Leopold Nature Preserve, Marquette Island. Photo by Joshua G. Cohen.

Appendix 1a. Stewardship prioritization for natural community element occurrences in the coastal zone of southern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
515	Lakeplain Wet-mesic Prairie	Algonac South Drain Prairie	B	G1?	5.00	S1	5.00	5.00	4.00	10	19
16138	Lakeplain Wet-mesic Prairie	Shirkey's Prairie	BC	G1?	5.00	S1	5.00	5.00	3.50	10	18.5
2053	Lakeplain Wet-mesic Prairie	Sebewaing Bay South	C	G1?	5.00	S1	5.00	5.00	3.00	10	18
2188	Lakeplain Wet Prairie	Killarney Beach	BC	G2	4.00	S1	5.00	4.50	3.50	10	18
3795	Lakeplain Wet-mesic Prairie	Geiger Road	C	G1?	5.00	S1	5.00	5.00	3.00	10	18
5006	Lakeplain Oak Openings	Dickinson Island	BC	G2?	4.00	S1	5.00	4.50	3.50	10	18
7263	Lakeplain Wet-mesic Prairie	Grand Mere	C	G1?	5.00	S1	5.00	5.00	3.00	10	18
8228	Lakeplain Wet Prairie	St. John's Prairie	BC	G2	4.00	S1	5.00	4.50	3.50	10	18
12663	Lakeplain Wet-mesic Prairie	Bay Park	C	G1?	5.00	S1	5.00	5.00	3.00	10	18
16151	Lakeplain Wet-mesic Prairie	St. Clair Flats	C	G1?	5.00	S1	5.00	5.00	3.00	10	18
1705	Lakeplain Oak Openings	Wildfowl Bay Islands	C	G2?	4.00	S1	5.00	4.50	3.00	10	17.5
2032	Lakeplain Wet Prairie	Channel Road	C	G2	4.00	S1	5.00	4.50	3.00	10	17.5
3048	Lakeplain Wet-mesic Prairie	Sebewaing Airport	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
3188	Lakeplain Wet-mesic Prairie	Middle Channel Golf Course	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
7668	Great Lakes Marsh	Pottawattomie Bayou	B	G2	4.00	S3	3.00	3.50	4.00	10	17.5
8491	Lakeplain Wet-mesic Prairie	Harsen's Island School	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
9075	Lakeplain Wet-mesic Prairie	Voakes Road Northwest	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
10350	Lakeplain Oak Openings	Bay City Recreation Area -- Killarney Beach	C	G2?	4.00	S1	5.00	4.50	3.00	10	17.5
10525	Lakeplain Wet-mesic Prairie	Knight Road	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
11243	Great Lakes Marsh	Coryeon Point	B	G2	4.00	S3	3.00	3.50	4.00	10	17.5
11695	Great Lakes Marsh	Wildfowl Bay Islands	B	G2	4.00	S3	3.00	3.50	4.00	10	17.5
11699	Lakeplain Wet Prairie	Geiger Road	C	G2	4.00	S1	5.00	4.50	3.00	10	17.5
12438	Lakeplain Wet-mesic Prairie	Bradleyville Road	CD	G1?	5.00	S1	5.00	5.00	2.50	10	17.5
12445	Great Lakes Marsh	Indian Channel	B	G2	4.00	S3	3.00	3.50	4.00	10	17.5
12940	Lakeplain Wet Prairie	Sebewaing VFW	C	G2	4.00	S1	5.00	4.50	3.00	10	17.5
908	Wet-mesic Flatwoods	Round Island Oaks	BC	G2G3	3.50	S2	4.00	3.75	3.50	10	17.25
260	Lakeplain Wet Prairie	Sebewaing Bay South	CD	G2	4.00	S1	5.00	4.50	2.50	10	17
1566	Great Lakes Marsh	Swan Creek	BC	G2	4.00	S3	3.00	3.50	3.50	10	17
2729	Lakeplain Wet Prairie	Essexville Prairie	CD	G2	4.00	S1	5.00	4.50	2.50	10	17
4506	Lakeplain Wet-mesic Prairie	Little Road	D?	G1?	5.00	S1	5.00	5.00	2.00	10	17
4507	Lakeplain Wet-mesic Prairie	La Croix Road	D?	G1?	5.00	S1	5.00	5.00	2.00	10	17
7138	Great Lakes Marsh	Kalamazoo River Estuary	BC	G2	4.00	S3	3.00	3.50	3.50	10	17
7691	Great Lakes Marsh	Millhouse Bayou	BC	G2	4.00	S3	3.00	3.50	3.50	10	17
7796	Lakeplain Wet Prairie	Dickinson Island	CD	G2	4.00	S1	5.00	4.50	2.50	10	17
9648	Lakeplain Wet-mesic Prairie	Weale Road	D	G1?	5.00	S1	5.00	5.00	2.00	10	17

Appendix 1a. Stewardship prioritization for natural community element occurrences in the coastal zone of southern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
9983	Lakeplain Oak Openings	Sebewaing VFW	CD	G2?	4.00	S1	5.00	4.50	2.50	10	17
10826	Great Lakes Marsh	Humbug Marsh	BC	G2	4.00	S3	3.00	3.50	3.50	10	17
20435	Lakeplain Wet Prairie	Pigeon Rd. North	CD	G2	4.00	S1	5.00	4.50	2.50	10	17
20411	Wet-mesic Flatwoods	Grosse Ile South	C	G2G3	3.50	S2	4.00	3.75	3.00	10	16.75
20471	Wet-mesic Flatwoods	Dickinson Flatwoods	C	G2G3	3.50	S2	4.00	3.75	3.00	10	16.75
358	Lakeplain Wet Prairie	Coryeon Point	D	G2	4.00	S1	5.00	4.50	2.00	10	16.5
535	Lakeplain Wet Prairie	Harsen's Island (Voakes Road Southeast Prairie)	D	G2	4.00	S1	5.00	4.50	2.00	10	16.5
3956	Great Lakes Marsh	Pinconning Marsh	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
4018	Great Lakes Marsh	St. Clair River Delta	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
4430	Lakeplain Oak Openings	Algonac State Park	D	G2?	4.00	S1	5.00	4.50	2.00	10	16.5
5651	Lakeplain Wet Prairie	Thomas Prairie	D	G2	4.00	S1	5.00	4.50	2.00	10	16.5
10798	Great Lakes Marsh	South Lloyd Island	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
11694	Great Lakes Marsh	Geiger Road	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
12181	Great Lakes Marsh	Galien River Estuary	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
12703	Great Lakes Marsh	Grand Haven State Game Area -- Dermo Island	C	G2	4.00	S3	3.00	3.50	3.00	10	16.5
19059	Wet-mesic Flatwoods	Belle Isle Flatwoods	D	G2G3	3.50	S2	4.00	3.75	2.00	10	15.75
823	Great Lakes Marsh	Pointe Mouillee State Game Area -- North	D	G2	4.00	S3	3.00	3.50	2.00	10	15.5
6708	Great Lakes Marsh	Clinton River Delta	D	G2	4.00	S3	3.00	3.50	2.00	10	15.5
12549	Great Lakes Marsh	Pointe Mouillee State Game Area -- South	D	G2	4.00	S3	3.00	3.50	2.00	10	15.5
6702	Open Dunes	Saugatuck Dunes (Kalamazoo River Mouth)	BC	G3	3.00	S3	3.00	3.00	3.50	8	14.5
8436	Open Dunes	Kitchel Dunes	CD	G3	3.00	S3	3.00	3.00	2.50	9	14.5
20462	Open Dunes	Lake Harbor Dunes	CD	G3	3.00	S3	3.00	3.00	2.50	9	14.5
20463	Open Dunes	Kirk Park Dunes	CD	G3	3.00	S3	3.00	3.00	2.50	9	14.5
20479	Clay Bluff	Wau-Ke-Na	BC	GNR	4.00	S2	4.00	4.00	3.50	7	14.5
9309	Mesic Southern Forest	Warren Dunes	B	G2G3	3.50	S3	3.00	3.25	4.00	7	14.25
20461	Open Dunes	Duck Lake Dunes	C	G3	3.00	S3	3.00	3.00	3.00	8	14
20464	Clay Bluff	Miami Park	C	GNR	4.00	S2	4.00	4.00	3.00	7	14
10111	Mesic Southern Forest	Palisades Park	BC	G2G3	3.50	S3	3.00	3.25	3.50	7	13.75
3189	Mesic Northern Forest	Vincent Creek Woods	B	G4	2.00	S3	3.00	2.50	4.00	7	13.5
4858	Coastal Plain Marsh	Grand Beach Marsh Preserve	CD	G2	4.00	S2	4.00	4.00	2.50	7	13.5
20465	Clay Bluff	Whirpool Bluff	CD	GNR	4.00	S2	4.00	4.00	2.50	7	13.5
246	Mesic Southern Forest	Shorewood Creek Woods	C	G2G3	3.50	S3	3.00	3.25	3.00	7	13.25
1349	Wooded Dune and Swale Complex	Port Crescent	C	G3	3.00	S3	3.00	3.00	3.00	7	13
2247	Open Dunes	Rosy Mound	C	G3	3.00	S3	3.00	3.00	3.00	7	13

Appendix 1a. Stewardship prioritization for natural community element occurrences in the coastal zone of southern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority. Extirpated element occurrences (gray) were assigned a score of zero.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
8108	Coastal Plain Marsh	Ross Preserve	B	G2	4.00	S2	4.00	4.00	4.00	5	13
8155	Mesic Northern Forest	Hoffmaster State Park	BC	G4	2.00	S3	3.00	2.50	3.50	7	13
8970	Open Dunes	Sadony Bayou	C	G3	3.00	S3	3.00	3.00	3.00	7	13
10656	Wooded Dune and Swale Complex	Sleeper State Park	C	G3	3.00	S3	3.00	3.00	3.00	7	13
12019	Interdunal Wetland	Muskegon State Park	B	G2?	4.00	S2	4.00	4.00	4.00	5	13
17520	Mesic Northern Forest	Muskegon State Park	BC	G4	2.00	S3	3.00	2.50	3.50	7	13
52	Mesic Northern Forest	Rosy Mound	C	G4	2.00	S3	3.00	2.50	3.00	7	12.5
941	Mesic Northern Forest	Saugatuck Dunes	C	G4	2.00	S3	3.00	2.50	3.00	7	12.5
1830	Open Dunes	Warren Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	6	12.5
1906	Mesic Northern Forest	Old Channel Trail	C	G4	2.00	S3	3.00	2.50	3.00	7	12.5
4857	Interdunal Wetland	Warren Dunes	BC	G2?	4.00	S2	4.00	4.00	3.50	5	12.5
7041	Mesic Northern Forest	Fruitport Hemlocks	C	G4	2.00	S3	3.00	2.50	3.00	7	12.5
7219	Mesic Northern Forest	Dyckman Woods	C	G4	2.00	S3	3.00	2.50	3.00	7	12.5
7495	Sand and Gravel Beach	Warren Dunes	CD	G3?	3.00	S3	3.00	3.00	2.50	7	12.5
10033	Interdunal Wetland	Saugatuck Dunes	BC	G2?	4.00	S2	4.00	4.00	3.50	5	12.5
2008	Interdunal Wetland	Kitchel Dunes	C	G2?	4.00	S2	4.00	4.00	3.00	5	12
7936	Open Dunes	Muskegon State Park	B	G3	3.00	S3	3.00	3.00	4.00	5	12
9617	Mesic Northern Forest	Duck Lake	CD	G4	2.00	S3	3.00	2.50	2.50	7	12
10114	Oak-Pine Barrens	Sleeper State Park	BC	G3	3.00	S2	4.00	3.50	3.50	5	12
12670	Open Dunes	Hoffmaster State Park	B	G3	3.00	S3	3.00	3.00	4.00	5	12
4116	Southern Hardwood Swamp	Tobico State Game Area -- Tobico Swamp	BC	G3	3.00	S3	3.00	3.00	3.50	5	11.5
20470	Southern Hardwood Swamp	Heisterman Swamp	BC	G3	3.00	S3	3.00	3.00	3.50	5	11.5
10494	Great Lakes Barrens	Kitchel Dunes	CD	G3	3.00	S2	4.00	3.50	2.50	5	11
11484	Coastal Plain Marsh	Muskegon State Park -- Hidden Lake	B	G2	4.00	S2	4.00	4.00	4.00	3	11
13388	Southern Hardwood Swamp	Harbert Tradeland	C	G3	3.00	S3	3.00	3.00	3.00	5	11
2519	Hardwood-Conifer Swamp	Devil's Kitchen	C	G4	2.00	S3	3.00	2.50	3.00	5	10.5
13781	Floodplain Forest	Hooks Corner Floodplain	BC	G3?	3.00	S3	3.00	3.00	3.50	4	10.5
13554	Northern Fen	Rush Lake Fen	B	G3	3.00	S3	3.00	3.00	4.00	3	10
943	Dry-mesic Southern Forest	Grand Mere	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
3129	Dry-mesic Northern Forest	Muskegon State Park	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
1238	Dry-mesic Southern Forest	Bethany Beach	C	G4	2.00	S3	3.00	2.50	3.00	1	6.5
8609	Emergent Marsh	Sand Point	BC	GU	2.00	S4	2.00	2.00	3.50	0	5.5
355	Lakeplain Wet Prairie	Bangor Prairie	X	G2	4.00	S1	5.00	4.50	0.00	10	0
10756	Lakeplain Wet Prairie	Sebewaing Railroad	X	G2	4.00	S1	5.00	4.50	0.00	10	0

Appendix 1b. Stewardship prioritization for natural community element occurrences in the coastal zone of northern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
18590	Great Lakes Marsh	El Cajon Bay, Misery Bay	A	G2	4.00	S3	3.00	3.50	5.00	7	15.5
1919	Great Lakes Marsh	Petobego Pond	AB	G2	4.00	S3	3.00	3.50	4.50	7	15
11690	Great Lakes Marsh	Waugoshance Point	AB	G2	4.00	S3	3.00	3.50	4.50	7	15
2786	Great Lakes Marsh	Cheboygan State Park	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
3574	Great Lakes Marsh	Pine River Delta	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
4290	Great Lakes Marsh	Squaw Bay	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
5459	Great Lakes Marsh	Negwegon Marsh	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
8543	Great Lakes Marsh	False Presque Isle	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
8859	Great Lakes Marsh	Bar Lake	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
17340	Great Lakes Marsh	Thompson's Harbor	B	G2	4.00	S3	3.00	3.50	4.00	7	14.5
409	Wooded Dune and Swale Complex	Negwegon Dune and Swale	B	G3	3.00	S3	3.00	3.00	4.00	7	14
5918	Great Lakes Marsh	Stony Creek	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
6116	Great Lakes Marsh	Pentwater River State Game Area -- Pentwater Marsh	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
11689	Great Lakes Marsh	Flower Creek	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
12514	Great Lakes Marsh	White River Estuary	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
12744	Great Lakes Marsh	Trail's End Bay	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
18835	Great Lakes Marsh	Ossineke Marsh	BC	G2	4.00	S3	3.00	3.50	3.50	7	14
201	Limestone Bedrock Lakeshore	Thunder Bay Island	A	G3	3.00	S2	4.00	3.50	5.00	5	13.5
403	Wooded Dune and Swale Complex	Squaw Bay	BC	G3	3.00	S3	3.00	3.00	3.50	7	13.5
983	Open Dunes	Silver Lake Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	7	13.5
2288	Great Lakes Marsh	Manistee River State Game Area -- Manistee River	C	G2	4.00	S3	3.00	3.50	3.00	7	13.5
10790	Open Dunes	Point Betsie	BC	G3	3.00	S3	3.00	3.00	3.50	7	13.5
20450	Great Lakes Marsh	Taganing Marsh	A	G2	4.00	S3	3.00	3.50	5.00	7	13.5
20469	Great Lakes Marsh	Sandy Hook Marsh	C	G2	4.00	S3	3.00	3.50	3.00	7	13.5
2179	Great Lakes Marsh	Hog Island -- East Shoreline	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
3468	Great Lakes Marsh	Temperance and Waugoshance Islands	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
7139	Great Lakes Marsh	Saganing River Delta	CD	G2	4.00	S3	3.00	3.50	2.50	7	13
10101	Wooded Dune and Swale Complex	Grass Bay	C	G3	3.00	S3	3.00	3.00	3.00	7	13
13020	Great Lakes Marsh	Indian Harbor	AB	G2	4.00	S3	3.00	3.50	4.50	7	13
126	Open Dunes	Nordhouse Dunes	AB	G3	3.00	S3	3.00	3.00	4.50	2	12.5
4200	Open Dunes	Sleeping Bear Dunes	AB	G3	3.00	S3	3.00	3.00	4.50	2	12.5
9418	Limestone Bedrock Glade	Thompson's Harbor Observatory	B	G2G4	3.00	S2	4.00	3.50	4.00	5	12.5
19142	Clay Bluff	Clay Cliffs	BC	GNR	4.00	S2	4.00	4.00	3.50	5	12.5

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EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
13250	Coastal Fen	Thunder Bay/Squaw Bay	C	G1G2	4.50	S2	4.00	4.25	3.00	5	12.25
3898	Interdunal Wetland	Nordhouse Dunes	A	G2?	4.00	S2	4.00	4.00	5.00	3	12
13045	Wooded Dune and Swale Complex	Platte Bay East	B	G3	3.00	S3	3.00	3.00	4.00	5	12
17854	Limestone Bedrock Lakeshore	Fisherman's Island	BC	G3	3.00	S2	4.00	3.50	3.50	5	12
144	Limestone Bedrock Glade	Thompson's Harbor	C	G2G4	3.00	S2	4.00	3.50	3.00	5	11.5
5305	Open Dunes	Waugoshance Point	BC	G3	3.00	S3	3.00	3.00	3.50	5	11.5
5676	Rich Conifer Swamp	El Cajon Bay	B	G4	2.00	S3	3.00	2.50	4.00	5	11.5
10051	Rich Conifer Swamp	Thompson's Harbor	B	G4	2.00	S3	3.00	2.50	4.00	5	11.5
11583	Open Dunes	Shalda Creek, Good Harbor Bay	BC	G3	3.00	S3	3.00	3.00	3.50	5	11.5
20445	Rich Conifer Swamp	Waugoshance Swamp	B	G4	2.00	S3	3.00	2.50	4.00	5	11.5
12664	Coastal Fen	Grass Bay	B	G1G2	4.50	S2	4.00	4.25	4.00	3	11.25
17529	Coastal Fen	Cheboygan State Park	B	G1G2	4.50	S2	4.00	4.25	4.00	3	11.25
19148	Coastal Fen	Trail's End Bay	B	G1G2	4.50	S2	4.00	4.25	4.00	3	11.25
599	Wooded Dune and Swale Complex	Big Stone Bay	C	G3	3.00	S3	3.00	3.00	3.00	5	11
1348	Wooded Dune and Swale Complex	Au Gres	C	G3	3.00	S3	3.00	3.00	3.00	5	11
3342	Interdunal Wetland	Cathead Bay	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
3786	Mesic Northern Forest	Point Betsie	BC	G4	2.00	S3	3.00	2.50	3.50	5	11
4223	Wooded Dune and Swale Complex	Bower's Harbor Swamp	C	G3	3.00	S3	3.00	3.00	3.00	5	11
4392	Great Lakes Barrens	Cheboygan State Park	BC	G3	3.00	S2	4.00	3.50	3.50	4	11
4686	Interdunal Wetland	Waugoshance Point	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
5053	Interdunal Wetland	Sturgeon Bay	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
8405	Interdunal Wetland	Grass Bay	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
11697	Interdunal Wetland	Silver Lake Dunes	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
11806	Wooded Dune and Swale Complex	Hammond Bay	C	G3	3.00	S3	3.00	3.00	3.00	5	11
12324	Wooded Dune and Swale Complex	Trail's End Bay	C	G3	3.00	S3	3.00	3.00	3.00	5	11
10477	Limestone Cobble Shore	Thompson's Harbor	AB	G2G3	3.50	S3	3.00	3.25	4.50	3	10.75
17336	Coastal Fen	Waugoshance Point	AB	G1G2	4.50	S2	4.00	4.25	4.50	2	10.75
17337	Limestone Cobble Shore	Waugoshance Point	AB	G2G3	3.50	S3	3.00	3.25	4.50	3	10.75
17845	Limestone Cobble Shore	Temperance and Waugoshance Islands	AB	G2G3	3.50	S3	3.00	3.25	4.50	3	10.75
105	Interdunal Wetland	Hog Island	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
456	Open Dunes	Palmer-Wilcox-Gates Preserve	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
2678	Open Dunes	Frankfort Beach	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
2826	Great Lakes Barrens	Silver Lake Dunes	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
2862	Open Dunes	Sturgeon Bay Point	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
3071	Interdunal Wetland	Cheboygan State Park	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5

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6701	Open Dunes	Lookout Point -- Beaver Island	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
7312	Great Lakes Barrens	Platte Bay East	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
8136	Wooded Dune and Swale Complex	Sturgeon Bay	AB	G3	3.00	S3	3.00	3.00	4.50	3	10.5
8395	Rich Conifer Swamp	Grass Bay	C	G4	2.00	S3	3.00	2.50	3.00	5	10.5
8689	Great Lakes Barrens	Cathead Bay	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
10670	Open Dunes	Elberta Dunes	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
17341	Northern Fen	Thompson's Harbor	AB	G3	3.00	S3	3.00	3.00	4.50	3	10.5
17844	Great Lakes Barrens	Waugoshance Point	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
18757	Interdunal Wetland	Besser Natural Area	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
18834	Interdunal Wetland	Ossineke Swale	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
19136	Open Dunes	Bluffs Road	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
19146	Interdunal Wetland	Vessel Point	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
19152	Interdunal Wetland	South Manitou Island	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
19744	Interdunal Wetland	Rockport South	BC	G2?	4.00	S2	4.00	4.00	3.50	3	10.5
20467	Rich Conifer Swamp	Soper Swamp	C	G4	2.00	S3	3.00	2.50	3.00	5	10.5
3734	Coastal Fen	Baldimore Bay Environmental Area	A	G1G2	4.50	S2	4.00	4.25	5.00	1	10.25
7888	Coastal Fen	Jensen Harbor	A	G1G2	4.50	S2	4.00	4.25	5.00	1	10.25
11086	Coastal Fen	Thompson's Harbor	A	G1G2	4.50	S2	4.00	4.25	5.00	1	10.25
18759	Limestone Cobble Shore	Besser Natural Area	B	G2G3	3.50	S3	3.00	3.25	4.00	3	10.25
19135	Limestone Cobble Shore	Old Mission Lighthouse	B	G2G3	3.50	S3	3.00	3.25	4.00	3	10.25
19153	Limestone Cobble Shore	Headlands Cobble Shore	B	G2G3	3.50	S3	3.00	3.25	4.00	3	10.25
20449	Limestone Cobble Shore	Taganing Shore	B	G2G3	3.50	S3	3.00	3.25	4.00	3	10.25
6089	Interdunal Wetland	Little Sandy Bay -- Beaver Island	C	G2?	4.00	S2	4.00	4.00	3.00	3	10
6666	Interdunal Wetland	Platte Bay East	C	G2?	4.00	S2	4.00	4.00	3.00	3	10
8003	Interdunal Wetland	Fisherman's Island State Park	C	G2?	4.00	S2	4.00	4.00	3.00	3	10
10808	Open Dunes	McFadden Point -- Beaver Island	C	G3	3.00	S3	3.00	3.00	3.00	4	10
17533	Northern Fen	Cheboygan State Park	B	G3	3.00	S3	3.00	3.00	4.00	3	10
18836	Northern Fen	Ossineke Fen	B	G3	3.00	S3	3.00	3.00	4.00	3	10
19164	Interdunal Wetland	Point Betsie	C	G2?	4.00	S2	4.00	4.00	3.00	3	10
20443	Mesic Northern Forest	McCort Hill	CD	G4	2.00	S3	3.00	2.50	2.50	5	10
20458	Mesic Northern Forest	Portage Point Forest	CD	G4	2.00	S3	3.00	2.50	2.50	5	10
20483	Open Dunes	Tawas Dunes	C	G3	3.00	S3	3.00	3.00	3.00	4	10
20484	Open Dunes	Maple Bay Dunes	C	G3	3.00	S3	3.00	3.00	3.00	4	10
1936	Coastal Fen	El Cajon Bay, Misery Bay	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
10574	Coastal Fen	Northcutt Bay	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75

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19745	Limestone Cobble Shore	Rockport South	BC	G2G3	3.50	S3	3.00	3.25	3.50	3	9.75
1267	Open Dunes	South Bigsbie Lake	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
2334	Wooded Dune and Swale Complex	Shalda Creek, Good Harbor Bay	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
6428	Wooded Dune and Swale Complex	Crystal River	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
8096	Floodplain Forest	White River -- Camp Owassippe	AB	G3?	3.00	S3	3.00	3.00	4.50	2	9.5
10470	Wooded Dune and Swale Complex	Black River	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
12961	Open Dunes	Pyramid Point	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
18758	Open Dunes	Besser Natural Area	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
19141	Open Dunes	Whaleback	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
19147	Clay Bluff	North Manitou Bluffs	AB	GNR	4.00	S2	4.00	4.00	4.50	1	9.5
19150	Great Lakes Barrens	North Manitou Barrens	B	G3	3.00	S2	4.00	3.50	4.00	2	9.5
19151	Great Lakes Barrens	South Manitou Barrens	B	G3	3.00	S2	4.00	3.50	4.00	2	9.5
19156	Open Dunes	Section 17 Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
19160	Open Dunes	Gull Point Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
20456	Open Dunes	Arcadia Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
20481	Open Dunes	Green Point Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
9513	Coastal Fen	Sweat Lodge Swale	B	G1G2	4.50	S2	4.00	4.25	4.00	1	9.25
20448	Limestone Cobble Shore	Monatou Bay	A	G2G3	3.50	S3	3.00	3.25	5.00	1	9.25
530	Open Dunes	Cable Bay -- Beaver Island	C	G3	3.00	S3	3.00	3.00	3.00	3	9
1963	Open Dunes	South Fox Island	A	G3	3.00	S3	3.00	3.00	5.00	1	9
3324	Great Lakes Barrens	Sturgeon Bay	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
4073	Open Dunes	McSauba Park	C	G3	3.00	S3	3.00	3.00	3.00	3	9
4074	Open Dunes	Fisherman's Island State Park	C	G3	3.00	S3	3.00	3.00	3.00	3	9
4199	Open Dunes	Empire Bluffs	B	G3	3.00	S3	3.00	3.00	4.00	2	9
4888	Open Dunes	Cathead Bay	B	G3	3.00	S3	3.00	3.00	4.00	2	9
5002	Open Dunes	Sand Bay -- Beaver Island	C	G3	3.00	S3	3.00	3.00	3.00	3	9
6100	Mesic Northern Forest	Cathead Bay	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
6368	Open Dunes	McCort Hill	C	G3	3.00	S3	3.00	3.00	3.00	3	9
6939	Open Dunes	Grass Bay	C	G3	3.00	S3	3.00	3.00	3.00	3	9
7487	Boreal Forest	Garden Island West Boreal Forest	A	GU	3.00	S3	3.00	3.00	5.00	1	9
7756	Open Dunes	South Arcadia Dunes	C	G3	3.00	S3	3.00	3.00	3.00	3	9
8311	Open Dunes	Platte Bay West	B	G3	3.00	S3	3.00	3.00	4.00	2	9
8507	Mesic Northern Forest	Tucker Point Woods	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
8508	Mesic Northern Forest	Marion Island	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
8871	Interdunal Wetland	Au Sable Point	D	G2?	4.00	S2	4.00	4.00	2.00	3	9

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9228	Open Dunes	Sturgeon Bay	B	G3	3.00	S3	3.00	3.00	4.00	2	9
9292	Open Dunes	Iron Ore Bay -- Beaver Island	C	G3	3.00	S3	3.00	3.00	3.00	3	9
9748	Open Dunes	South Manitou Island	A	G3	3.00	S3	3.00	3.00	5.00	1	9
10698	Open Dunes	High Island	A	G3	3.00	S3	3.00	3.00	5.00	1	9
10898	Mesic Northern Forest	Leffingwell Point	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
10977	Sand and Gravel Beach	High Island Bay	A	G3?	3.00	S3	3.00	3.00	5.00	1	9
11891	Great Lakes Barrens	Nordhouse Dunes	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
12637	Open Dunes	Platte Bay East	B	G3	3.00	S3	3.00	3.00	4.00	2	9
13026	Sand and Gravel Beach	High Island	A	G3?	3.00	S3	3.00	3.00	5.00	1	9
13387	Interdunal Wetland	Huron Beach	D	G2?	4.00	S2	4.00	4.00	2.00	3	9
17339	Northern Shrub Thicket	Thompson's Harbor	AB	G4	2.00	S5	1.00	1.50	4.50	3	9
18862	Mesic Northern Forest	Wycamp Mesic Forest	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
20444	Sand and Gravel Beach	Fisher Beach	C	G3?	3.00	S3	3.00	3.00	3.00	3	9
20454	Great Lakes Barrens	Nezewabegon Barrens	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
20457	Open Dunes	Portage Point Dunes	C	G3	3.00	S3	3.00	3.00	3.00	3	9
20460	Submergent Marsh	Hamlin Lake Marsh	B	GU	2.00	S4	2.00	2.00	4.00	3	9
20466	Hardwood-Conifer Swamp	Belanger Creek Swamp	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
24	Coastal Fen	Whitefish Bay	BC	G1G2	4.50	S2	4.00	4.25	3.50	1	8.75
6527	Limestone Cobble Shore	High Island	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
20447	Limestone Cobble Shore	Hog Island	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
1435	Mesic Northern Forest	Old Mission Point	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
1636	Hardwood-Conifer Swamp	Cecil Bay	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
1818	Mesic Northern Forest	South Storage Reservoir	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
2127	Boreal Forest	Cap's Cabin	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
4742	Mesic Northern Forest	Lake Genesereth Old Growth -- Beaver Island	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
4856	Boreal Forest	High Island	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
6073	Boreal Forest	North Fox Island	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
7947	Northern Hardwood Swamp	North Fox Island	A	G4	2.00	S3	3.00	2.50	5.00	1	8.5
8649	Mesic Northern Forest	Williamsport	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
8704	Sinkhole	Rockport Karst	AB	G3G5	2.00	S2	4.00	3.00	4.50	1	8.5
12329	Boreal Forest	Waugoshance and Temperance Islands	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
17329	Sand and Gravel Beach	Sleeping Bear Dunes	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
17335	Northern Shrub Thicket	Wilderness State Park	B	G4	2.00	S5	1.00	1.50	4.00	3	8.5
17838	Boreal Forest	Big Stone Bay Boreal Forest	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
19154	Open Dunes	West Side Dunes	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5

Appendix 1b. Stewardship prioritization for natural community element occurrences in the coastal zone of northern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
19155	Sand and Gravel Beach	West Side Beach	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
19157	Open Dunes	South Shore Dunes	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
19158	Sand and Gravel Beach	Vessel Point	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
19159	Sand and Gravel Beach	South Manitou Beach	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
1997	Sand and Gravel Beach	South Fox Island	B	G3?	3.00	S3	3.00	3.00	4.00	1	8
2988	Poor Fen	Egg Lake	B	G3	3.00	S3	3.00	3.00	4.00	1	8
4501	Boreal Forest	Thunder Bay Island	B?	GU	3.00	S3	3.00	3.00	4.00	1	8
7678	Boreal Forest	Waugoshance Point	B	GU	3.00	S3	3.00	3.00	4.00	1	8
9259	Dry-mesic Northern Forest	Pointe La Par	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
9328	Mesic Northern Forest	Font Lake Old-growth	CD	G4	2.00	S3	3.00	2.50	2.50	3	8
9639	Rich Conifer Swamp	Hog Island	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
10758	Mesic Northern Forest	North Fox Island	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
15803	Northern Fen	Stevenson's Fen	B	G3	3.00	S3	3.00	3.00	4.00	1	8
17334	Northern Fen	Wilderness State Park	B	G3	3.00	S3	3.00	3.00	4.00	1	8
17840	Poor Fen	Sturgeon Bay	B	G3	3.00	S3	3.00	3.00	4.00	1	8
17841	Northern Fen	Sturgeon Bay	B	G3	3.00	S3	3.00	3.00	4.00	1	8
17842	Northern Fen	Waugoshance Fen	B	G3	3.00	S3	3.00	3.00	4.00	1	8
18591	Northern Fen	Whitefish Bay	B	G3	3.00	S3	3.00	3.00	4.00	1	8
19140	Boreal Forest	Whaleback	C	GU	3.00	S3	3.00	3.00	3.00	2	8
19161	Open Dunes	North Shore Dunes	B	G3	3.00	S3	3.00	3.00	4.00	1	8
20452	Mesic Northern Forest	Nezewabegon Forest	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
9208	Limestone Cliff	El Cajon Bay	B	G4G5	1.50	S2	4.00	2.75	4.00	1	7.75
11804	Northern Wet Meadow	Garden Island Harbor	A	G4G5	1.50	S4	2.00	1.75	5.00	1	7.75
626	Mesic Northern Forest	Martins Bluff	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5
788	Boreal Forest	South Fox Island	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
1867	Boreal Forest	Point Betsie	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
2437	Boreal Forest	Little Sand Bay -- Beaver Island	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
10493	Mesic Northern Forest	Southwest Old Growth -- Beaver Island	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5
10623	Hardwood-Conifer Swamp	Hog Island North	A	G4	2.00	S3	3.00	2.50	5.00	0	7.5
13195	Dry-mesic Northern Forest	Nebo Trail	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5
16925	Boreal Forest	Headlands Boreal Forest	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
19137	Boreal Forest	Leelanau Lighthouse	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
19746	Northern Fen	Ferrion Point Fen	BC	G3	3.00	S3	3.00	3.00	3.50	1	7.5
20453	Dry-mesic Northern Forest	High Island	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5
20468	Boreal Forest	Paradesia Point	CD	GU	3.00	S3	3.00	3.00	2.50	2	7.5

Appendix 1b. Stewardship prioritization for natural community element occurrences in the coastal zone of northern Lower Michigan. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority. Extirpated element occurrences (gray) were assigned a score of zero.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
359	Mesic Northern Forest	South Fox Island	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
6311	Boreal Forest	French Bay -- Beaver Island	C	GU	3.00	S3	3.00	3.00	3.00	1	7
7843	Mesic Northern Forest	Hog Island	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
9318	Mesic Northern Forest	South Manitou Island	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
10142	Boreal Forest	South Manitou Island	C	GU	3.00	S3	3.00	3.00	3.00	1	7
18860	Dry-mesic Northern Forest	Wycamp Pines	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
19149	Dry-mesic Northern Forest	Piney Ridge	BC	G4	2.00	S3	3.00	2.50	3.50	1	7
20451	Wooded Dune and Swale Complex	Taganing Dune and Swale	C	G3	3.00	S3	3.00	3.00	3.00	1	7
20459	Emergent Marsh	Hamlin Lake Marsh	B	GU	2.00	S4	2.00	2.00	4.00	1	7
17839	Muskeg	Nebo Muskeg	BC	G4G5	1.50	S3	3.00	2.25	3.50	1	6.75
3082	Dry-mesic Northern Forest	Leffingwell Point	C	G4	2.00	S3	3.00	2.50	3.00	1	6.5
3913	Wooded Dune and Swale Complex	Hog Island -- East Shoreline	CD	G3	3.00	S3	3.00	3.00	2.50	1	6.5
10496	Mesic Northern Forest	Red Oak Garden	C	G4	2.00	S3	3.00	2.50	3.00	1	6.5
11745	Mesic Northern Forest	South Manitou Island	C	G4	2.00	S3	3.00	2.50	3.00	1	6.5
12097	Bog	Fox Lake Bog -- Beaver Island	AB	G3G5	2.00	S4	2.00	2.00	4.50	0	6.5
17338	Emergent Marsh	Thompson's Harbor	AB	GU	2.00	S4	2.00	2.00	4.50	0	6.5
17843	Emergent Marsh	Waugoshance Island	AB	GU	2.00	S4	2.00	2.00	4.50	0	6.5
20442	Bog	Greene's Lake	AB	G3G5	2.00	S4	2.00	2.00	4.50	0	6.5
18861	Northern Wet Meadow	Wycamp Swales	BC	G4G5	1.50	S4	2.00	1.75	3.50	3	6.25
10501	Boreal Forest	Big Rock Point	D?	GU	3.00	S3	3.00	3.00	2.00	1	6
6555	Bog	Brinkman Bog	C	G3G5	2.00	S4	2.00	2.00	3.00	0	5
15857	Mesic Northern Forest	Acme Beech-Maple	X	G4	2.00	S3	3.00	2.50	0.00	0	0

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
2121	Alvar	Maxton Plains	A	G2?	4.00	S1	5.00	4.50	5.00	6	15.5
1338	Great Lakes Marsh	Carp River, Pine River	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
1522	Great Lakes Marsh	Grand Island	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
5370	Great Lakes Marsh	St. Martin Bay	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
5395	Great Lakes Marsh	Sand Island	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
9136	Great Lakes Marsh	Pointe Aux Chenes	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
10115	Great Lakes Marsh	Duck Bay -- Marquette Island	AB	G2	4.00	S3	3.00	3.50	5.00	5	13.5
11784	Great Lakes Marsh	Munuscong & Little Munuscong Rivers & Pickford Point	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
12028	Alvar	Jones Lake -- Drummond Island	B	G2?	4.00	S1	5.00	4.50	4.00	5	13.5
12426	Great Lakes Marsh	Voight Bay -- Marquette Island	A	G2	4.00	S3	3.00	3.50	5.00	5	13.5
142	Limestone Bedrock Glade	Sucker Lake	AB	G2G4	3.00	S2	4.00	3.50	4.50	5	13
563	Great Lakes Marsh	Roach Point	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
2353	Great Lakes Marsh	Burnt Island East	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
3173	Great Lakes Marsh	Burnt Island West	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
5158	Great Lakes Marsh	Au Train	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
6682	Great Lakes Marsh	Harbor Island Bay	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
12535	Great Lakes Marsh	Duck Lake -- Sugar Island	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
13013	Great Lakes Marsh	Shingle Bay -- Sugar Island	AB	G2	4.00	S3	3.00	3.50	4.50	5	13
5371	Great Lakes Marsh	Hessel Marsh	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
5952	Limestone Bedrock Glade	Kregg Bay Glade	B	G2G4	3.00	S2	4.00	3.50	4.00	5	12.5
9612	Limestone Bedrock Glade	Garden Glade Southeast	B	G2G4	3.00	S2	4.00	3.50	4.00	5	12.5
10157	Great Lakes Marsh	Peck Bay - Marquette Island	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
10365	Great Lakes Marsh	Baie de Wasai -- Sugar Island	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
11557	Great Lakes Marsh	Fishdam River Delta	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
12046	Great Lakes Marsh	Kenyon Bay and West	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
19732	Great Lakes Marsh	Lime Island	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
20473	Great Lakes Marsh	Gut Port Marsh	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
20476	Great Lakes Marsh	Mouth of the Tahquamenon	B	G2	4.00	S3	3.00	3.50	4.00	5	12.5
1297	Great Lakes Marsh	Mismer Bay	C	G2	4.00	S3	3.00	3.50	3.50	5	12
2797	Great Lakes Marsh	Epoufette Bay	BC	G2	4.00	S3	3.00	3.50	3.50	5	12
4682	Great Lakes Marsh	Winter Point -- Neebish Island	BC	G2	4.00	S3	3.00	3.50	3.50	5	12
5233	Great Lakes Marsh	Gogomain River	BC	G2	4.00	S3	3.00	3.50	3.50	5	12
5394	Great Lakes Marsh	Whipple Point, Sugar Island	BC	G2	4.00	S3	3.00	3.50	3.50	5	12
8215	Great Lakes Marsh	Point St. Ignance	BC	G2	4.00	S3	3.00	3.50	3.50	5	12

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
9211	Great Lakes Marsh	Paw Point, Scott Point	BC	G2	4.00	S3	3.00	3.50	3.50	5	12
200	Great Lakes Marsh	Whitefish River Delta, Rapid River	C	G2	4.00	S3	3.00	3.50	3.00	5	11.5
1154	Limestone Bedrock Glade	Huron Bay Road	C	G2G4	3.00	S2	4.00	3.50	3.00	5	11.5
4159	Limestone Bedrock Lakeshore	Poverty Island	A	G3	3.00	S2	4.00	3.50	5.00	3	11.5
4683	Great Lakes Marsh	Hursley Creek, Charlotte River	C	G2	4.00	S3	3.00	3.50	3.00	5	11.5
5883	Limestone Bedrock Lakeshore	Seamans Point -- Drummond Island	A	G3	3.00	S2	4.00	3.50	5.00	3	11.5
7436	Limestone Bedrock Glade	Charbenou Lake	C	G2G4	3.00	S2	4.00	3.50	3.00	5	11.5
7753	Limestone Bedrock Lakeshore	Huron Bay -- Drummond Island	A	G3	3.00	S2	4.00	3.50	5.00	3	11.5
8109	Limestone Bedrock Lakeshore	Bass Cove -- Drummond Island	A	G3	3.00	S2	4.00	3.50	5.00	3	11.5
9877	Great Lakes Marsh	Kemp's Point	C	G2	4.00	S3	3.00	3.50	3.00	5	11.5
10606	Limestone Bedrock Lakeshore	Point De Tour	A	G3	3.00	S2	4.00	3.50	5.00	3	11.5
11037	Interdunal Wetland	Big Knob Campground	AB	G2?	4.00	S2	4.00	4.00	4.50	3	11.5
13163	Great Lakes Marsh	Big Shoal Cove -- Drummond Island	C	G2	4.00	S3	3.00	3.50	3.00	5	11.5
13170	Great Lakes Marsh	Rocky Point	C?	G2	4.00	S3	3.00	3.50	3.00	5	11.5
15894	Interdunal Wetland	Voight Bay	AB	G2?	4.00	S2	4.00	4.00	4.50	3	11.5
19476	Interdunal Wetland	Crisp Point	AB	G2?	4.00	S2	4.00	4.00	4.50	3	11.5
20386	Limestone Bedrock Glade	Fox Point Glade	C	G2G4	3.00	S2	4.00	3.50	3.00	5	11.5
986	Wooded Dune and Swale Complex	Thompson	C	G3	3.00	S3	3.00	3.00	3.00	7	11
2258	Limestone Bedrock Lakeshore	Summer Island	AB	G3	3.00	S2	4.00	3.50	4.50	3	11
3190	Limestone Bedrock Lakeshore	Grand Marais Lake	AB	G3	3.00	S2	4.00	3.50	4.50	3	11
4734	Limestone Bedrock Glade	Seaman's Point -- Drummond Island	AB	G2G4	3.00	S2	4.00	3.50	4.50	3	11
7614	Interdunal Wetland	Pointe Aux Chenes	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
8647	Wooded Dune and Swale Complex	Au Train	C	G3	3.00	S3	3.00	3.00	3.00	5	11
10973	Wooded Dune and Swale Complex	Point Catosh Swales	C	G3	3.00	S3	3.00	3.00	3.00	5	11
11798	Limestone Bedrock Lakeshore	Goudreau's Harbor	AB	G3	3.00	S2	4.00	3.50	4.50	3	11
12340	Interdunal Wetland	Inland Harbor	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
13468	Limestone Bedrock Lakeshore	Dudley Bay	AB	G3	3.00	S2	4.00	3.50	4.50	3	11
13469	Limestone Bedrock Glade	Dudley Bay	AB	G2G4	3.00	S2	4.00	3.50	4.50	3	11
13479	Limestone Bedrock Glade	Bush Bay	AB	G2G4	3.00	S2	4.00	3.50	4.50	3	11
13759	Interdunal Wetland	Ponchartrain Meadows and Cedars	B	G2?	4.00	S2	4.00	4.00	4.00	3	11
18583	Interdunal Wetland	Horseshoe Bay Grosse Point	A	G2?	4.00	S2	4.00	4.00	5.00	3	11
1924	Limestone Bedrock Lakeshore	Kregg Bay Northeast	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
1975	Wooded Dune and Swale Complex	Brevoort Lake and Dunes	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
3676	Limestone Bedrock Lakeshore	Big Shoal Cove -- Drummond Island	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
4993	Wooded Dune and Swale Complex	Scott Point	AB	G3	3.00	S3	3.00	3.00	4.50	3	10.5

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
6497	Wooded Dune and Swale Complex	Big Knob Campground	AB	G3	3.00	S3	3.00	3.00	4.50	3	10.5
8641	Limestone Bedrock Glade	The Rock -- Drummond Island	B	G2G4	3.00	S2	4.00	3.50	4.00	3	10.5
12697	Limestone Bedrock Lakeshore	Stony Point	B	G3	3.00	S2	4.00	3.50	4.00	3	10.5
17864	Limestone Bedrock Glade	Maxton North	B	G2G4	3.00	S2	4.00	3.50	4.00	3	10.5
15835	Coastal Fen	Big St. Martin Island	A	G1G2	4.50	S2	4.00	4.25	5.00	1	10.25
18584	Coastal Fen	Horseshoe Bay Grosse Point	A	G1G2	4.50	S2	4.00	4.25	5.00	1	10.25
19748	Limestone Cobble Shore	Lime Island	B	G2G3	3.50	S3	3.00	3.25	4.00	3	10.25
317	Rich Conifer Swamp	Central Cedar Swamp	AB	G4	2.00	S3	3.00	2.50	4.50	3	10
1910	Open Dunes	Inland Harbor	B	G3	3.00	S3	3.00	3.00	4.00	3	10
2491	Limestone Bedrock Glade	Big Shoal Cove	BC	G2G4	3.00	S2	4.00	3.50	3.50	3	10
5042	Wooded Dune and Swale Complex	Pointe Aux Chenes	B	G3	3.00	S3	3.00	3.00	4.00	3	10
6496	Wooded Dune and Swale Complex	Bethlehem Tract	B	G3	3.00	S3	3.00	3.00	4.00	3	10
9523	Wooded Dune and Swale Complex	Seiner's Point	B	G3	3.00	S3	3.00	3.00	4.00	3	10
11401	Wooded Dune and Swale Complex	Big Bay de Noc	B	G3	3.00	S3	3.00	3.00	4.00	3	10
12342	Interdunal Wetland	Albany Creek Mouth	C	G2?	4.00	S2	4.00	4.00	3.00	3	10
16872	Wooded Dune and Swale Complex	Whitefish Point	B	G3	3.00	S3	3.00	3.00	4.00	3	10
17855	Rich Conifer Swamp	Lime Kiln Point	AB	G4	2.00	S3	3.00	2.50	4.50	3	10
1093	Coastal Fen	Meridian Fen	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
13746	Coastal Fen	Peck Bay	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
15833	Coastal Fen	St. Martin Island	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
15897	Coastal Fen	Voight Bay	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
17625	Coastal Fen	St. Martin Point	AB	G1G2	4.50	S2	4.00	4.25	4.50	1	9.75
124	Rich Conifer Swamp	Charles	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
3085	Wooded Dune and Swale Complex	Portage Bay	AB	G3	3.00	S3	3.00	3.00	4.50	2	9.5
6522	Sandstone Lakeshore Cliff	Au Train Point	A	G3	3.00	S2	4.00	3.50	5.00	1	9.5
7333	Wooded Dune and Swale Complex	Gulliver Lake Dunes	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
7752	Limestone Bedrock Lakeshore	Potagannissing Bay	C	G3	3.00	S2	4.00	3.50	3.00	3	9.5
8060	Rich Conifer Swamp	Horseshoe Bay	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
11688	Mesic Northern Forest	Harbor Island	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
11799	Limestone Bedrock Lakeshore	Whitefish Point (Prentiss Bay)	C	G3	3.00	S2	4.00	3.50	3.00	3	9.5
13747	Rich Conifer Swamp	Peck Bay	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
16751	Mesic Northern Forest	Oak Ridge North	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
18153	Mesic Northern Forest	Pictured Rocks	B	G4	2.00	S3	3.00	2.50	4.00	3	9.5
18841	Wooded Dune and Swale Complex	Rock River Complex	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
1437	Limestone Lakeshore Cliff	Poverty Island	A	G4G5	1.50	S1	5.00	3.25	5.00	1	9.25

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
7889	Coastal Fen	Voight Bay West	B	G1G2	4.50	S2	4.00	4.25	4.00	1	9.25
13470	Coastal Fen	Dudley Bay	B	G1G2	4.50	S2	4.00	4.25	4.00	1	9.25
2	Wooded Dune and Swale Complex	Ogontz Bay	A	G3	3.00	S3	3.00	3.00	5.00	1	9
562	Wooded Dune and Swale Complex	West Epoufette	B	G3	3.00	S3	3.00	3.00	4.00	2	9
2834	Wooded Dune and Swale Complex	St. Vital Bay	B	G3	3.00	S3	3.00	3.00	4.00	2	9
4597	Wooded Dune and Swale Complex	Horseshoe Bay	B	G3	3.00	S3	3.00	3.00	4.00	2	9
5088	Mesic Northern Forest	Sand Bay -- Drummond Island	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
5748	Northern Fen	Charles	A	G3	3.00	S3	3.00	3.00	5.00	1	9
7488	Boreal Forest	Poverty Island	A	GU	3.00	S3	3.00	3.00	5.00	1	9
7658	Mesic Northern Forest	Lime Kiln Point	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
8473	Boreal Forest	Lighthouse Point	A	GU	3.00	S3	3.00	3.00	5.00	1	9
8531	Patterned Fen	Park Patterned Peatland	B	GU	4.00	S2	4.00	4.00	4.00	1	9
9225	Open Dunes	Pointe Aux Chenes	C	G3	3.00	S3	3.00	3.00	3.00	3	9
9618	Mesic Northern Forest	Wells Mesic Northern Forest	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
10265	Open Dunes	Grand Sable Dunes	A	G3	3.00	S3	3.00	3.00	5.00	1	9
10987	Mesic Northern Forest	Cut River Gorge	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
16603	Northern Fen	Big Bay de Noc	A	G3	3.00	S3	3.00	3.00	5.00	1	9
17322	Rich Conifer Swamp	Nahma	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
18157	Sandstone Lakeshore Cliff	Pictured Rocks	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
20474	Boreal Forest	De Tour Peninsula	B	GU	3.00	S3	3.00	3.00	4.00	2	9
3234	Limestone Lakeshore Cliff	Middle Bluff	AB	G4G5	1.50	S1	5.00	3.25	4.50	1	8.75
3957	Limestone Cobble Shore	Seiner's Point	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
4140	Limestone Cobble Shore	Horseshoe Bay	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
5671	Limestone Cliff	Marblehead	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
9467	Limestone Lakeshore Cliff	Burnt Bluff	AB	G4G5	1.50	S1	5.00	3.25	4.50	1	8.75
13466	Limestone Cobble Shore	Bush Bay	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
15586	Limestone Cliff	Summer Island	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
17860	Limestone Cobble Shore	Fourth Lake Complex	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
17865	Limestone Cobble Shore	Maxton North	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
18155	Sandstone Bedrock Lakeshore	Pictured Rocks National Lakeshore	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
20472	Limestone Cobble Shore	De Tour Shore	AB	G2G3	3.50	S3	3.00	3.25	4.50	1	8.75
604	Open Dunes	Voight Bay West	CD	G3	3.00	S3	3.00	3.00	2.50	3	8.5
1231	Boreal Forest	Harbor Island	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
2108	Sandstone Lakeshore Cliff	Shelter Bay	B	G3	3.00	S2	4.00	3.50	4.00	1	8.5
2230	Boreal Forest	Burnt Island	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
5747	Northern Fen	Horseshoe Bay	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
6003	Mesic Northern Forest	North Point	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
8212	Boreal Forest	Bellevue Island	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
10290	Wooded Dune and Swale Complex	Tahquamenon Bay	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
13552	Poor Fen	Munuscong River	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
13582	Sinkhole	The Rock -- Drummond Island	AB	G3G5	2.00	S2	4.00	3.00	4.50	1	8.5
16148	Wooded Dune and Swale Complex	AU SABLE POINT	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
17866	Boreal Forest	Maxton North	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
17867	Poor Fen	Tahquamenon River Mouth Fen	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
17869	Dry Northern Forest	Tahquamenon River Mouth	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
17870	Poor Fen	Park Poor Fen	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
18156	Sand and Gravel Beach	Pictured Rocks	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
18811	Sand and Gravel Beach	Lake Superior Campground	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
18858	Rich Conifer Swamp	Wells Swamp	C	G4	2.00	S3	3.00	2.50	3.00	3	8.5
19484	Sand and Gravel Beach	Crisp Point	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
20482	Northern Fen	Leopold's Fen	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5
1548	Coastal Fen	Marquette Bay	C	G1G2	4.50	S2	4.00	4.25	3.00	1	8.25
4632	Limestone Cobble Shore	Bois Blanc Island	B	G2G3	3.50	S3	3.00	3.25	4.00	1	8.25
9646	Limestone Lakeshore Cliff	Little Summer Island	B	G4G5	1.50	S1	5.00	3.25	4.00	1	8.25
11602	Coastal Fen	Point Detachee Fen	C	G1G2	4.50	S2	4.00	4.25	3.00	1	8.25
12061	Limestone Cobble Shore	Gros Cap	B	G2G3	3.50	S3	3.00	3.25	4.00	1	8.25
13467	Limestone Cobble Shore	Dudley Bay	B	G2G3	3.50	S3	3.00	3.25	4.00	1	8.25
17856	Limestone Cobble Shore	Lime Kiln Point	B	G2G3	3.50	S3	3.00	3.25	4.00	1	8.25
18158	Sandstone Cliff	Pictured Rocks	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
18593	Limestone Cobble Shore	St. Martin Point	B	G2G3	3.50	S3	3.00	3.25	4.00	1	8.25
2270	Boreal Forest	Garden Island	B	GU	3.00	S3	3.00	3.00	4.00	1	8
4498	Boreal Forest	Au Sable Point	B	GU	3.00	S3	3.00	3.00	4.00	1	8
4969	Sand and Gravel Beach	Pointe Aux Chenes	B	G3?	3.00	S3	3.00	3.00	4.00	1	8
9668	Mesic Northern Forest	Bois Blanc Island -- Lighthouse Point	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
9909	Boreal Forest	La Salle Island	B	GU	3.00	S3	3.00	3.00	4.00	1	8
17859	Boreal Forest	Fourth Lake Complex	B	GU	3.00	S3	3.00	3.00	4.00	1	8
17861	Poor Fen	Maxton North	B	G3	3.00	S3	3.00	3.00	4.00	1	8
18810	Dry Northern Forest	Lake Superior Campground	B	G3?	3.00	S3	3.00	3.00	4.00	1	8
20475	Boreal Forest	Derby Boreal Forest	C	GU	3.00	S3	3.00	3.00	3.00	2	8
372	Limestone Cobble Shore	Warner's Cove -- Drummond Island	BC	G2G3	3.50	S3	3.00	3.25	3.50	1	7.75

Appendix 1c. Stewardship prioritization for natural community element occurrences in the coastal zone of the eastern Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
10330	Boreal Forest	Barbed Point -- Drummond Island	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
12200	Dry-mesic Northern Forest	Hiawatha National Forest Dunes	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5
14549	Boreal Forest	Boreal #7	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
18859	Boreal Forest	Wells Boreal Forest	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
19731	Boreal Forest	Lime Island	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
17857	Northern Wet Meadow	Mud Lake Bois Blanc Island	AB	G4G5	1.50	S4	2.00	1.75	4.50	1	7.25
17863	Northern Wet Meadow	Maxton North	AB	G4G5	1.50	S4	2.00	1.75	4.50	1	7.25
17868	Muskeg	Tahquamenon River Mouth Muskeg	B	G4G5	1.50	S3	3.00	2.25	4.00	1	7.25
19951	Northern Wet Meadow	Horseshoe Bay	AB	G4G5	1.50	S4	2.00	1.75	4.50	1	7.25
3146	Boreal Forest	Marquette Bay	C	GU	3.00	S3	3.00	3.00	3.00	1	7
16764	Northern Fen	Castle Rock North	C	G3	3.00	S3	3.00	3.00	3.00	1	7
17858	Northern Shrub Thicket	Fourth Lake Complex	AB	G4	2.00	S5	1.00	1.50	4.50	1	7
17862	Northern Shrub Thicket	Maxton North	AB	G4	2.00	S5	1.00	1.50	4.50	1	7
18592	Northern Fen	Isaacson Lake	C	G3	3.00	S3	3.00	3.00	3.00	1	7
9821	Boreal Forest	Fairview Cove -- Drummond Island	CD	GU	3.00	S3	3.00	3.00	2.50	1	6.5
19485	Emergent Marsh	Crisp Point	AB	GU	2.00	S4	2.00	2.00	4.50	0	6.5
19482	Hardwood-Conifer Swamp	Crisp Point	BC	G4	2.00	S3	3.00	2.50	3.50	0	6
10308	Bog	Shawnee Lake Bog	C	G3G5	2.00	S4	2.00	2.00	3.00	0	5

Appendix 1d. Stewardship prioritization for natural community element occurrences in the coastal zone of the western Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
3482	Northern Bald	Escarpment Trail	B	GU	5.00	S1	5.00	5.00	4.00	3	12
17846	Northern Bald	Bare Bluff Bald	B	GU	5.00	S1	5.00	5.00	4.00	3	12
17297	Sandstone Cobble Shore	Point Abbaye	AB	G2G3	3.50	S2	4.00	3.75	4.50	3	11.25
5458	Great Lakes Marsh	Lac La Belle	AB	G2	4.00	S3	3.00	3.50	4.50	3	11
17301	Sandstone Cobble Shore	Point Abbaye SE	B	G2G3	3.50	S2	4.00	3.75	4.00	3	10.75
6629	Great Lakes Marsh	Pequaming Marsh	B	G2	4.00	S3	3.00	3.50	4.00	3	10.5
8300	Great Lakes Marsh	Sturgeon River	B	G2	4.00	S3	3.00	3.50	4.00	3	10.5
8882	Great Lakes Marsh	Portage River Marsh	B	G2	4.00	S3	3.00	3.50	4.00	3	10.5
11423	Great Lakes Marsh	Independence Lake	B	G2	4.00	S3	3.00	3.50	4.00	3	10.5
11916	Wooded Dune and Swale Complex	Pine River	CD	G3	3.00	S3	3.00	3.00	2.50	5	10.5
18817	Granite Lakeshore Cliff	Little Presque Isle	AB	GU	5.00	S1	5.00	5.00	4.50	1	10.5
17298	Sandstone Bedrock Lakeshore	Point Abbaye	AB	G4G5	1.50	S2	4.00	2.75	4.50	3	10.25
1268	Volcanic Lakeshore Cliff	Bete Grise (Bear Bluff)	A	GU	5.00	S1	5.00	5.00	5.00	1	10
4387	Mesic Northern Forest	Porcupine Mountains	AB	G4	2.00	S3	3.00	2.50	4.50	1	10
6892	Volcanic Bedrock Glade	Fish Cove	A	GU	4.00	S2	4.00	4.00	5.00	1	10
6938	Volcanic Bedrock Glade	Bailey Creek, Grand Marais Harbor	B	GU	4.00	S2	4.00	4.00	4.00	2	10
10267	Volcanic Bedrock Glade	Agate Harbor	B	GU	4.00	S2	4.00	4.00	4.00	2	10
10793	Volcanic Bedrock Glade	Devil's Washtub	A	GU	4.00	S2	4.00	4.00	5.00	1	10
12518	Volcanic Lakeshore Cliff	Manitou Island	A	GU	5.00	S1	5.00	5.00	5.00	1	10
18004	Volcanic Bedrock Glade	Porcupine Mountains Glades	B	GU	4.00	S2	4.00	4.00	4.00	2	10
18009	Clay Bluff	Porcupine Mountains Clay Bluffs	A	GNR	4.00	S2	4.00	4.00	5.00	1	10
19776	Volcanic Bedrock Glade	East Vista Glade	C	GU	4.00	S2	4.00	4.00	3.00	3	10
17300	Sandstone Bedrock Lakeshore	Point Abbaye South	B	G4G5	1.50	S2	4.00	2.75	4.00	3	9.75
18012	Sandstone Cobble Shore	Porcupine Shore	A	G2G3	3.50	S2	4.00	3.75	5.00	1	9.75
1911	Volcanic Bedrock Glade	Horseshoe Harbor	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5
3138	Mesic Northern Forest	Harlow Lake	B	G4	2.00	S3	3.00	2.50	4.00	5	9.5
3235	Sandstone Lakeshore Cliff	Portage Lake Ship Canal West	A	G3	3.00	S2	4.00	3.50	5.00	1	9.5
3390	Wooded Dune and Swale Complex	Little Presque Isle Point	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
4890	Volcanic Bedrock Glade	Dan's Point	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5
7311	Wooded Dune and Swale Complex	Iron River	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
10522	Wooded Dune and Swale Complex	Little Traverse Bay	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
12676	Wooded Dune and Swale Complex	Cat Harbor	BC	G3	3.00	S3	3.00	3.00	3.50	3	9.5
17179	Patterned Fen	Keweenaw Point	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5
17283	Volcanic Bedrock Glade	Keweenaw Point	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5
17848	Volcanic Bedrock Glade	Bare Bluff Glade	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5

Appendix 1d. Stewardship prioritization for natural community element occurrences in the coastal zone of the western Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
17850	Volcanic Lakeshore Cliff	Bare Bluff	AB	GU	5.00	S1	5.00	5.00	4.50	1	9.5
18003	Volcanic Bedrock Glade	Green Mountain Glade	AB	GU	4.00	S2	4.00	4.00	4.50	1	9.5
18818	Sand and Gravel Beach	Little Presque Isle	AB	G3?	3.00	S3	3.00	3.00	4.50	2	9.5
19750	Volcanic Lakeshore Cliff	Fish Cove	AB	GU	5.00	S1	5.00	5.00	4.50	1	9.5
17290	Sandstone Cobble Shore	Sleeping Misery Bay	AB	G2G3	3.50	S2	4.00	3.75	4.50	1	9.25
750	Mesic Northern Forest	Presque Isle	BC	G4	2.00	S3	3.00	2.50	3.50	3	9
4937	Sandstone Lakeshore Cliff	Traverse-Louis Points	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
9468	Sandstone Lakeshore Cliff	Rabbit Bay -- Jacobsville	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
11913	Wooded Dune and Swale Complex	Salmon Trout River	A	G3	3.00	S3	3.00	3.00	5.00	1	9
17279	Northern Fen	Keweenaw Point	A	G3	3.00	S3	3.00	3.00	5.00	1	9
17296	Sandstone Lakeshore Cliff	Point Abbaye	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
17299	Sandstone Lakeshore Cliff	Point Abbaye SE	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
18010	Sand and Gravel Beach	Porcupine Beach	A	G3?	3.00	S3	3.00	3.00	5.00	1	9
18819	Sandstone Lakeshore Cliff	Little Presque Isle	AB	G3	3.00	S2	4.00	3.50	4.50	1	9
1925	Volcanic Bedrock Lakeshore	Devil's Washtub	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
2123	Volcanic Bedrock Lakeshore	Bete Grise -- Bear Bluff and Big Bay West	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
2311	Volcanic Bedrock Lakeshore	Keystone Point	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
3191	Volcanic Bedrock Lakeshore	Dan's Point	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
3958	Volcanic Bedrock Lakeshore	Horseshoe Harbor	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
4634	Volcanic Bedrock Lakeshore	Copper Harbor Lighthouse, Norland Trust	B	G4G5	1.50	S2	4.00	2.75	4.00	2	8.75
4737	Volcanic Bedrock Lakeshore	Seven Mile Point	B	G4G5	1.50	S2	4.00	2.75	4.00	2	8.75
6106	Granite Bedrock Lakeshore	Partridge Bay	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
9280	Volcanic Bedrock Lakeshore	Manitou Island	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
10478	Volcanic Bedrock Lakeshore	Bailey Creek, Grand Marais Harbor, Silver Isle, Agate Harbor	B	G4G5	1.50	S2	4.00	2.75	4.00	2	8.75
10595	Volcanic Bedrock Lakeshore	Keweenaw Point, High Rock, Keystone Bay	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
17847	Volcanic Cliff	Bare Bluff Cliffs	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
18000	Volcanic Cliff	Escarpment Trail Cliffs	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
18013	Volcanic Bedrock Lakeshore	Porcupine Shore	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
18014	Sandstone Bedrock Lakeshore	Porcupine Shore	A	G4G5	1.50	S2	4.00	2.75	5.00	1	8.75
699	Interdunal Wetland	Eagle Harbor	BC	G2?	4.00	S2	4.00	4.00	3.50	1	8.5
1441	Sandstone Lakeshore Cliff	Little Traverse Bay South	B	G3	3.00	S2	4.00	3.50	4.00	1	8.5
5916	Interdunal Wetland	Lightfoot Bay	BC	G2?	4.00	S2	4.00	4.00	3.50	1	8.5
7069	Sandstone Lakeshore Cliff	Granite Point	B	G3	3.00	S2	4.00	3.50	4.00	1	8.5
8644	Wooded Dune and Swale Complex	Oliver Bay	AB	G3	3.00	S3	3.00	3.00	4.50	1	8.5

Appendix 1d. Stewardship prioritization for natural community element occurrences in the coastal zone of the western Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
12196	Mesic Northern Forest	Huron Mountains	A	G4	2.00	S3	3.00	2.50	5.00	1	8.5
17281	Sand and Gravel Beach	Keweenaw Point	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
17284	Boreal Forest	Keweenaw Point	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
17292	Sand and Gravel Beach	Sleeping Misery Bay	AB	G3?	3.00	S3	3.00	3.00	4.50	1	8.5
17849	Boreal Forest	Bare Bluff Boreal Forest	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
19752	Boreal Forest	Fish Cove	AB	GU	3.00	S3	3.00	3.00	4.50	1	8.5
6528	Volcanic Bedrock Lakeshore	Porters Island	BC	G4G5	1.50	S2	4.00	2.75	3.50	2	8.25
12063	Volcanic Bedrock Lakeshore	Agate Harbor	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
13106	Volcanic Bedrock Lakeshore	Fort Wilkins	BC	G4G5	1.50	S2	4.00	2.75	3.50	2	8.25
17280	Volcanic Cobble Shore	Keweenaw Point	A	G4G5	1.50	S3	3.00	2.25	5.00	1	8.25
17293	Sandstone Bedrock Lakeshore	Sleeping Misery Bay	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
18002	Volcanic Cliff	Green Mountain Cliffs	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
18028	Sandstone Cliff	Shining Cloud Falls	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
18815	Granite Bedrock Lakeshore	Little Presque Isle	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
19773	Volcanic Cliff	Porcupine South	AB	G4G5	1.50	S2	4.00	2.75	4.50	1	8.25
3631	Wooded Dune and Swale Complex	Grand Traverse Bay	B	G3	3.00	S3	3.00	3.00	4.00	1	8
10720	Sandstone Lakeshore Cliff	Presque Isle Point	BC	G3	3.00	S2	4.00	3.50	3.50	1	8
12057	Wooded Dune and Swale Complex	Flint Steel River	B	G3	3.00	S3	3.00	3.00	4.00	1	8
14556	Dry Northern Forest	Huron Mountain Jack Pines	B	G3?	3.00	S3	3.00	3.00	4.00	1	8
17294	Mesic Northern Forest	Sleeping Misery Bay	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
17931	Rich Conifer Swamp	Carp River East	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
17934	Submergent Marsh	Carp River and Lake of the Clouds	A	GU	2.00	S4	2.00	2.00	5.00	1	8
18056	Dry-mesic Northern Forest	Porcupine Oaks	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
18814	Granite Bedrock Glade	Little Presque Isle	B	G3G5	2.00	S2	4.00	3.00	4.00	1	8
19751	Rich Conifer Swamp	Hoar Creek Swamp	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
19771	Northern Hardwood Swamp	Government Peak Swamp	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
19772	Northern Hardwood Swamp	Lake of the Clouds Swamp	AB	G4	2.00	S3	3.00	2.50	4.50	1	8
8388	Granite Bedrock Lakeshore	Granite Point	B	G4G5	1.50	S2	4.00	2.75	4.00	1	7.75
17999	Northern Wet Meadow	Carp River and Lake of the Clouds	A	G4G5	1.50	S4	2.00	1.75	5.00	1	7.75
18008	Sandstone Cliff	Presque Isle River	B	G4G5	1.50	S2	4.00	2.75	4.00	1	7.75
18011	Volcanic Cobble Shore	Porcupine Shore	AB	G4G5	1.50	S3	3.00	2.25	4.50	1	7.75
18816	Granite Cliff	Little Presque Isle	B	G4G5	1.50	S2	4.00	2.75	4.00	1	7.75
17295	Boreal Forest	Point Abbaye	BC	GU	3.00	S3	3.00	3.00	3.50	1	7.5
17932	Northern Shrub Thicket	Carp River East	A	G4	2.00	S5	1.00	1.50	5.00	1	7.5
18813	Dry-mesic Northern Forest	Little Presque Isle	B	G4	2.00	S3	3.00	2.50	4.00	1	7.5

Appendix 1d. Stewardship prioritization for natural community element occurrences in the coastal zone of the western Upper Peninsula. Element occurrences are sorted by their stewardship prioritization scores and assigned a high (red), medium (yellow), or low (blue) stewardship priority.

EO ID	Natural Community Type	Survey Site	EO Rank	Global Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Ecological Integrity Index	Threat Severity Index	Stewardship Score
18863	Hardwood-Conifer Swamp	Carp River Swamp	A	G4	2.00	S3	3.00	2.50	5.00	0	7.5
19775	Submergent Marsh	Mirror Lake Trail	AB	GU	2.00	S4	2.00	2.00	4.50	1	7.5
18005	Northern Wet Meadow	Carp River West	AB	G4G5	1.50	S4	2.00	1.75	4.50	1	7.25
19774	Northern Wet Meadow	Little Carp River Meadow	AB	G4G5	1.50	S4	2.00	1.75	4.50	1	7.25
6355	Dry Northern Forest	Eagle Harbor	C	G3?	3.00	S3	3.00	3.00	3.00	1	7
17291	Northern Shrub Thicket	Sleeping Misery Bay	AB	G4	2.00	S5	1.00	1.50	4.50	1	7
17998	Emergent Marsh	Lake of the Clouds	A	GU	2.00	S4	2.00	2.00	5.00	0	7
18006	Northern Shrub Thicket	Carp River West	AB	G4	2.00	S5	1.00	1.50	4.50	1	7
19767	Hardwood-Conifer Swamp	Mirror Lake Swamp	AB	G4	2.00	S3	3.00	2.50	4.50	0	7
19768	Hardwood-Conifer Swamp	Carp River Swamp South	AB	G4	2.00	S3	3.00	2.50	4.50	0	7
9209	Granite Bedrock Lakeshore	Harvey DNR	C	G4G5	1.50	S2	4.00	2.75	3.00	1	6.75
18001	Northern Wet Meadow	Miscowawbic Meadow	B	G4G5	1.50	S4	2.00	1.75	4.00	1	6.75
19769	Hardwood-Conifer Swamp	Little Carp River Swamp	B	G4	2.00	S3	3.00	2.50	4.00	0	6.5
19770	Hardwood-Conifer Swamp	Union Creek Swamp	B	G4	2.00	S3	3.00	2.50	4.00	0	6.5
19766	Bog	Little Carp River Bog	C	G3G5	2.00	S4	2.00	2.00	3.00	0	5

Appendix 2. Global and state element ranking criteria.

GLOBAL RANKS

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

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

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

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

G5 = secure: common; widespread.

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

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

G? = incomplete data.

STATE RANKS

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

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

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

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

S5 = common and widespread in the state.

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

S? = incomplete data.

Rich conifer swamp, Waugoshance Swamp, Wilderness State Park. Photo by Joshua G. Cohen.