

FINAL REPORT
ON A NATURAL AREAS INVENTORY
OF MICHIGAN'S DESIGNATED SAND DUNE AREAS

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Michigan Natural Features Inventory
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INTRODUCTION

The Sand Dune Protection and Management Act, PA 222 (1976), calls for the wise use and protection of Michigan's dunes and dunelike formations. Under the provisions of Act 222, the Department of Natural Resources identified 20 areas as Series I and II Designated Sand Dune Areas (DSD's) (Anonymous 1981), and proposed 12 Series III DSD's. Comprehensive studies of these dunes and determination of their values for environmental, recreational and industrial purposes were to be completed. Land Resource Program's Coastal Zone Management Unit, advised by the Sand Dunes Technical Advisory Board, is developing criteria by which to evaluate Sand Dune Areas' sensitivity to development. The Michigan Natural Features Inventory has been recommended as the source for data on the biological resources of dune ecosystems for use in that evaluation process.

The Michigan Natural Features Inventory (MNFI) was established in 1980 as a joint venture of The Nature Conservancy and the Michigan Department of Natural Resources' Land Resource Programs Division (Crispin 1984, Master et al. 1982). In its five years of operation, MNFI has become Michigan's chief storehouse of information on outstanding natural habitat types (called natural communities by MNFI), sensitive plant and animal species, great blue heron rookeries, and several other noteworthy natural features. About 6,000 detailed occurrence records, largely the result of field surveys, are stored in computer files and denoted on topographic maps. Additional data are stored in extensive manual files set up for over 100 natural community types, over 500 plant and animal species, over 60 other types of features, about 300 managed areas, and for each of Michigan's 1,200 7.5-minute USGS quad maps.

To organize the natural features data and set conservation priorities, each natural feature (an element) is ranked using factors of rarity and threat on a

state-wide (state element ranking) and range-wide basis (global element ranking). An example of an MNFI element ranking worksheet and a list of state and global ranks for all natural communities are given in Appendix I. Each location of a special feature (an element occurrence) is ranked (an element occurrence ranking or EO Rank) according to its natural quality (departure from presettlement conditions) and condition (degree of disturbance). An explanation of MNFI's four quality-ranks is given in Appendix II along with some of the specific criteria used to determine EO Rank. The element ranking and element occurrence ranking systems help MNFI to simultaneously gauge the singular importance of each occurrence of, for instance, open dunes, piping plover, or Pitcher's thistle, as well as the state-wide or world-wide importance of these natural features. Obviously, sites with several high-ranked occurrences of high-ranked elements merit more immediate attention than sites with a few low-ranked occurrences of lower-ranked elements.

Prior to 1982, MNFI collected primarily existing data on occurrences of elements of concern, drawing from publications, herbarium and museum specimens, and the knowledge of expert botanists, zoologists, ecologists, and naturalists. From this foundation, MNFI then focused efforts on high-ranking elements and began systematic inventories for the best occurrences of them. For example, inventories for dry sand prairie (Chapman and Crispin 1984) and the prairie fringed orchid (Chapman and Crispin 1985) in Michigan were undertaken. These surveys yielded highly definitive information on the status of these elements and the locations and quality of their best remaining examples.

Beginning in 1985, the Michigan Natural Features Inventory initiated comprehensive and systematic inventories to find all natural quality community occurrences within a county or region. This methodology is based on successful

natural areas inventories undertaken elsewhere in the midwestern United States (e.g., White 1978 in Illinois and Anonymous 1985 in Indiana). It is the long range goal of MNFI to complete a natural areas inventory for the entire state. Definitive knowledge about the best natural lands in a county, and eventually in the state, derive from this approach. In 1985 MNFI undertook a systematic inventory of Cass and Branch Counties. Air photos were examined to locate all natural lands, these locations were checked from aircraft, and the qualifying potential natural areas were visited on foot. This systematic approach greatly increased MNFI's information base for these counties and makes it possible to design conservation plans which ensure protection of each county's natural diversity. It can also be focused on a particular type of feature or area of the state to assist in protection planning for that feature or region. Employed on a statewide basis, this method can provide an effective approach to protecting the entire spectrum of Michigan's natural diversity.

MNFI employed the systematic inventory approach to identify the areas of highest natural integrity in Michigan's Designated Sand Dune Areas. These areas, comprised of natural communities with their characteristic species, represent perhaps 90 percent of the biological diversity in Michigan's duneland; the other 10 percent consists of sensitive plant and animal species which occur both within and outside these natural areas. The full range of biological diversity in the Sand Dunes Areas can be conserved by protecting sites with the best occurrences of the dunes' natural communities and by protecting enough populations of the dunes' sensitive plant and animal species. The natural community and sensitive species data are the foundation for judging the biological values of the Designated Sand Dune Areas.

METHODS

I. Methods used in the Sand Dunes Natural Area Inventory follow those developed in Illinois (White 1978) and Indiana (Anonymous 1985). The inventory proceeds in three stages: 1) map and air photo interpretation; 2) reconnaissance by aircraft; and 3) ground survey.

Map and Air Photo Interpretation

A list of natural features found in coastal zone dunes was prepared from MNFI's data base. Photointerpreters familiarized themselves with the air photo characteristics of high quality natural communities already documented by MNFI. Additional resources, such as vegetation maps, field surveys, soil maps, historical aerial photography and original land survey records, were consulted to increase understanding of the duneland environment. It had proven critical that an ecologist or person with similar training interpret the maps and air photos.

Work progressed county by county within the DSD's and selected non-designated sand dune regions. Wooded dunes, open dunes and wetlands within dunes were studied to the greatest inland extent of the dune system. The natural area potential of all parcels of land was assessed and topographic maps were marked with interpretive symbols, such as "ALD" standing for "average-large-dense," meaning crown size was average to large and there were few or no canopy openings. From past experience, the maturity of dune forests was assumed to correlate with crown size of canopy trees, average-sized crowns, for example, indicating mature trees of 40-60 cm dbh. Ground-truthing often improves the accuracy of interpretation, but was not done for lack of time. Consistency of interpretation was checked by re-interpreting some previously surveyed parcels.

Interpreters finding minimally disturbed natural vegetation outlined each

such potential natural area (PNA) in red pencil. A dashed line was used if it was likely the site and similar ones would be eliminated during later reconnaissance, so that workers can decide in the field whether or not to continue checking areas that are proving to be poor quality. A summary document, the County Scorecard, was used to track the survey and protection status of each PNA. Areas falling in two counties were considered one PNA and included in one or the other county, but referenced on the County Scorecard within the complementary county. MNFI maps and occurrence records were consulted to determine the extent of fieldwork already done in each PNA to avoid duplication.

Aerial Reconnaissance

Reconnaissance from aircraft provides a highly efficient method of conducting an initial screening of PNA's. Interpretive errors are discovered, better characterization of the vegetation is obtained, and areas destroyed or disturbed since the air photos were taken can be eliminated. A blue pencil is used to number PNA's in aerial survey order within each each county. Flight lines are drawn on air photos, taking into account the capacity of the aircraft to make turns, the presence of radio and TV towers, etc. Quad maps and PNA forms are arranged in flight order, and each quad is completed before moving on to the next. The best air reconnaissance is done at 500 feet, but is possible as high as 1400. Forests should be flown before leaf-on in spring to make stumps, size of trunks, etc. visible. Upland grasslands and savannas are flown in early spring when prairie grass colors stand out. Wetlands are best flown in mid- to late August, after grasses, composites, and the alien Lythrum salicaria have fully developed. A Potential Natural Area (PNA) Survey Form was completed for each area selected for field survey (Appendix III).

A single aerial reconnaissance flight was conducted in 1986. No flights

were done in 1985, due to funding and time limitations. The 1986 flight was undertaken in July and covered PNA's located on Lake Michigan island DSD's. Because the timing of the flight was late, northern hardwood forest were difficult to evaluate. Hence, only two PNA's were eliminated. However, due to the high cost in time and expense to survey islands, that flight was considered worthwhile.

Field Work

In the first year of this inventory, it was necessary to rapidly build experience in evaluating site quality. Because aircraft reconnaissance was not done, an overview survey of all duneland PNA's was performed. Workers categorized the vegetation by natural community type for each PNA visited, using the PNA Form. Species checklists were completed whenever possible. The presence of sensitive plants and animals was noted. A preliminary evaluation of quality was made for each natural community, care being taken to give reasons for eliminating areas from further consideration.

A second visit was made to natural communities ranked C or better to confirm the quality-rank and complete detailed MNFI survey forms (Appendix IV) on B- and A-rank natural communities and for all special plant and animal occurrences. Vegetation structure and dominance, size of trees, kind of soil, presence of animals, and general notes on disturbance, buffers, threats, etc. were recorded.

During the 1986 season, sufficient field work had been accomplished and evaluative criteria established to guide new field workers. Therefore, only single visits were made to each PNA. In addition, revisits were made to 1985 sites needing further work. Field workers documented occurrences for all special plant and animal occurrences as well as natural communities with an EO Rank of C and higher, if state ranked S2-3, or EO Rank BC and higher, if state

ranked S3 or lower.

Data Analysis

Field data on natural communities and sensitive plant and animal species were abstracted for each occurrence and summarized on MNFI's Element Occurrence Records (EOR's)(see Appendix V for example). These occurrences were mapped and the EOR's computerized. Element occurrences (EO's) are retrievable by Sand Dune Area, by county or other geographical area, by element type, and by several other parameters. MNFI's mapped EO's from the 1985 field season have been digitized into the Michigan Resource Inventory System, a computerized mapping database. Mapped EO's from the 1986 field season will be digitized by MIRIS during the winter of 1987.

Element occurrences are summarized on a Natural Heritage Scorecard. This document (Appendix IX) lists, in ranked order by state rank and EO Rank, each natural community element occurrence. Furthermore, it concisely presents data critical to conservation planning, including EO Ranking comments and comments on protection needs, strategies, or present levels.

RESULTS

From aerial photographs, 119 sites were selected for field checking; of those, 23 were outside Designated Sand Dune Areas. Each site contained 1-6 natural community types. Six natural community types predominated in the Designated Sand Dune Areas and are listed in order of prevalence: Open Dunes (26 element occurrences), Interdunal Wetland (14), Boreal Forest (9), Mesic Northern Forest (7), Great Lakes Barrens (6) and Sand/Gravel Beach (5). Forty-eight excellent or good (A- and B-rank) examples of natural communities were found in the course of this inventory. Forty-eight fair examples (BC- and C-rank) of natural communities were found. These community occurrences are

listed in Appendix IX, prioritized in order of state rank and element occurrence rank.

More excellent, good and fair examples of Open Dunes were found than of any other community type. (Descriptions of natural community types are given in Appendix VII.) The best examples are near Saugatuck, at Hoffmaster State Park, Muskegon State Park, Big Sable Point (Ludington/Nordhouse Dunes), Platte River Point, Sleeping Bear Dunes, Pyramid Point, Cathead Bay, along Sturgeon Bay proper, Grand Sable Dunes, South Manitou Island, South Fox Island and High Island.

Good examples of Interdunal Wetland usually were associated with good occurrences of Open Dunes, as at Saugatuck, Muskegon State Park, Little Sable Point, Big Sable Point, Platte River Point, Sturgeon Bay, Hog Island and Point Aux Chenes. Two good examples occur outside Designated Sand Dune Areas: Grass Bay and Crow River Mouth.

The southern subtype or variant of Boreal Forest occurs in nine sites on Designated Sand Dunes. High quality occurrences on Designated Sand Dunes are: North and South Fox Islands, High Island, Waugoshance Point. Au Sable Point is a high quality occurrence just outside a DSD region.

Great Lakes Barrens occurs at six sites. All but one are excellent to good occurrences. These are: Big Sable Dunes, Platte Bay, Silver Lake State Park, Good Harbor Bay and Cathead Bay.

Only one excellent and seven good quality non-Boreal forest tracts were found, five on islands and one outside the Designated Sand Dune Areas. Bridgman Dunes represents a good example of Mesic Southern Forest and Hoffmaster State Park contains a good example of Dry-mesic Southern Forest which, because of its location, is transitional to Dry-mesic Northern Forest. Hog Island has locally uncut Rich Conifer Swamp and a Dry-Mesic Northern Forest

that last saw disturbance from Indians in presettlement times. North Fox Island has an excellent example of Mesic Northern Forest and possibly a community type not previously described (Wet-Mesic Northern Forest). South Manitou and South Fox Islands still have small tracts of good quality Mesic Northern Forest, despite their history of heavy logging.

Thirteen fair quality forest community occurrences were located. These are listed on the Natural Diversity Scorecard (Appendix IX). The paucity of good forest tracts is the consequence of heavy past cutting and severe fires, compounded by a recovery rate in dune forests which is slower than forests not on sand. Because they were cut first, the southern forest types are developing old growth conditions while the northern forest have just reached maturity. Cutting still continues, more in northern forests than southern. About 5 percent of all sites visited suffered recent cutting.

Other excellent and good examples of community types found are Coastal Plain Marsh (near Covert), Cobble Beach (at Waugoshance Point), and Sand/Gravel Beach (at Pointe Aux Chenes and on High Island). Good examples of Great Lakes Marsh exist at Waugoshance Point and (not within a Sand Dunes Area) at Cheboygan State Park.

Special plants are found at 193 locations and special animals at 18 places within the Designated Sand Dunes. The largest DSD's do not have the greatest number of special species occurrences, nor do small DSD's necessarily have the fewest, illustrating that each DSD's has individual characteristics which determine its potential for special species regardless of the size of the DSD. But there is a strong trend for the larger DSD's to support more natural community occurrences, reflecting a correlation between size and habitat diversity.

The two largest Designated Sand Dune Areas--Benzie/Leelanau County and

Muskegon/Ottawa County--have respectively 25 percent and 19 percent of the natural community occurrences and 12 percent and 11 percent of the special plant and animal occurrences.

Although large, the Emmet County Sand Dune Area is diverse beyond its size. It contains many more special plant and animal occurrences than other Areas--23 percent of all the occurrences--and is third in the number of natural community occurrences (14 percent). Diversity is high here partly because the Straits of Mackinac lie at the center of several special plants' ranges. But in addition, the low dunes underlaid by calcareous bedrock promoted the formation of several natural community types (e.g., Cobble Beach and Great Lakes Barrens) in fairly small areas which, except for forest land, were little exploited by humans.

Berrien County and Van Buren County represent diverse Sand Dune Areas, having 13 percent and 16 percent of the special plant and animal occurrences respectively. The number of community occurrences here (14 percent of the total) results from the large area involved and the recovery time enjoyed by southern forests since early logging. Several plant species restricted in the sand dunes to southwest Lower Michigan boost the number of special species occurrences. The Allegan/Ottawa County Sand Dune Area experiences this distribution phenomenon: 6 percent of all special species occurrences are here. The other Sand Dune Areas have fewer than 3 percent each of the total. The Mason County Sand Dune Area stands out for supporting one of the world's largest population of Cirsium pitcheri. Allegan/Ottawa County, Oceana County and Mason County Areas, as is expected of large tracts, have a fair number of natural community occurrences, about 5 percent each.

About half the occurrences of natural communities and special plants lie partly on state and federal lands, mostly within parks. These public lands have different levels of protection, from dedicated Natural Areas on state

land, to administratively designated Outstanding Natural Feature Subzones in Federal Parks, to mere inclusion in a state park or national forest. The latter situation often provides insufficient protection for sensitive natural features on public land. Virtually no protection is afforded the remaining natural features in duneland, except those within natural areas owned by conservation organizations, local governments, or universities, of which there are very few. Development within a site or at its edge had disturbed about 17 percent of all the potential natural areas checked in this survey. This development occurred on private lands primarily from Muskegon south to Indiana, on the Leelanau Peninsula and near Traverse City, and around the Straits of Mackinac.

Duneland vegetation varies considerably from Indiana to the north shore of Lake Michigan. Sand Dune Areas fall within four natural regions which are defined as areas of generally uniform landforms, soils, climate, and vegetation. The first natural region, extending from Indiana to Muskegon, is defined by climate and reinforced by a soil change at Muskegon from fine to coarse textured soils. Several southern plant species reach their northern range limit here, including Corylus americana, Podophyllum peltatum, Rosa carolina, Geranium maculatum, Ptelea trifoliata, Euonymus obovata, Vitis aestivalis, Cornus florida, Smilax rotundifolia, and Chimaphila maculata. Conversely, certain northern species disappear or become rare and restricted to special microhabitats (like dunes) south of Muskegon, such as Acer spicatum, Taxus canadensis, Pinus resinosa, P. banksiana, Tsuga canadensis, Deschampsia flexuosa, and Eleocharis pauciflora.

The division between the second and third natural region occurs around Portage Lake (between Manistee and Frankfort) where moraines occur at the lake shore and extend considerably inland. Several southern species reach the

northern edge of their range here: Quercus velutina, Sassafras albidum, Rhus copallina, Panicum virgatum, and Cyperus schweinitzii. The northern species not found south of this line include Geocaulon lividum, Arceuthobium pusillum, Anemone multifida, Parnassia parviflora, Rubus parviflorus, Cyperipedium arietinum, Acer pensylvanicum, Goodyera oblongifolia, Juniperus horizontalis, Agropyron dasystachyum, Tanacetum huronense, Streptopus amplexifolius, and Lilium philadelphicum. Some of these stop short of here and are most abundant around the Straits of Mackinac.

At Cross Village, the moraines give way to lakeplain with calcareous bedrock close to the surface. This natural region around the Straits of Mackinac supports most populations of the sensitive Great Lakes endemic species Iris lacustris and Solidago houghtonii.

The Lake Michigan Islands support some of the highest quality natural communities. There is a strong correlation between island habitation and both frequency and natural quality of the community occurrences there. Hog and North Fox Islands are the least disturbed and have had only temporary settlement by Indians, fisherman or reclusive millionaires. South Fox, South Manitou, High, and Beaver Islands have seen much more disturbance from settlement activities and logging. It is generally the lands of lowest economic returns that are the least disturbed here. While that pattern is evident throughout Michigan's DSD's, it is most obvious on these islands.

RECOMMENDATIONS

Because of the high natural diversity and overall global importance of dune ecosystems, other sand dunes not within DSD's, as well as undeveloped non-dune coastal zone lands should also be inventoried. Other dunes occur in Lower Michigan on the shore of northern Lake Huron, in the Thumb region, in Upper

Michigan between Epoufette and Seul Choix Point on Lake Michigan and at additional scattered locations along Lake Superior.

There is a continuing need for research directed at problems in community classification and evaluation. While the present survey has provided valuable data on community occurrences within DSD's, the Michigan Natural Community Types Classification needs to incorporate occurrences from well outside the DSD's (e.g., Lake Huron and Erie coastal zone).

Each Designated Sand Dune Area belongs to a distinct natural region of the state (Albert, et al., 1986). This distinction needs be incorporated into any rating system for duneland protection. Priorities better reflecting the biology of dunelands will result from examining such issues as whether other examples of an element occur or are protected within a natural region.

MNFI needs to periodically update the Duneland Natural Heritage Scorecard to insure that our data reflects present conditions. As development occurs throughout the dunes and man's activities eliminate or degrade natural features, Scorecard revision will be needed. While the MNFI database is designed for continuous revision and upgrading of EOR's as new data is obtained, it is difficult to commit staff time to monitor sites which have already received comprehensive inventory. Time and cost effective methods of updating site information, such as accompanying Shoreline Protection Program personnel on shoreline reconnaissance flights, would be desirable.

ACKNOWLEDGMENTS

Kim Chapman, former MNFI Ecologist, coordinated much of the work on the Designated Sand Dunes Natural Areas Inventory up until his departure in April, 1986. He, as well as the authors, acknowledge the diligence and tenacity of workers contracted by MNFI. For field work and other duties associated with this project, we thank Martha Koby, Vicki Dunevitz, Michael Penskar, Ralph Reitz, John Freudenstein, Julie Hoinville, Cornell Rosiu, Richard Futyma and Barb Musgrave.

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(6/22/83)

STATE ELEMENT RANKING FORMElement Code: CPN Class: NC State/Program: MIElement Name: Inland Salt Marsh Date: 29 March 1984Common Name: _____ Prepared by: Kim Chapman

EO SPECIFICATIONS: Salinity of water & soil must result from natural processes. Area of saline soil or indicator spp. mark boundaries. May have only 2 indicator spp.
 HABITAT OR COMMUNITY DESCRIPTION: Naturally saline wetland (Na,Cl,K). Vegetation influenced by salinity is sparser or lacks spp. of nearby non-saline habitats. Indicators EXEMPLARY EO IN STATE: include *Scirpus olneyi*, *Eleocharis parvula*, *Samolus floribundus*, *Atriplex patula*, *Chara*, *S. americanus*, *Typha angustifolia*, *Hibiscus*.
 Island Salt Marsh, Clinton Co.
 TAXONOMIC DISTINCTNESS: Related to salt marshes of Atlantic (& Pacific?) coasts, but salinity not derived from ocean. Alkali flats & saline grasslands of the West not similar
 PERMANENCE OF EOs: Edaphic climax--permanently resists woody encroachment & invasion by many marsh spp. unless hydrology changes.
 STATE STATUS:
 Comments:

DEGREE OF LEGAL PROTECTION: None. Two obligate halophytes are state-threatened spp.

STATE RANKING CRITERIA

Estimated State EOs: (A) B C D
 Comments: 16 sites formerly--9 confirmed destroyed. 2 good EO's, 1 poor EO known.

Estimated State Abundance: (A) B C D
 Comments: 180 Acres formerly. 12 acres good now, 10 acres poor.

State Range: (A) B C D
 Comments: Formerly 14 counties, but very local within counties. Presently known from one county, potentially three others.

Estimated Adequately Protected EOs in State: U A (B) C D
 Comments: DNR has been notified of 2 EO's and has established management agreement with The Nature Conservancy for protection.

Relative Threat of Destruction: A B (C) D
 Comments: Formerly highly threatened because of economic value of salt. Urbanization/filling destroyed many & agriculture destroyed a couple.

Ecological Fragility: A (B) C D
 Comments: Desruption of salt spring or seep destroys marsh. Plowing changes vegetation permanently.

Other Ranking Criteria:

STATE ELEMENT PRIORITY RANK: (S1) S2 S3 S4 S5 SA SE SH SU SX
 Summarize reasons: Great rarity, restricted distribution, small size.

NUMBER OF PROTECTED EOs NEEDED IN STATE (include reasons):

Every EO should get maximum protection

INVENTORY/RESEARCH NEEDS:

Does depletion of regional aquifers affect rate of flow at brine spring or seep?

OTHER PROTECTION/STEWARDSHIP NEEDS:

Monitor effect of deer, hunters, and naturalists on fragile, highly saline zone of salt marshes that have obligate halophytes. Heavy visitation may promote or eliminate halophytes.

GLOBAL AND STATE RANKS FOR MICHIGAN NATURAL COMMUNITIES

BUR OAK PLAINS	G1	BUR OAK PLAINS	SX
INLAND SALT MARSH	G1	OAK OPENINGS	S1
LAKEPLAIN OAK OPENING	G1	LAKEPLAIN OAK OPENINGS	S1
MESIC SAND PRAIRIE	G1	INLAND SALT MARSH	S1
OAK OPENINGS	G1	BLACKSOIL PRAIRIE	S1
COASTAL PLAIN MARSH	G2	NORTHERN BALD	S1
INTERDUNAL WETLAND	G2	MESIC SAND PRAIRIE	S1
INTERMITTENT WETLAND	G2	(CAVE)	S1
BEDROCK BEACH	G2?	(SINKHOLE)	S1
OAK BARRENS	G2?	WET-MESIC PRAIRIE	S1-2
NORTHERN BALD	G2-3	HILLSIDE PRAIRIE	S1-2
LAKEPLAIN WET-MESIC PRAIRIE	G2-3	LAKEPLAIN WET-MESIC PRAIRIE	S1-2
LAKEPLAIN WET PRAIRIE	G2-3	LAKEPLAIN WET PRAIRIE	S1-2
ALVAR	G2-3	BEDROCK BEACH	S2
BLACKSOIL PRAIRIE	G3	COASTAL PLAIN MARSH	S2
WET-MESIC PRAIRIE	G3	INTERDUNAL WETLAND	S2
HILLSIDE PRAIRIE	G3	INTERMITTENT WETLAND	S2
WET PRAIRIE	G3	WET PRAIRIE	S2
DRY SAND PRAIRIE	G3	DRY SAND PRAIRIE	S2
GREAT LAKES BARRENS	G3	ALVAR	S2
COBBLE BEACH	G3	OAK BARRENS	S2
NORTHERN FEN	G3	DRY SOUTHERN FOREST	S2
PATTERNED FEN	G3	PRAIRIE FEN	S2-3
PINE BARRENS	G3	WOODLAND PRAIRIE	S2-3
POOR FEN	G3	GREAT LAKES BARRENS	S2-3
PRAIRIE FEN	G3	COBBLE BEACH	S2-3
RELICT CONIFER SWAMP	G3	RELICT BOG	S2-3
RELICT BOG	G3	RELICT CONIFER SWAMP	S2-3
SAND/GRAVEL BEACH	G3	DRY-MESIC SOUTHERN FOREST	S2-3
SOUTHERN SWAMP	G3	DRY NORTHERN FOREST	S2-3
OPEN DUNES	G3	NORTHERN FEN	S2-3
DRY SOUTHERN FOREST	G3-4	SOUTHERN FLOODPLAIN FOREST	S2-3
WOODLAND PRAIRIE	G3-4	SOUTHERN SWAMP	S2-3
DRY-MESIC SOUTHERN FOREST	G3-4	BOREAL FOREST	S2-3
DRY NORTHERN FOREST	G3-4	DRY ACID CLIFF	S2-3
SOUTHERN FLOODPLAIN FOREST	G3-4	MOIST ACID CLIFF	S2-3
MESIC SOUTHERN FOREST	G3-4	PINE BARRENS	S3
SOUTHERN WET MEADOW	G3-4	POOR FEN	S3
GREAT LAKES MARSH	G3-4	SAND/GRAVEL BEACH	S3
(CAVE)	G3-5	OPEN DUNES	S3
(SINKHOLE)	G3-5	MESIC SOUTHERN FOREST	S3
DRY ACID CLIFF	G3-5	GREAT LAKES MARSH	S3
MOIST ACID CLIFF	G3-5	PATTERNED FEN	S3
DRY NON-ACID CLIFF	G3-5	SOUTHERN WET MEADOW	S3
MOIST NON-ACID CLIFF	G3-5	BEDROCK GLADE	S3
SOUTHERN SHRUB SWAMP	GU	DRY NON-ACID CLIFF	S3
BOREAL FOREST	G4-5	MOIST NON-ACID CLIFF	S3
BEDROCK GLADE	G4-5	EMERGENT MARSH	S3
EMERGENT MARSH	G4-5	RICH CONIFER SWAMP	S3-4
SUBMERGENT MARSH	G4-5	DRY-MESIC NORTHERN FOREST	S3-4
HARDWOOD-CONIFER SWAMP	G4-5	HARDWOOD-CONIFER SWAMP	S3-4
DRY-MESIC NORTHERN FOREST	G4-5	NORTHERN WET MEADOW	S3-4
RICH CONIFER SWAMP	G4-5	MUSKEG	S3-4
NORTHERN WET MEADOW	G4-5	SUBMERGENT MARSH	S3-4
MUSKEG	G4-5	BOG	S4-5
BOG	G4-5	POOR CONIFER SWAMP	S4-5
POOR CONIFER SWAMP	G4-5	MESIC NORTHERN FOREST	S4-5
MESIC NORTHERN FOREST	G4-5	SOUTHERN SHRUB SWAMP	S4-5
NORTHERN SHRUB SWAMP	G4-5	NORTHERN SHRUB SWAMP	S4-5

Bold type=ranking forms done.

(COMMUNITY) not biological?

Michigan Natural Features Inventory
Element Occurrence Quality-Ranks

Quality-Rank*	Explanation**
A	Excellent occurrence: all A-rank occurrences of an element merit quick, strong protection. An A-rank community is nearly undisturbed by humans, or has nearly recovered from early human disturbance; it is further distinguished by being an extensive, well-buffered, etc. occurrence. An A-rank population of a sensitive species is large in area and number of individuals, stable, if not growing, shows good reproduction, and exists in natural habitat.
B	Good occurrence: protection of the occurrence is important to the survival of the element in Michigan, especially if very few or no A-rank occurrences exist. A B-rank community is still recovering from early disturbance or recent light disturbance but eventually will reach A-rank, or it is nearly undisturbed or nearly recovered from disturbance but is less than A-rank because of significantly smaller size, poorer buffer, etc. A B-rank population of a sensitive species is at least stable, in a minimally disturbed habitat, and of moderate size and number.
C	Fair occurrence: protection of the occurrence helps conserve the diversity of a region's or county's biota and is important to state-wide conservation if no higher-ranked occurrences exist. A C-rank community is in an early stage of recovery from disturbance, or its structure and composition have been altered such that the original vegetation of the site will never rejuvenate, yet with management and time partial restoration of the community is possible. A C-rank population of a sensitive species is in a clearly disturbed habitat, small in size and/or number, and possibly declining.
D	Poor occurrence: protection of the occurrence may be worthwhile for historical reasons or only if no higher ranked occurrences exist. A D-rank community is severely disturbed, its structure and composition have been greatly altered, and recovery to original conditions, despite management and time, essentially will not take place. A D-rank population of a sensitive species is very small with a high likelihood of dying out or being destroyed, and exists in a highly disturbed and vulnerable habitat.

* Intermediate ranks may also be assigned.

** More detailed ranking instructions for individual elements are found in the element specification field of the element ranking form.

Quality-Ranking Criteria for
Palustrine and Terrestrial Natural Communities
of Michigan's Great Lakes Coastal Zone

Michigan Natural Features Inventory
Mason Building, Box 30028
Lansing, MI 48909

Palustrine

Marsh

Submergent Marsh Hydrology must be unaltered by road-building, dams, drains, etc.; if recovered from human-created water level changes, then occurrence is acceptable but rank must be lowered. Vegetative diversity, isolation (no motorboats, etc.), and extent of shoreline development (affecting water quality) also affect quality rank.

Minimum Acres: A-rank occurrence is 100+ acres; B-rank is 60-99 acres; C-rank is 30-59 acres.

Boundary Mapping:

Exemplary Occurrence: None documented.

Emergent Marsh Hydrology must be unaltered by road-building, dams, drains, etc.; if recovered from human-created water level changes, then occurrence is acceptable but rank must be lowered. Vegetative diversity, isolation (no motorboats, etc.), and extent of shoreline development (affecting water quality) also affect quality rank.

Minimum Acres: A-rank occurrence is 100+ acres; B-rank is 60-99 acres; C-rank is 30-59 acres.

Boundary Mapping:

Exemplary Occurrence: Miller Lake, Branch Co.

Great Lakes Marsh Must be big enough to sustain breeding waterfowl, shorebirds, fish spawning grounds, and some medium-sized mammals (e.g. muskrat, fox). Must exhibit typical zonation, preferably with natural vegetation at upland edge. Increase rank for marshes with several cover types and many native vascular plant species (40+). Decrease rank for presence of exotics, water control structures, etc., especially if major vegetative composition changes result. Boat slips, jetties, etc. are minor disturbances unless associated with heavy human use, which disturbs animals and destroys submergent vegetation.

Minimum Acres: A-rank occurrence is 300+ acres; B-rank is 100-299 acres; C-rank occurrence is 30-99 acres.

Boundary Mapping: Wetlands associated with a single coastal feature (a bay, a delta) constitute one occurrence even if interrupted by fields, forest, fill, or channels. Highly managed portions of marshes, even if they sustain animals, should be excluded.

Exemplary Occurrence: St. Clair River Delta, St. Clair Co. (southern type); Munuscong River Delta, Chippewa Co. (northern type); Pottawattomie Bayou, Ottawa Co. (estuary).

Northern Wet Meadow Hydrology must be unaltered by road-building, dams, drains, etc.; if sufficiently recovered from human-created water level changes, then occurrence is acceptable but rank must be lowered.

Good upland buffer raises rank. Light grazing or mowing in the past is acceptable if the dominants and vegetative composition are still typical.
Minimum Acres: A-rank occurrence is 60+ acres; B-rank is 40-59 acres; C-rank is 20-39 acres.

Boundary Mapping:

Exemplary Occurrence: None documented.

Southern Wet Meadow Hydrology must be unaltered by road-building, dams, drains, etc.; if sufficiently recovered from human-created water level changes, then occurrence is acceptable but rank must be lowered. Good upland buffer raises rank. Light grazing or mowing in the past is acceptable if the dominants and vegetative composition are still typical.
Minimum Acres: A-rank occurrence is 60+ acres; B-rank is 40-59 acres; C-rank is 20-39 acres.

Boundary Mapping:

Exemplary Occurrence: Christiana Creek, Cass Co.

Interdunal Wetland Raise the rank for very diverse sites (50+ native vascular plant species, good species equitability, all stages of swale development, etc.).

Acres: A-rank occurrence is 80+ acres; B-rank 40-79 acres; C-rank 5-39 acres; include smaller occurrences if they represent isolated, particularly "disjunct" occurrences.

Boundary Mapping: Associated wooded areas (e.g. jack pine on drier edges, cedar-tamarack on narrow dune ridges in wetland) are included if too small for separate occurrence.

Exemplary Occurrence: Big Sable (Ludington and Nordhouse) Swales, Mason Co.; Crow River Mouth, Mackinac Co.; Grass Bay, Cheboygan Co.

Prairie

Lakeplain Wet Prairie A-rank occurrence must never have been plowed and possess at least 45 native vascular plant species, including most of the type indicators (see description). Recovering, plowed tracts can be an occurrence if diversity is good.

Minimum Acres: A-rank occurrence is 5+ acres; B-rank is 2-4 acres; C-rank is 1 acre.

Boundary Mapping:

Exemplary Occurrence: Sebewaing Bay, Tuscola Co.

Lakeplain Wet-mesic Prairie A-rank occurrence must never have been plowed and possess at least 55 native vascular plant species, including most of the type indicators (see description). Recovering, plowed tracts can be an occurrence if diversity is good.

Minimum Acres: A-rank occurrence is 5+ acres; B-rank is 2-4 acres; C-rank is 1 acre.

Boundary Mapping:

Exemplary Occurrence: Middle Channel Country Club, St. Clair Co.

Forest

Poor Conifer Swamp Uncut stands needed for A- and B-rank. Besides having other characteristics of old growth, A-rank stands must have many canopy trees of 25-35 cm dbh (80+ years?). Younger uncut stands can be ranked high if the vegetative structure and composition are natural and typical.

Minimum Acres: A-rank stands are 120+ acres; B-rank 60-119 acres; C-rank 30-59 acres.

Boundary Mapping: Map the swamp as part of an open bog if it is obviously successional related and of limited extent (e.g. in a small kettlehole).

Exemplary Occurrence: Lumberman's Bay, Marquette Co.

Rich Conifer Swamp Old growth needed for A-rank sites. (Many canopy trees are 140-170 years old; at the wettest sites these trees will be 35-55 cm dbh; at better sites 65-80 cm dbh.) Light cutting is acceptable if canopy still is 90% conifer. The canopy may be as sparse as 40-50 percent cover, but greater cover--suggesting longer stability--raises rank. Forest must be mature for C-rank.

Minimum Acres: A-rank occurrence is 120+ acres, B-rank is 60-119 acres, C-rank is 30-59 acres, but uncut stands may be ranked higher than acreage suggests.

Boundary Mapping:

Exemplary Occurrence: Dukes RNA, Marquette Co.

Hardwood-Conifer Swamp Old growth is needed for A-rank, but light cutting is acceptable. (Most canopy hardwood trees on wet sites are 35-50 cm dbh; on better sites they are 60-80 cm dbh; sizes of conifers are as for Rich Conifer Swamp.) Forest must be mature for C-rank. Diversity, extent of buffer, additional disturbances affect rank.

Minimum Acres: A-rank is 100+ acres; B-rank 50-99 acres; C-rank 25-49 acres.

Boundary Mapping:

Exemplary Occurrence: None documented.

Southern Swamp Old growth is preferred for A-rank, but light cutting is acceptable. (Many canopy trees are 55-75 cm dbh and 140+ years old.) Younger stands, if uncut and typical in vegetative structure and composition, may be acceptable. Forest must be mature for C-rank. Diversity, extent of buffer, additional disturbances affect rank.

Minimum Acres: A-rank occurrence is 80+ acres; B-rank 50-79 acres; C-rank 25-49 acres.

Boundary Mapping:

Exemplary Occurrences: None documented.

Shrub

Northern Shrub Swamp Occurrences should be virtually undisturbed. Long-lived stands are required.

Minimum Acres: A-rank occurrence is 60+; B-rank is 35-59 acres; C-rank is 15-34 acres.

Boundary Mapping: Map adjacent mudflats along streams, small inclusions of wet meadow, etc. as part of occurrence if less than 5 acres.

Exemplary Occurrence: None documented.

Southern Shrub Swamp Occurrences should be virtually undisturbed. Long-lived stands are required.

Minimum Acres: A-rank occurrence is 60+; B-rank is 35-59 acres; C-rank is 15-34 acres.

Boundary Mapping: Map adjacent mudflats along streams, small inclusions of wet meadow, etc. as part of occurrence if less than 5 acres.

Exemplary Occurrence: None documented.

Forest/Marsh

Wooded Dune and Swale Complex

Terrestrial

Forest

Mesic Southern Forest (Southern Hardwood Forest) Old growth preferable for A-rank, but light cutting is acceptable. (Many canopy trees are 50-70 cm dbh, 140-170 years old.) Forest must be mature for C-rank (many canopy trees 40+ cm dbh, 120+ years old). Diversity, extent of buffer, additional disturbances affect rank. Light grazing is acceptable if stand is old growth and 15+ acres.

Minimum Acres: A-rank occurrence is 80+ acres; B-rank 40-79 acres; C-rank 15-39 acres. Minimum size for old growth is 10 acres if good buffer is present.

Boundary Mapping:

Exemplary Occurrence: Warren Woods, Berrien County.

Dry-mesic Southern Forest (Oak-Hardwood Forest) Old growth preferable for A-rank, but light, even recent cutting, is acceptable. (Many canopy trees are 60-80 cm, 140+ years old.) Forest must be mature for C-rank (many canopy trees 40+ cm dbh, 100+ years old). Diversity, extent of buffer, additional disturbance affect rank. Ungrazed stands preferable, but light grazing acceptable if stand is old growth and 20+ acres.

Minimum Acres: A-rank occurrence is 80+ acres; B-rank is 40-79 acres; C-rank is 20-39 acres. Minimum size for old growth is 15 acres if good buffer is present.

Boundary Mapping:

Exemplary Occurrence: Smith's Woods, Jackson Co.

Dry Southern Forest (Oak Forest) Old growth preferable for A-rank. (Many canopy trees are 50-70 cm dbh, 140+ years old.) Forest must be mature for C-rank (many canopy trees 40+ cm dbh, 100+ years old). Diversity, extent of buffer, additional disturbance affect rank. Ungrazed stands preferable, but light grazing acceptable if stand is old growth and 20+ acres.

Minimum Acres: A-rank occurrence is 80+ acres; B-rank is 40-79 acres; C-rank is 20-39 acres. Minimum size for old growth is 15 acres if good buffer is present.

Boundary Mapping:

Exemplary Occurrence: None documented.

Mesic Northern Forest (Northern Hardwood Forest and Hemlock-Hardwood Forest) Old growth required for A- and B-rank; very light selective cutting is allowed. (Many canopy trees are 50-70 cm dbh--at 170-180 years for sugar maple and 220-250 years for hemlock.) A- and B-rank further distinguished by degree of disturbance, floristic diversity (unless a cover type is naturally poor in species), number of cover types, and presence of a wide, continuous buffer. C-rank must be mature (40-50 cm dbh, 120-140 years old).

Minimum Acres: A-rank occurrence is 100+ acres; B-rank 50-99 acres; C-rank 25-49 acres, smaller if old growth, but then good buffer is needed.

Boundary Mapping: For large tracts, outline the entire area on map and simply map smaller included occurrences of other community types

(e.g. other forest types that interdigitate with Mesic Northern Forest, like Dry-mesic Northern Forest) without drawing their boundaries; draw boundaries of other included community types if they are easily defined (e.g. a lake type, a swamp type).

Exemplary Occurrence: Porcupine Mountains, Ontonagon and Gogebic Co.; Sylvania Recreation Area, Gogebic Co.; Huron Mountains, Marquette Co.

Dry-mesic Northern Forest (Pine-Hardwood Forest) Old growth preferable for A-rank. (Many canopy trees are 55-65 cm dbh, 150-170 years; original forests were 75-95 cm dbh.) A- and B-rank further distinguished by degree of disturbance, floristic diversity (unless a cover type is naturally poor in species), number of cover types, and presence of a wide, continuous buffer. C-rank must be mature (40-50 cm dbh, 120-140 years).

Minimum Acres: A-rank occurrence is 100+ acres; B-rank 50-99 acres; C-rank 25-49 acres, smaller if old growth, but then good buffer is needed.

Boundary Mapping: Several proximal tracts in a single vast area of presettlement vegetation can be one occurrence if composition is more or less uniform throughout.

Exemplary Occurrence: Huron Mountain, Marquette Co.

Dry Northern Forest (Pine Forest) Old growth preferable for A-rank. (For red pine, many canopy trees are 50-60 cm dbh, 150-170 years old--original forest 70-90 cm dbh; for jack pine, many canopy trees are 25-35 cm dbh, 80-130 years old.) C-rank occurrences should be mature, (for red pine 35-50 cm dbh, 100-120 years old; for jack pine 20-25 cm, 65-70 years old). Canopy cover should be greater than 40 percent with few large openings. Diversity, extent of buffer, additional disturbance affect rank.

Minimum Acres: A-rank occurrence should be 100+ acres; B-rank 40-99 acres, C-rank 20-39 acres, as small as 10+ acres if old growth, but then surrounded by good buffer of same community type.

Boundary Mapping: Adjacent jack and red pine stands are one occurrence if each cover type has reached the same developmental stage.

Exemplary Occurrence: Roscommon Red Pine Natural Area, Roscommon Co.; Crawford Red Pines, Crawford Co.

Boreal Forest Old growth is A-rank, but stands of younger, smaller trees can be ranked high. (In stable old growth stands, many canopy fir trees are 20-35 cm dbh, canopy white spruce are 30-50 cm dbh.) Young stands experiencing heavy windthrow without evidence of past cutting can be natural; likewise, fire origin may be acceptable if stand has recovered to 60+ percent conifer canopy. In old stands, cutting must be limited (e.g., light selective for pine), but past disturbance by windthrow and fire are natural if canopy composition is still 80 percent conifer. Diversity, extent of buffer, additional disturbance affect rank.

Minimum Acres: A-rank occurrence is 80+ acres; B-rank 40-79 acres; C-rank 20-39 acres. Shoreline strips must be 200+ feet wide or be well buffered.

Boundary Mapping: Several small tracts near one another (e.g. in the same dune complex) are one occurrence.

Exemplary Occurrence: Passage Island RNA, Keweenaw Co.

Savanna

Lakeplain Oak Openings Cutting does not much affect rank unless plant species composition changes due to increased shade by root sprouts. Good potential for restoration raises rank. Stand with a canopy but no

groundlayer may be worth restoring, especially if next to a native grassland relict, but occurrence is D-rank, unless 20+ acres or canopy is exceptional.

Minimum Acres: A-rank occurrence is 20+ acres; B-rank is 6-19 acres; C-rank is 2-5 acres.

Boundary Mapping: Include small openings and grassland fringes too small to qualify as good prairie occurrences.

Exemplary Occurrence: Black Road Savanna, Tuscola Co.

Oak Barrens Cutting does not much affect rank unless plant species composition changes due to increased shade by root sprouts. Good potential for restoration raises rank. Buffering by similar but more disturbed vegetation raises rank. A- and B-rank occurrences are unplowed, but light grazing, mowing, some off-road vehicle disturbance is acceptable. A-rank occurrence has 45+ native vascular plant species of good prairie affinity, including many indicators of Dry Sand Prairie (see description); B-rank has 35-44 native vascular plant species.

Minimum Acres: A-rank occurrence is 30+ acres; B-rank is 15-29 acres; C-rank is 5-14 acres.

Boundary Mapping: Include small openings and grassland fringes too small to qualify as good prairie occurrences.

Exemplary Occurrence: Allegan Pine Plains, Allegan Co.

Great Lakes Barrens Stand must be uncut. Some disturbance by off-road vehicles is acceptable, but severe damage lowers rank. A-rank occurrence has 30+ native vascular plant species.

Minimum Acres: A-rank occurrence is 100+ acres; B-rank is 50-99 acres; C-rank 15-49 acres.

Boundary Mapping: Individual patches may be as small as 1 acre and be separated by 600 feet, but collectively must total 15 acres for C-rank.

Exemplary Occurrence: Ludington/Nordhouse Dunes-Big Sable Point, Mason Co.

Primary

Open Dunes Human foot-traffic and off-road vehicle damage should be slight for A- and B-rank occurrences. A-rank occurrence has 35+ native vascular plant species. Diversity, lack of disturbance, isolation, etc. affect rank.

Minimum Acres: A-rank occurrence is 500+ acres; B-rank is 100-499 acres; C-rank is 40-99 acres. Isolated blowouts may be as small as 5 acres.

Boundary Mapping: Map discrete blowouts within 300 feet of each other as one occurrence. Include adjacent beach if dune occurrence is A- or B-rank, unless beach is A-rank occurrence. When mapping perched dunes, exclude morainal slopes.

Exemplary Occurrence: Ludington/Nordhouse Dunes--Big Sable Point, Mason Co.; Grand Sable Dunes, Alger Co.

Sand/Gravel Beach Beach should be large enough to sustain good numbers of feeding shorebirds. Disturbance should result only from lake action. A-rank occurrence has 25+ native vascular plant species.

Minimum Acres: A-rank occurrence is 1 mile long and 100 feet wide.

Boundary Mapping: The end of an occurrence may be defined as the point where the beach becomes narrow enough so that non-storm waves wash over it, perhaps 30 feet wide.

Exemplary Occurrence: Pointe Aux Chenes Bay, Mackinac Co.

Cobble Beach (Cobble Shore) Disturbance should result only from lake action. A-rank occurrence has 50+ native vascular plant species. Presence of exotic plant species does not lower rank. Good buffer raises rank.

Minimum Acres: A-rank occurrence is 35 acres; B-rank is 15-34 acres; C-rank is 5-14 acres.

Boundary Mapping: Include pools and patches of trees if less than 1 acre. Map inland to forest edge (usually no intervening community).

Exemplary Occurrence: Waugoshance Point, Mackinac Co.

Bedrock Beach (Rock Shore) Disturbance should result only from lake action. Presence of the three typical zones and good wooded buffer raises rank. Homes built in buffer may be acceptable if site is otherwise very good. A-rank occurrence has 30+ native vascular plant species and 20+ lichen species.

Minimum Acres: A-rank occurrence is a half mile long and 100 feet wide.

Boundary Mapping: Map from water's edge to edge of dense forest (scattered tree cover of inland-most zone is not forest). Include pools and small dense patches of trees. Map as one occurrence rock shore broken by stretches of up to 200 feet.

Exemplary Occurrence: Passage Island, Keweenaw Co.; Dan's Point, Keweenaw Co.

Dry Acid Cliff Occurrence must be a natural exposure of bedrock at least 15 feet high. Highest cliffs are higher ranked because they are more exposed. A-rank occurrence has 35+ native vascular plant species.

Minimum Acres: A-rank occurrence is a half mile long.

Boundary Mapping: Map as one occurrence cliffs interrupted by 200 foot stretches of other terrain.

Exemplary Occurrence: None documented.

Moist Acid Cliff Occurrence must be a natural exposure of bedrock at least 15 feet high. A-rank occurrence has 30 native vascular plant species.

Minimum Acres: A-rank occurrence is a half mile long.

Boundary Mapping: Map as one occurrence cliffs interrupted by 200 foot stretches of other terrain.

Exemplary Occurrence: None documented.

Current: 19 February 1986
Kim Alan Chapman

MICHIGAN NATURAL FEATURES INVENTORY
POTENTIAL NATURAL AREA SURVEY FORM, PAGE 1

COUNTY: _____ NO. _____

QUADRANGLE/CODE: _____

PHOTO NO./DATE: _____

Name _____

Location _____

Description _____

Map and Aerial Photo Examination Investigators _____ Date _____

Aerial Survey Investigators _____ Date _____

Forest Age: Young _____ Mature _____ Old _____ All-aged _____

Logging: Not Evident _____ Light Sel. _____ Heavy Sel. _____ Heavy Gen. _____

Grazing: Not Evident _____ Light _____ Moderate _____ Heavy _____

Additional Notes: _____

Eliminate _____ Needs Further Checking _____

Ground Survey Investigators _____ Date _____

Description/evaluation: _____

Natural Area _____ Notable Area _____ Eliminate _____

Comments: _____

DETAILED LOCATION INFORMATION

Directions to site - Provide written directions to the site. Be concise. Refer to the nearest topographic map landmark (hills, villages, ponds, highway junctions, etc.) as your starting point.

Topographic base map - Attach (staple) a photocopy of that portion of the topographic map(s) showing the site. Aerial photographs may also be used. Upon this base map note the following:

Completed?

yes no

1. Indicate precise element locations (using dots) and/or boundaries (using solid lines). Identify each element with the codes you used in the Index of page 1.

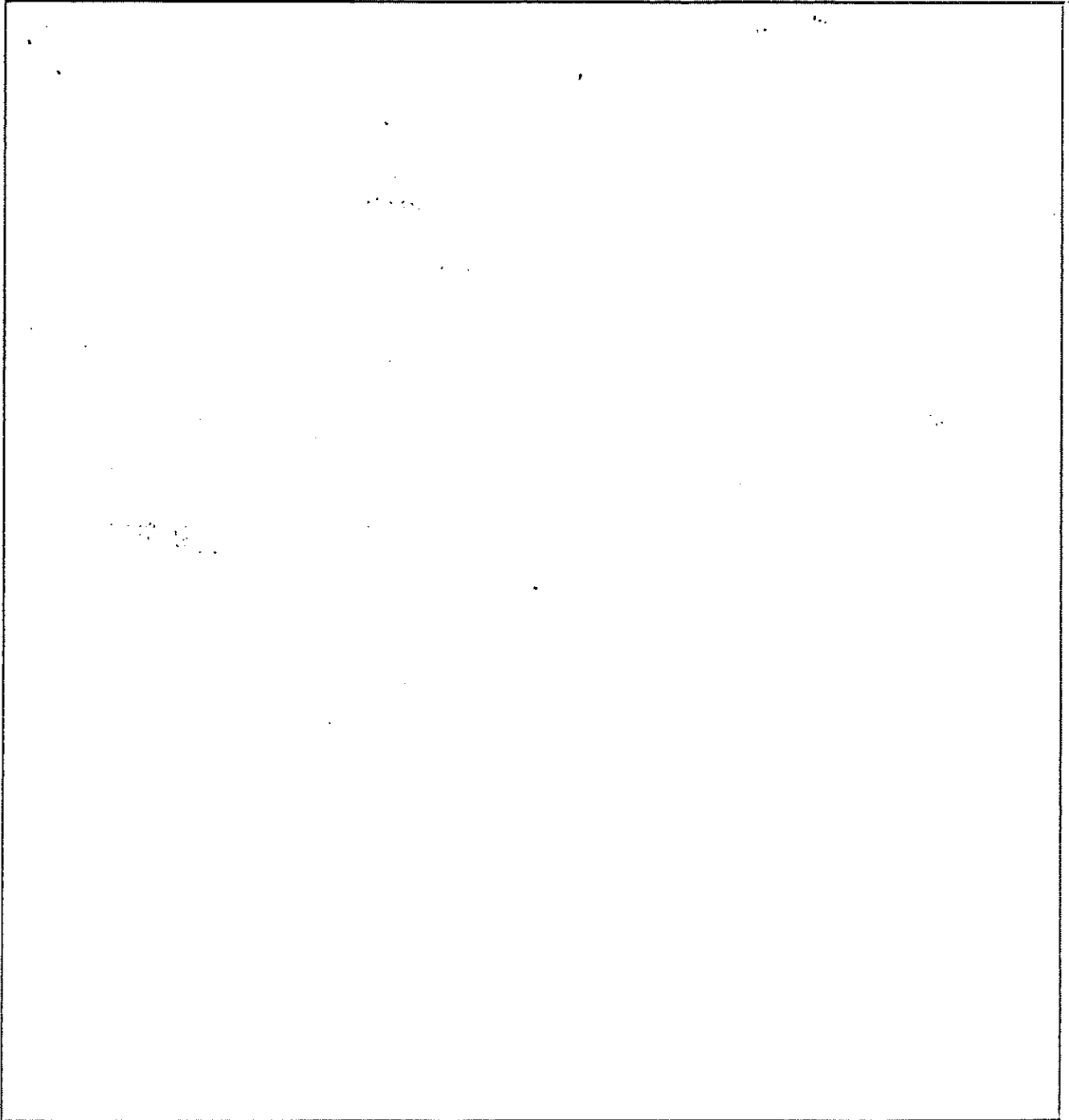
yes no

2. If knowledge of the site permits, draw primary (+|+|+) and secondary (-||-||-) ecological site boundaries. Within the primary site boundary include all known element occurrences and lands deemed necessary for the continued viability of the EOs. The secondary boundary, or "buffer", includes lands intended to mitigate future unforeseen negative impacts to the EOs (i.e., to control erosion, trespass-related damage, natural succession, exotic species, urban sprawl, etc.). Use +||-||+ where primary and secondary coincide.

yes no

3. If known, indicate tract ownership boundaries, using dashed lines (- -).

Habitat map - The purpose of the sketch is to show fine details of the site which are not shown on the topographic base map. Sketch the habitat area searched, and show; 1) the route taken, 2) any listed species/communities and their boundaries, and 3) landmarks. Include scale and indicate north.



NATURAL COMMUNITY FORMSite Name: _____
Natural Community Name: _____Date of first visit: _____ Surveyor: _____
Date of second visit: _____ Surveyor: _____
Date of third visit: _____ Surveyor: _____

Complete this form for each good quality natural community at a site. Differentiate plant communities by dominant species and separate species lists. Separate soil descriptions may be necessary for the different plant communities.

Quality rank: _____ Reasons for the quality rank: _____

Describe all natural and disturbed boundaries: _____

Evidence of human and natural disturbance: _____

Describe microsites, vegetation gradients, other variations: _____

Immediate threats, management needs, and current protection: _____

USDA soil series (rock type if primary), or describe color and texture of A horizon: _____

pH of A horizon: _____	Organic content: _____
Soil moisture: _____	Is soil moisture typical: _____
Litter depth: _____	% bare substrate: _____
Natural community acreage: _____	Elevation range: _____

Sketch the most descriptive cross-section through the natural community. Give compass direction for sloping sites. For scale, draw a human figure or another familiar thing.

Site Name: _____ Date: _____ Surveyor: _____ Sheet 2

For each plant community, in descending order, list up to 4 of the most important species in each vegetation layer. Put the following symbols between species names to indicate relative dominance.

>> much greater than > greater than = about the same

Canopy: _____

Subcanopy: _____

Shrub layer: _____

Groundlayer: _____

Canopy cover:	complete	partial	scattered	none
---------------	----------	---------	-----------	------

Subcanopy cover:	complete	partial	scattered	none
------------------	----------	---------	-----------	------

Shrub layer:	complete	partial	scattered	none
--------------	----------	---------	-----------	------

Groundlayer:	dense	moderate	sparse	none
--------------	-------	----------	--------	------

Canopy: _____

Subcanopy: _____

Shrub layer: _____

Groundlayer: _____

Canopy cover:	complete	partial	scattered	none
---------------	----------	---------	-----------	------

Subcanopy cover:	complete	partial	scattered	none
------------------	----------	---------	-----------	------

Shrub layer:	complete	partial	scattered	none
--------------	----------	---------	-----------	------

Groundlayer:	dense	moderate	sparse	none
--------------	-------	----------	--------	------

Canopy: _____

Subcanopy: _____

Shrub layer: _____

Groundlayer: _____

Canopy cover:	complete	partial	scattered	none
---------------	----------	---------	-----------	------

Subcanopy cover:	complete	partial	scattered	none
------------------	----------	---------	-----------	------

Shrub layer:	complete	partial	scattered	none
--------------	----------	---------	-----------	------

Groundlayer:	dense	moderate	sparse	none
--------------	-------	----------	--------	------

What future survey work is needed? _____

Additional comments:

Site Name: _____

Surveyor: _____

Date: _____

SPECIAL PLANT FORM

Species: _____

Exact location (sect, 1/4, etc.) if more specific than genl. site location: _____

_____ (Also indicate precisely on Habitat Map.)

Estimate size of colony (formed by imaginary line connecting outermost individuals): _____

Estimate number of clumps: _____; shoots per clump: _____; solitary shoots: _____

Phenology: % of all shoots--sterile: %
 budding: %
 flowering: %
 in seed/past flowering (circle one): %
 seed gone: %

Size: Fertile shoots--typical height: _____; range in height: _____

Sterile shoots--typical height (or leaf length if rosette or prostrate): _____

_____; range in height (or leaf length): _____

Apparent vigor of plants: _____; basis for estimate: _____

Are smaller sterile (i.e., young) plants present? _____; what is their distribution?

_____; seedlings or clones? _____

Fauna observed associated with species: _____

Population trend: declining stable increasing unknown

Basis for estimate: _____

Disturbances to plants or habitat: _____

Immediate threats/protection or management needs: _____

Potential or long-range threats/management needs: _____

Research/monitoring needs: _____

Is owner aware of plants? _____; protecting them? _____

Identification positive? _____; reference or person consulted: _____

Photos taken? _____; describe: _____

Specimen(s) collected? _____; Coll. #'s: _____; where deposited? _____

Cross section of local topography--INCLUDE SCALE, direction of slope, and position of plants:

General habitat type (MNFI natural community, if known): _____
Extent of general habitat in immediate area: _____
Proportion of general habitat occupied by species: _____

MICROHABITAT (area defined previously under "size of colony"):

Soil type, texture: _____; pH: _____
Organic content: low moderate high ; Litter depth: _____
Light: open filtered shade
Moisture: dry moist saturated inundated

Description of microhabitat (focus on exactly where special plant grows & why):

List of species occurring within microhabitat. Abundance codes: D=dominant or codominant; C=common; U=uncommon; R=rare.

Ground cover species: (_____ % cover)

Understory/Shrub species: (_____ % cover)

- Code _____
- _____ 1) _____
- _____ 2) _____
- _____ 3) _____
- _____ 4) _____
- _____ 5) _____
- _____ 6) _____
- _____ 7) _____
- _____ 8) _____
- _____ 9) _____
- _____ 10) _____
- _____ 11) _____
- _____ 12) _____
- _____ 13) _____
- _____ 14) _____
- _____ 15) _____

- _____ 1) _____
- _____ 2) _____
- _____ 3) _____
- _____ 4) _____
- _____ 5) _____
- _____ 6) _____

Overstory/Tree species: (_____ % cover)

- _____ 1) _____
- _____ 2) _____
- _____ 3) _____
- _____ 4) _____
- _____ 5) _____
- _____ 6) _____
- _____ 7) _____
- _____ 8) _____

Typical dbh of canopy trees: _____

Comments: _____

Source Code: _____

Site Name: _____

Location (T,R,S): _____

Surveyor: _____

Date: _____

SPECIAL ANIMAL FIELD SURVEY FORM

Fill out one of these for each special animal at the site, and indicate locations precisely on the Habitat Map.

Species: _____

Species found? _____ If no, why? _____

Circumstances of observation (deliberate search, accidental observation, etc.):

Weather: _____ . Time: _____ to _____

Number, sex, and age of individuals observed:

Evidence of reproduction at site (nests, young, territorial behavior, etc.):

Verification: Identification positive? _____. Reference used? _____

Photos(s) taken? _____. If individuals marked or banded, give details: _____

If specimens collected, how many? _____; how taken? _____;

where deposited? _____; collection number? _____

Estimated number of individuals in this local population: _____

Basis for this estimate:

When is species present on site? (year-round or specify months): _____

Historical use of site: specify years of

confirmed breeding _____ suspected breeding _____

Source of this information: _____

Population trend: ____ declining ____ stable ____ increasing ____ unknown; since 19 ____

General habitat type (natural or plant community): _____

Description of the habitat/microhabitat (focus on where animal occurs and why):

Extent of this habitat in the immediate area: _____

Proportion of this habitat apparently occupied by the species: _____

ELEMENT OCCURRENCE RECORD
MICHIGAN NATURAL FEATURES INVENTORY
(517-373-1552)

Code: CPU000000.006
Name: COASTAL PLAIN MARSH
Common Name:
Margin Number: 6
Global Rank: G2 Federal Status:
State Rank: S2 State Status:
Occurrence Rank: B
Comments: 18 prevalent species, 6 indicators.
County Name(s): VAN BUREN R 17W
Township and Range: T 02S
Quad Code(s): 4208633 Section: 30 Comments: NE4
Quad Name(s): COVERT
Latitude: 421600 -south: 421548 -north: 421617
Longitude: 861947 -east: 861923 -west: 861955
MDOI Number: 07
Right-of-Way?:
Precision: S
Correctly Identified?: Y
Date First Observed: 1982
Date Last Observed: 1983-08-24
Date of Field Evaluation/Ranking: 1983-03-24
Nest Number (Osprey or Eagle):
Acreage: 33
Watershed: 04050002
Planning Region: 04
Wildlife District: 12
Forestry District: 83
Natural Region: 4
Boundaries Known?: Y

Site Name: ROSS PROPERTY Site Code: VANB.003
Directions to Site: Southwest of Covert 3.75 miles. From 44th Street midway between 80th and 82nd Streets go north on the winding two-track to the cottage; three swales lie north, west and southwest.

General Description: Cladium mariscoides-Calamagrostis canadensis. Swales on sandy lake plain behind wooded dunes on Lake Michigan; three seepage depressions with vegetation of coastal plain affinities.

Element Data: pH 5.2. Sandy peat to peat. Carex lasiocarpa codominant in south with Cladium, Calamagrostis. Cladium dominant in north. Abundant: Soligo remota, Panicum spretum, Fimbristylis, Rhynchospora fusca. R. macrostachya, Dulichium and Scieria reticularis are locally dominant.

Comments: SP: (SE) 1, (ST) 2, (SC) 2; 36 Species reported. South portion of north swale, north and east sides of south swale were plowed; road through north swale.

Managed Area #1: Contained?:
" #2: Contained?:
" #3: MIXPPDSUNEB Contained?: Y
Other Managed Areas: More land?: N
Owner (Pvt., Corp.): Ross, Harry. Comments: The owner lives in Minneapolis, Minnesota.
Need protection?: N Comments: Entire area fenced. Ross may give or sell to TNC.
Need management?: ?
Monitor: Comments:

Best Source: Schaddelee, L. 1983. August 24 - MNFI Site Survey.
Source Code(s): F83CSC47 F82NAH05 U82SCH03
Transcribed: 83-01-28 KAC
Mapped: 83-02-14 MRR
Sensitive Data?:
Photographs?:
Qualitative survey?: Y
Quantitative survey?:
More information?:
Monitor Number:
Data Updated:
Computer Update: 86-12-09 SJO

Appendix VI

Palustrine and Terrestrial Natural Community
Classification Units in Michigan

Palustrine

Marsh

- (*)Submergent Marsh (CPA)
- (*)Emergent Marsh (CPD)
- * Great Lakes Marsh (CPV)
- (*)Northern Wet Meadow (CPM)
- (*)Southern Wet Meadow (CPG)
- Inland Salt Marsh (CPN)
- Intermittent Wetland (CPK)
- Coastal Plain Marsh (CPU)
- * Interdunal Wetland (CPS)

Prairie

- * Lakeplain Wet Prairie (CPW)
- * Lakeplain Wet-mesic Prairie (CPZ)
- Wet Prairie (CPP)
- Wet-mesic Prairie (CPY)

Fen

- Prairie Fen (CPR)
- (*)Northern Fen (CPX)
- Patterned Fen (CPT)
- Poor Fen (CPL)

Bog

- Bog (CPQ)
- Muskeg (CQC)

Forest

- (*)Poor Conifer Swamp (CPC)
- (*)Rich Conifer Swamp (CPB)
- Relict Conifer Swamp (CPJ)
- (*)Hardwood-Conifer Swamp (CPF)
- (*)Southern Swamp (CPE)
- Southern Floodplain Forest (CPH)

Shrub

- (*)Northern Shrub Swamp (COB)
- (*)Southern Shrub Swamp (COA)

Forest/Marsh

- * Wooded Dune and Swale Complex (CQD)

Terrestrial

Forest

- (*)Mesic Southern Forest (CTA)
- (*)Dry-mesic Southern Forest (CTB)
- (*)Dry Southern Forest (CTC)
- (*)Mesic Northern Forest (CTD)
- (*)Dry-mesic Northern Forest (CTE)
- (*)Dry Northern Forest (CTF)
- * Boreal Forest (CTG)

Savanna

- * Lakeplain Oak Openings (CUD)
- Bur Oak Plains (CUG)
- Oak Openings (CTH)
- (*)Oak Barrens (CTJ)
- Pine Barrens (CTK)
- * Great Lakes Barrens (CUF)
- Northern Bald (CTL)

Prairie

- Blacksoil Prairie (CTN)
- Hillside Prairie (CUC)
- Mesic Sand Prairie (CTM)
- Woodland Prairie (CUB)
- Dry Sand Prairie (CTP)

Primary

- * Open Dunes (CTR)
- * Sand/Gravel Beach (CUH)
- * Cobble Beach (CTS)
- * Bedrock Beach (CTT)
- Alvar (CTU)
- Bedrock Glade (CUE)
- (*)Dry Non-acid Cliff (CTV)
- (*)Moist Non-acid Cliff (CTW)
- (*)Dry Acid Cliff (CTX)
- (*)Moist Acid Cliff (CTY)
- Sinkhole (CTZ)

Subterranean

Cave (CSA)

- * Chiefly in coastal zone
- (*) Can occur in coastal zone

Appendix VII

Draft Descriptions of
Palustrine and Terrestrial Natural Community
Classification Units in Michigan

PALUSTRINE

MARSH

SUBMERGENT MARSH *

A chiefly submerged marsh of deep to sometimes shallow water in lakes and streams. Typical dominants include the following genera and species: Ceratophyllum, Elodea, Heteranthera dubia, Myriophyllum, Najas, Potamogeton, Ranunculus, Vallisneria americana, Chara, etc. A variant shallow water type in northern softwater, acid lakes is composed of several rosette-forming species, such as Eriocaulon septangulare, Isoetes spp., Littorella uniflora, Juncus pelocarpus f. submersus, Lobelia dortmanna, Myriophyllum tenellum. Most similar to EMERGENT MARSH.

EMERGENT MARSH *

A shallow water marsh characterized by emergent narrow- and broad-leaved as well as floating-leaved herbs at the shores of lakes and streams. Typical dominants include the following genera and species: Alisma plantago-aquatica, Carex, Eleocharis, Glyceria borealis, Leersia, Lemna, Nuphar, Nymphaea, Polygonum, Pontederia cordata, Sagittaria, Scirpus, Sparganium, Spirodela, Typha, Wolffia, Zizania aquatica. Southern and northern subtypes can be separated based on dominance and the presence-absence of component species. Most similar to EMERGENT MARSH, SOUTHERN WET MEADOW and NORTHERN WET MEADOW.

GREAT LAKES MARSH *

A multi-seral non-forested wetland directly influenced by and connected to a large freshwater lake. Associated coastal features are principally freshwater deltas, riverine estuaries, coastal marshes protected by offshore bars or a barrier dune (forming a lagoon), and shallow bays on lee shores. Vegetational pattern and dominance are influenced by the type of coastal feature, but generally include the following: a deep marsh with submerged plants (Vallisneria americana, Potamogeton spp., Myriophyllum spp., Elodea canadensis, etc.); an emergent marsh of mostly narrow-leaved species (Typha glauca, Scirpus spp., Sagittaria spp., Sparganium spp., Zizania aquatica, etc.); a marsh meadow which is inundated by storms, dominated by Carex, and at the upland margin by Cornus spp., Salix spp., Alnus rugosa, Myrica gale, and species of Carex. Seiches, storms and water level cycles strikingly change vegetation over short periods by destroying some vegetation zones, creating others, and forcing all zones to shift lakeward or landward to accommodate water levels. Important habitat for migrating and breeding waterfowl, shorebirds, spawning fish, and medium-sized mammals (muskrat, fox). Most similar to DEEP MARSH, EMERGENT MARSH, SOUTHERN WET MEADOW, and NORTHERN WET MEADOW.

* Preliminary characterization only

NORTHERN WET MEADOW *

A sedge and grass dominated wetland located mostly north of the transition zone typically bordering streams, but also found on pond and lake margins and above beaver dams. Nearly always on muck soil, which is strongly acid to slightly acid. Dominance is mostly by Calamagrostis canadensis, Carex (C. stricta, C. rostrata, C. lasiocarpa, C. vesicaria, etc.) and Scirpus cyperinus. A number of species are shared with Southern Wet Meadow, but southern species of that type are missing. Most similar to SOUTHERN WET MEADOW, EMERGENT MARSH, and NORTHERN SHRUB SWAMP.

SOUTHERN WET MEADOW *

A sedge and grass dominated wetland located mostly south of the transition zone in stream valleys, along lake margins, and in depressions and channels in glacial outwash. Typically muck soil is neutral to medium acid. Dominance is mostly by Calamagrostis canadensis, Carex (C. stricta, C. aquatilis, C. lanuginos, ?C. bebbii, C. lacustris) and Phalaris arundinacea, which is favored by disturbance. Other typical important species and genera are Eleocharis, Juncus, Typha, Eupatorium maculatum, and E. perfoliatum. Leersia, Phalaris arundinacea, and Phragmites australis in abundance usually indicate past disturbance, often grazing. Species of Northern Wet Meadow are present, in addition to several southern ones. Most similar to NORTHERN WET MEADOW, EMERGENT MARSH, and SOUTHERN SHRUB SWAMP.

INTERMITTENT WETLAND *

An herb or herb-shrub wetland along lakeshores or in depressions, which experience fluctuating water levels seasonally and from year to year. North of the transition zone these wetlands always occur on sandy glacial lake plains; south of the transition zone they are on lake plains and level sandy outwash plains. Soil ranges from loamy sand and peaty sand to peaty muck and is very strongly acid to strongly acid. Sites are bog-like, dominated by Chamaedaphne calyculata and Sphagnum, or in situations north of the transition zone major cover is contributed by Calamagrostis canadensis, C. inexpansa, Phalaris arundinacea, Scirpus spp., Eleocharis spp., etc.). Some northern sites were created when fire burned the original bogs occupying them. Often species of coastal plain affinities are present, especially south of the transition zone. Most similar to NORTHERN WET MEADOW, BOG, and perhaps SOUTHERN WET MEADOW.

COASTAL PLAIN MARSH

A grass and rush dominated wetland on shores of softwater seepage lakes, ponds, or depressions, where water levels fluctuate yearly and during each season. Located nearly always in sandy glacial outwash or on sandy glacial lake plains. Soil ranges from sand to peaty sand to peaty muck and is very strongly to strongly acid. Community shows distinct zonation in concentric bands: open water (when present); shallow water to recently emerged shore dominated by annual plant species and emergents; moist meadow typically dominated by Calamagrostis canadensis and sometimes Cladium mariscoides, Rhynchospora capitellata, Carex scoparia, etc.; and shrub-tree margin (when present), often with Acer rubrum, Nyssa sylvatica, Quercus palustris, Aronia melanocarpa, Vaccinium corvmbosum, Cornus spp., Cephalanthus occidentalis. This wooded zone, or the moist meadow, grades directly into Dry and Dry-mesic Southern and, less commonly, Northern Forest. Indicators are species found on the northern Atlantic coastal plain, either disjunct or ranging west into the Lower Great Lakes region. Most similar to INTERMITTENT WETLAND, WET PRAIRIE, and SOUTHERN WET MEADOW.

INTERDUNAL WETLAND

A rush, sedge, and shrub dominated wetland situated in depressions of open dunes along large freshwater lakes, experiencing a fluctuating water table seasonally and yearly in synchrony with lake level changes. Settings typically are in long troughs between dune ridges, in wind-excavated depressions at the base of blowouts, in hollows of dune fields wedged between inland lakes and the Great Lakes, and in old river channels that once flowed parallel to the lakeshore behind a foredune. The saturated sand (sometimes covered by a thin layer of muck) and pondwater are neutral to moderately alkaline. Dominant plants include Juncus balticus in the driest swales; Cladium mariscoides and sometimes Eleocharis elliptica in wetter ones; Panicum implicatum (including P. lindheimeri), Eleocharis pauciflora, Rhynchospora capillacea and Equisetum variegatum in drying pools; and Myrica gale, Potentilla fruticosa, Hypericum kalmianum on slight rises, especially at the north end of Lake Michigan and Huron. The most mature swales farthest inland become dominated by Calamagrostis canadensis and Carex spp. (C. aquatilis, C. stricta, C. lasiocarpa, etc.). Pinus banksiana dominates the driest parts of the wetland, at the end of a successional sequence, although it persists after sand accumulating beneath it creates conditions for open dune species. It is superceded in the north by Larix laricina, Thuja occidentalis, and other conifers. Typical species include Carex garberi, C. crawei, C. viridula, Gentiana procera, Gerardia paupercula, Lobelia kalmii, Solidago houghtonii, Tofieldia glutinosa, Triglochin maritima, and Utricularia cornuta. Most similar to COBBLE BEACH, NORTHERN FEN, and PRAIRIE FEN.

PRAIRIE

LAKEPLAIN WET PRAIRIE

Native lowland grassland on level sites in sandy, and less commonly, silty/clayey glacial lakeplains with seasonally high water table. Very fine sandy loam, loam, or silty clay loam (less commonly loamy very fine sand) soil is moderately alkaline (ave. pH 8.0) with moderate water retaining capacity. Dominant plants are Calamagrostis canadensis, Carex spp. (C. aquatilis, C. stricta, C. lanuginosa, etc.), and less often Andropogon gerardii and Sorghastrum nutans. Typical species are Asclepias incarnata, A. sullivantii, Aster dumosus, Carex buxbaumii, Cirsium muticum, Eleocharis elliptica, Erigeron philadelphicus, Fraxinus pensylvanica, Galium trifidum, Habenaria leucophaea, Liatris spicata, Lysimachia quadriflora, Lythrum alatum, Parnassia glauca, Populus deltoides, Potentilla anserina, Prenanthes racemosa, Rosa palustris, Scirpus validus, Stachys tenuifolia, and Vernonia missurica. Most similar to LAKEPLAIN WET-MESIC PRAIRIE, with some relations to PRAIRIE FEN and INTERDUNAL WETLAND.

LAKEPLAIN WET-MESIC PRAIRIE

Native lowland grassland on level sites in sandy, and less commonly, silty/clayey glacial lakeplains with seasonally high water table. Very fine sandy loam, less commonly loamy very fine sand or loam is moderately alkaline (ave. pH 8.0) with moderate water retaining capacity. Dominant plants are Andropogon scoparius, Sorghastrum nutans, less often Panicum virgatum, Andropogon gerardii, Carex lanuginosa. Typical plant species include Aster ericoides, Cacalia plantaginea, Cypripedium candidum, Hypericum kalmianum, Potentilla fruticosa, Solidago nemoralis, S. ohioensis, as well as several typical species of Lakeplain Wet Prairie. A variant (wet-mesic sand prairie) found just inland from the lakeplain in southeast Lower Michigan has less

alkaline soil and usually occurs on sandy loam next to muckland. Most similar to LAKEPLAIN WET PRAIRIE, but with similarities to PRAIRIE FEN and INTERDUNAL WETLAND.

FEN

NORTHERN FEN *

A sedge and rush dominated wetland on peat through which flows groundwater rich in calcium and magnesium carbonates. Possibly restricted to areas north of the transition zone where calcareous bedrock underlies a thin mantle of glacial drift. The saturated peat is neutral to slightly alkaline. Dominants include Carex spp. (C. aquatilis, C. lasiocarpa, C. limosa, etc.), Scirpus spp. (S. cespitosus, S. hudsonianus), Eleocharis spp., Potentilla fruticosa, Cladium mariscoides. Calciphiles are present (e.g. Tofieldia glutinosa, Parnassia glauca, Gentiana procera) along with bog plants (Chamaedaphne calyculata, Ledum groenlandicum, Vaccinium oxycoccos, etc.), especially on Sphagnum hummocks. Thuja occidentalis commonly surrounds and invades Northern Fens. Most similar to PATTERNED PEATLAND and perhaps INTERDUNAL WETLAND, with relations to PRAIRIE FEN.

BOG

BOG

An ombrotrophic peatland characterized by a sedge or sedge-sphagnum floating mat and/or deep sphagnum peat dominated by Sphagnum and low ericaceous shrubs. Often occurs on margins of lakes and ponds, located in depressions in glacial outwash and sandy glacial lake plains; also, south of the transition zone, in kettles of end moraines. Saturated peat is extremely acid, but elevated slightly by neutral to slightly alkaline lake and groundwater south of the transition zone. Dominant species are Sphagnum spp. (S. magellanicum, S. cuspidatum), Carex oligosperma, C. lasiocarpa, perhaps C. trisperma, and Chamaedaphne calyculata. Typical plants include Andromeda glaucophylla, Calla palustris, Drosera rotundifolia, Eriophorum spp., Kalmia polifolia, Vaccinium macrocarpon, V. oxycoccos. Typical sphagnum species are S. papillosum, ?S. teres, S. recurvum, S. russowii, S. fuscum, and S. capillifolium. Rhynchospora alba, Carex pauciflora, and C. paupercula can be common. Kettle hole bogs, if limited in area, include later successional states of Shrub Swamp (Vaccinium corymbosum, Aronia melanocarpa, Nemophanthus mucronata, etc.), Poor Conifer Swamp (Picea mariana, Larix laricina, etc.) and, south of the transition zone, Relict Conifer Swamp (Larix laricina, Acer rubrum, etc.). A variant exists south of the transition zone where greater minerotrophy and warmer climate causes several northern species to drop out and some southern species to be added. Most similar to POOR FEN, POOR CONIFER SWAMP, and RELICT CONIFER SWAMP.

FOREST

POOR CONIFER SWAMP *

An ombrotrophic or very weakly minerotrophic forested peatland occurring mostly north of the transition zone. Situated primarily in depressions of glacial outwash or glacial lakes plains and in kettles in coarse-textured moraines. Saturated deep peat, and occasionally shallow peat, is extremely acid to very strongly acid. Picea mariana usually dominates solitarily or with Larix laricina and Abies balsamea; Pinus banksiana also can dominate,

presumably where the other conifers were eliminated by fire. Other conifers often are present (e.g. Pinus strobus, Thuja occidentalis). A dense shrub layer can develop, usually of Chamaedaphne calyculata, Ledum groenlandicum, and Kalmia polifolia. Groundlayer dominants include Sphagnum (S. magellanicum, S. fuscum, ?S. centrale, ?S. wulfianum), Carex trisperma (and C. oligosperma?), feather mosses, etc. Most similar to MUSKEG and RICH CONIFER SWAMP.

RICH CONIFER SWAMP *

A weakly minerotrophic forested peatland occurring mostly north of the transition zone. Situated primarily along streams and lakes, but also in drainageways, and in depressions in shallow drift over limestone and dolomite; found on glacial outwash, glacial lake plains, and in coarse-textured ground moraines, especially those that are drumlin fields. Saturated peat can be very strongly acid, or neutral to mildly alkaline (e.g. in calcareous ground moraine or over calcareous bedrock). Overwhelming dominant is Thuja occidentalis which often forms nearly pure stands. Abies balsamea is always present in the canopy. Other less common canopy species include Betula papyrifera, B. allegheniensis, Acer rubrum, Picea glauca, Picea mariana, Larix laricina, Tsuga canadensis, and Pinus strobus. Alnus rugosa, A. crispa and Cornus spp. are typical shrubs. Groundlayer is very diverse and possesses numerous moss species, including Sphagnum (S. squarrosum, S. warnstorffii), Pleurozium shreberi, Hylocomium splendens, and ?Ptilium crista-castrensis. Lesser peat accumulates than in poor conifer swamp. More minerotrophic conditions are indicated by Mnium spinulosum, M. punctatum, M. pseudopunctatum, and Drepanocladus aduncans. Most similar to HARDWOOD-CONIFER SWAMP, POOR CONIFER SWAMP, and BOREAL FOREST.

HARDWOOD-CONIFER SWAMP *

A minerotrophic swamp of less saturated conditions than conifer swamps and dominated by a mixture of northern hardwoods and lowland conifers. It occurs along floodplains, or as a transitional community between conifer swamps and upland forests, or at stream headwaters in moraines. Moist mineral soil or shallow muck (sometimes deep muck, especially south of the transition zone) is medium acid to neutral. Dominance in the canopy always includes one of three species: Thuja occidentalis, Fraxinus nigra, Betula allegheniensis. When the two hardwoods predominate, other conifers are present, usually Tsuga canadensis and Larix laricina; other deciduous species include Ulmus americana (less important since the elm blight) and Acer rubrum. Abies balsamea is nearly always present. Toward the north, Populus balsamifera may become important. South of the transition zone Pinus strobus can become important while Thuja occidentalis greatly diminishes and Abies balsamea disappears. Very rich shrub and groundlayer due to abundant moisture and favorable drainage. Most similar to RICH CONIFER SWAMP, RELICT CONIFER SWAMP, and BOREAL FOREST.

SOUTHERN SWAMP *

A wetland forest type located south of the transition zone. Situated primarily in depression and channels of ground moraines and also in depressions of glacial outwash, especially near moraines. Loam and silt loam soil (sometimes sandy loam) often possesses a clay layer; pH is neutral to slightly acid (in sandier soils). Dominant species often are Acer saccharinum, Fraxinus pennsylvanica and, before the elm blight arrived, Ulmus americana; several other species which codominate in the canopy, or whose presence increases canopy diversity significantly, include Platanus occidentalis, Acer rubrum, Quercus bicolor, Q. palustris, Nyssa sylvatica, the last two principally in sandy

regions. Sites are often inundated in the spring, a condition which can last into the summer, hence the groundlayer, except on elevated areas, is often sparse. Most similar to SOUTHERN FLOODPLAIN FOREST and MESIC SOUTHERN FOREST.

SHRUB

NORTHERN SHRUB SWAMP *

A fairly persistent shrub dominated wetland located north of the transition zone. Usually a streamside community, but also adjacent to lakes. Muck or peat soil is medium acid, with a better supply of nutrients than most northern swamps. Dominance overwhelmingly is by Alnus rugosa, but other shrubs (Viburnum cassinoides, ?V. trilobum, Myrica gale) can be important. Occasional canopy trees of Fraxinus nigra, Thuja occidentalis, etc. can be present. Many of the same groundlayer species as NORTHERN WET MEADOW, to which this type is most similar; also similar to SOUTHERN SHRUB SWAMP and SOUTHERN WET MEADOW.

SOUTHERN SHRUB SWAMP *

A relatively short-lived shrub dominated wetland located south of the transition zone. A streamside or lakeside community, but also occupying depressions in glacial outwash. Muck soil is neutral to mildly alkaline. Dominant species include Cornus racemosa, C. stolonifera, Salix discolor, S. interior, S. rigida, S. lucida, Sambucus canadensis, and Ilex verticillata. In the oak region, Cephalanthus occidentalis dominates many kettleholes and lake margins located in oak forests. Occasionally Fraxinus pennsylvanica, Ulmus americana, Acer spp., etc. form a sparse canopy. Many groundlayer species are shared with SOUTHERN WET MEADOW, to which this type is most similar; also similar to NORTHERN SHRUB SWAMP and NORTHERN WET MEADOW.

FOREST-MARSH COMPLEX

WOODED DUNE AND SWALE COMPLEX *

A complex of forest and marsh on alternating sand ridges and interdunal troughs along the shores of the Great Lakes. Narrow bands of dry forest vegetation sharply juxtapose with wet meadow. Located on sandy glacial lakeplains in former embayments of the Great Lakes, the successive arcuate dune and trough topography originally supported open dunes and interdunal wetland. Sand ridges generally are covered by DRY and DRY-MESIC NORTHERN FOREST having some BOREAL FOREST character due to proximity with the lakes. The troughs support NORTHERN WET MEADOW or BOG vegetation. Similarities are to the community types of which the complex is composed.

TERRESTRIAL

FOREST

MESIC SOUTHERN FOREST

A southern hardwood forest type with little oak, lying mostly south of the transition zone and occurring principally on medium- to fine-textured end and ground moraines, silty/clayey glacial lake plains and some sandy lake plains and sand dunes; in the southern oak region it is also found on kettle-kame topography and coarse-textured ground and end moraines. Generally, loam to sandy loam soil is slightly acid to neutral. Canopy is dominated by Acer saccharum and Fagus grandifolia together or each alone, a natural preponderance of Fagus indicating a longer time in mature forest conditions. Occasionally,

Quercus rubra or Liriodendron tulipifera codominates; other important canopy species are Fraxinus americana, Tilia americana, Prunus serotina, Carya cordiformis, and sometimes Acer rubrum, Quercus alba, and Q. macrocarpa. The spring flora of these mesophytic woods shows striking diversity and extravagance, typified by large colonies of such herbs as Allium tricoccum, Asarum canadense, Dentaria laciniata, Dicentra cucullaria, Erythronium americanum, Hydrophyllum virginianum, Isopovrum biternatum, Phlox divaricata, Trillium grandiflorum. Most similar to MESIC NORTHERN FOREST, DRY-MESIC SOUTHERN FOREST, SOUTHERN SWAMP, and SOUTHERN FLOODPLAIN FOREST.

DRY-MESIC SOUTHERN FOREST

An oak or oak-hardwood forest type lying mostly south of the transition zone, occurring principally on glacial outwash, coarse-textured end moraines, and sandy glacial lake plains; also on kettle-kame topography, coarse-textured ground moraines, and sand dunes. Sandy loam and loam soil is slightly acid to neutral. Quercus rubra and Q. alba always are dominant or important in the canopy, the former more than the latter. Other trees sometimes codominate or are important: Acer rubrum, A. saccharum, Carya ovalis, Fagus grandifolia, Fraxinus americana, Tilia americana, Quercus coccinea. Pinus strobus and Tsuga canadensis enter toward the transition zone. Constant canopy trees are Prunus serotina, Quercus velutina and Sassafras albidum. Typical species include Actaea alba, Adiantum pedatum, Brachyelytrum erectum, Bromus pubescens, Carex albursina, C. convoluta, Carya ovata, Corallorhiza maculata, Galium triflorum, Hamamelis virginiana, Ostrya virginiana, Sanicula marilandica, Smilax tamnoides, Viola pubescens. Most similar to DRY SOUTHERN FOREST and MESIC SOUTHERN FOREST.

DRY SOUTHERN FOREST

An oak-dominated forest type lying mostly south of the transition zone, occurring principally on glacial outwash, but also on sand ridges and elevations in sandy glacial lake plains and on sand dunes. Loamy sand or sandy loam soil is strongly acid to medium acid. Canopy is dominated by Quercus velutina and/or Q. alba, locally with Carva glabra and C. ovalis and with constant but lesser amounts of Acer rubrum, Prunus serotina, Quercus rubra, Sassafras albidum and, toward the transition zone, Pinus strobus. Even-aged stands of Q. velutina, especially in southwest Lower Michigan, can represent former brushy prairies or Oak Barrens; of Q. alba, they may represent former Oak Openings. Typical shrub and herb species of the segment derived from Oak Barrens include Ceanothus americanus, Corvylus americana, Hackelia virginiana, Lysimachia quadrifolia and Vitis aestivalis. The groundlayer of the remaining segment is less distinct, but may be indicated (in conjunction with canopy composition) by Hamamelis virginiana, Monotropa uniflora and Vitis aestivalis. Most similar to OAK BARRENS, DRY-MESIC SOUTHERN FOREST and DRY NORTHERN FOREST.

MESIC NORTHERN FOREST

A forest type lying mostly north of the transition zone, characterized by the presence of northern hardwoods, hemlock and, less often, white pine. Chiefly on coarse-textured ground and end moraines, but also common on sandy lake plains, silty/clayey lake plains, and thin glacial till over bedrock; less commonly on medium-textured moraines, kettle-kame topography, and sand dunes. Loamy sand to sandy loam (sometimes loam) soil ranges widely in pH, from extremely acid to medium acid. Canopy is dominated by Tsuga canadensis or Acer saccharum most commonly, Tsuga predominating or accompanied by A. saccharum, Betula lutea and, less frequently, A. rubrum, Fagus grandifolia, Betula

papyrifera, Quercus rubra and Pinus strobus. Tilia americana is often (can codominate?) important in Acer stands, along with Betula allegheniensis, Quercus rubra and Fagus grandifolia. Fagus frequently codominates with Acer saccharum as well. Tracts of A. saccharum with Thuja occidentalis in dunes or over calcareous bedrock were known from the literature, but are known today only rarely from dunes. Historical accounts portray MESIC NORTHERN FOREST as having a high shrub layer of Taxus canadensis (especially in Tsuga stands), which is now uncommon because so many deer live north of the transition zone and graze this plant excessively. Stands dominated by Betula papyrifera are often on mesic sites formerly occupied by--or succeeding to--mesic northern forest. Most similar to MESIC SOUTHERN FOREST, DRY-MESIC NORTHERN FOREST, CONIFER-HARDWOOD SWAMP.

DRY-MESIC NORTHERN FOREST

A pine-hardwood forest type located mostly north of the transition zone, occurring principally on sandy glacial outwash, sandy glacial lake plains, and on thin glacial drift over bedrock; also on coarse-textured end moraines. Sand or loamy sand soil is extremely acid to very strongly acid. Pinus strobus is nearly always present in the canopy as a dominant or important species. Pinus resinosa or Tsuga canadensis are frequently present and sometimes dominant. Hardwoods usually important or dominant are Acer saccharum, Betula allegheniensis, Quercus rubra and Acer rubrum. Abies balsamea is often present in the subcanopy. Shrub and groundlayer species found in Dry and Mesic Northern Forest overlap in this forest type. Most similar to DRY NORTHERN FOREST and MESIC NORTHERN FOREST. Transition zone dry-mesic forests of white pine and oak were converted to drier oak forest by lumbering and fire. Present-day extensive oak forests in northern Lower Michigan formerly were dry-mesic northern forest. Parts of "stump prairies" (see bracken-grassland below) such as Kingston Plains in north central Upper Michigan, with aspen, birch, pin cherry, bracken fern and reindeer lichens are lumbered and severely burned sites of former dry-mesic northern forest.

DRY NORTHERN FOREST

A pine dominated forest type lying mostly north of the transition zone, occurring principally on sandy glacial outwash and sandy glacial lake plains, less commonly on sand ridges of peatland on glacial outwash or glacial lake plains. Dry sand soil is extremely acid to very strongly acid. Dominant or very important canopy species always are either Pinus banksiana or P. resinosa, the latter often present over canopies of the former in secondary stands as supracanopy relicts. Quercus ellipsoidalis, Prunus serotina, Populus tremuloides usually accompany Pinus banksiana; Populus grandidentata, Q. rubra and perhaps Betula papyrifera accompany Pinus resinosa. Acer rubrum is found with both pines. Abies balsamea, Pinus resinosa, P. strobus and Picea spp. are often in the subcanopy. Low shrub layer of Pteridium aquilinum, Vaccinium angustifolium, with Diervilla lonicera and Comptonia peregrina. Groundlayer is dominated by Carex pensylvanica under Pinus banksiana and some P. resinosa stands, with Cladina rangifera, Dicranum and Hypnum mosses, Gaultheria procumbens, Arctostaphylos uva-ursi, Epigaea repens and Danthonia spicata (in more open stands); Gavlussacia baccata, Deschampsia flexuosa, Vaccinium myrtilloides (under P. resinosa) become more important in Upper Michigan. Other typical species include Amelanchier spicata, Apocynum androsaemifolium, Hieraceum venosum, Melampyrum lineare, Oryzopsis pungens, Prunus pumila and Rubus flagellaris (including R. arundelanus). Most similar to PINE BARRENS and DRY-MESIC NORTHERN FOREST. There are many more acres of this type than

formerly, through logging and burning of some dry-mesic forest and the red pine phase of dry forest. BRACKEN-GRASSLAND is thought to derive from dry and dry-mesic northern forest. Natural openings may have existed in small depressions (forest pockets) due to microclimatic effects (cold air drainage mostly), but logging and fire produced the extensive "stump prairies" dominated by Cladina lichens, Poa compressa, P. pratensis, Danthonia spicata, Pteridium aquilinum, and the exotics Hieraceum aurantiacum, Rumex acetosella, Phleum pratense, Verbascum thapsus. Very slow invasion of these sites by Prunus virginiana, Abies balsamea, Populus tremuloides, Betula papyrifera is taking place.

BOREAL FOREST *

A conifer-hardwood forest type characterized by species dominant in the Canadian Boreal Forest. Typically occupies upland sites (often with local wet places) along shores of the Great Lakes, on islands in the Great Lakes (e.g. Isle Royale, Drummond Island) and locally inland (e.g. restricted areas in the Negaunee-Michigamme Highlands). Occurs primarily on sand dunes, in glacial lakeplains, and on thin soil over bedrock, both igneous and calcareous. Site factors are moderated by local climatic conditions promoting higher humidity, greater snowfall, lower summer temperatures, and maybe greater summer fog and mist. Sand and sandy loam soils are typically slightly acid to neutral, but heavier soils and more acid conditions can be found. Dominants are usually Abies balsamea, Picea glauca, Thuja occidentalis and Betula papyrifera, shifting toward Betula when fire and spruce budworm affect a site, and toward Abies and Picea in the absence of such disturbance. Thuja is most important in sand dunes and on soil over limestone. Other canopy species, which also occasionally dominate, are Populus tremuloides, Pinus strobus, perhaps Acer rubrum and, less often, P. resinosa and P. banksiana. Acer spicatum, Sorbus decora, S. americana and Corylus cornuta are typical understory species. Groundlayer species are a mix of Mesic Northern Forest and northern swamp types, but prominent among them are Actaea rubra, Aralia nudicaulis, Carex eburnea, Clintonia borealis, Coptis groenlandica, Cornus canadensis, Galium triflorum, Goodyera oblongifolia, Linnaea borealis, Lonicera canadensis and Trientalis borealis. Cyrtopodium arietinum and Iris lacustris are uncommon, but characteristic. Mosses and Usnea lichens often are abundant due to favorable, moist conditions. Most similar to RICH CONIFER SWAMP, MESIC NORTHERN FOREST, HARDWOOD-CONIFER SWAMP and DRY-MESIC NORTHERN FOREST.

SAVANNA

LAKEPLAIN OAK OPENINGS

A savanna on sand ridges and slightly raised level areas, in an undisturbed state usually adjacent to Lakeplain Wet-mesic and Wet Prairie, in sandy and, less commonly, silty/clayey glacial lakeplains with seasonally high water table. Very fine sandy loam or loamy very fine sand (sometimes loam) is mildly alkaline with moderate water retaining capacity. Dominant canopy species are Quercus macrocarpa, Q. palustris, Q. hallii (hybrid between Q. macrocarpa and Q. bicolor), Q. velutina and Q. alba, with Fraxinus pensylvanica and Populus deltoides. Crataegus spp. and other shrubs (e.g. Cornus racemosa, Ceanothus americanus, Salix humilis) are important. Groundlayer consists of species typical of Mesic Sand Prairie and Lakeplain Wet-mesic Prairie. A wet variant of this type, suggesting flatwoods, is dominated by Q. palustris and Fraxinus pensylvanica, with Quercus macrocarpa and Q. bicolor and formerly may have had a Lakeplain Wet Prairie groundlayer

component. Most similar to MESIC SAND PRAIRIE, OAK OPENINGS and LAKEPLAIN WET-MESIC PRAIRIE.

OAK BARRENS

A savanna type of scattered and clumped trees and shrubs in a matrix of grass, as well as thin woods surrounding Dry Sand Prairie openings. On nearly level to slightly undulating ground in well-drained sandy glacial outwash, sandy glacial lake plains, and less often sandy areas in coarse-textured moraines. Soil is sandy or loamy sand of medium to slightly acid pH and low water retaining capacity. Dominant canopy species are Quercus velutina and Q. alba, with smaller amounts of Carya glabra, C. ovalis and Q. rubra. Q. ellipsoidalis replaces Q. velutina north of the transition zone; Pinus strobus and P. resinosa enter toward and beyond the transition zone; Quercus coccinea may be present on the southeast Lower Michigan lake plain. Dominant groundlayer plant species are Andropogon scoparius, Carex pensylvanica, A. gerardii, with Poa compressa in disturbed sites. The sedge replaces the bluestems in shaded places and toward the transition zone. Certain species may be favored by the ecotonal conditions of savanna; e.g. Aureolaria spp., Cacalia atriplicifolia, Ceanothus americanus, Helianthus divaricatus, Lathyrus ochroleucus, Lespedeza hirta, Stipa avenacea, Swertia caroliniensis. Most similar to DRY SAND PRAIRIE, DRY OAK WOODS, OAK OPENINGS and PINE BARRENS.

GREAT LAKES BARRENS *

A coniferous savanna of scattered trees and often dense low or creeping shrubs on sandy former embayments along the Great Lakes. The sand soil is dry, but subsoil water levels are periodically elevated by changes in lake water levels. Dominant canopy species are Pinus strobus, P. resinosa, and P. banksiana. Low shrub layer dominated chiefly by Juniperus communis. Shepherdia canadensis, though uncommon, may be a constant species. Groundlayer dominated or characterized by Juniperus horizontalis, Arctostaphylos uva-ursi, Danthonia spicata, Festuca saximontana, Hudsonia tomentosa, with species present of stable sandy habitats (e.g. Cyperus schweinitzii, Solidago nemoralis, Gnaphalium spp., Koeleria macrantha) and of Open Dunes. Stands of Pinus banksiana, on margins of interdunal wetlands if large and open enough, are examples of this type. Most similar to OPEN DUNES and PINE BARRENS.

PRIMARY

OPEN DUNES

A grass and shrub dominated multi-seral community on wind-deposited sand formations at the shores of large freshwater lakes, strongly affected by lake-driven winds. Sand formations include foredunes, high dunes, perched dunes, dune fields, and blowouts in forested dunes. Because the sand contains calcareous minerals, it is neutral to slightly alkaline. Dominants and community structure vary depending on degree of sand deposition, sand erosion, and distance from the lake. Depositional areas, such as foredunes, are dominated by Ammophila breviligulata; erosional zones, such as slacks in blowouts and dune fields by Calamovilfa longifolia; and stabilized areas by Andropogon scoparius. In dune fields and on secondary dune ridges, especially around northern Lake Michigan and Huron, low evergreen shrubs (Arctostaphylos uva-ursi, Juniperus horizontalis) occupy crests of ridges and mounds; other less frequent dominants include Prunus pumila, Salix cordata, Salix glaucophylloides, Juniperus communis. Trees invade the inland edge of Open Dunes, often creating savanna beyond the forest, typically oak-pine in the

south, Boreal Forest in the north. Perhaps 25-35 percent of Open Dunes species grow in maritime dunes (e.g. Cakile edentula, Ammophila breviligulata, Hudsonia tomentosa, Lathyrus japonicus), but the many western species set Open Dunes apart (as do endemic plants, like Cirsium pitcheri and Tanacetum huronense). Most similar to GREAT LAKES BARRENS, PINE BARRENS, with relations to DRY SAND PRAIRIE.

SAND/GRAVEL BEACH *

Unstable shoreline of freshwater lakes, severely affected by wind, waves, and winter ice. Easily shifted sand or gravel substrate permits little vegetation to develop, unless protected by a shoreline configuration that breaks waves and blocks winter ice. A shrub zone (Physocarpus opulifolius, Cornus stolonifera, Rosa acicularis, etc.) can develop at the inland margin of some gravel beaches. Species found on sand and gravel beaches in most cases are those of other shoreline habitats which gain a tenuous foothold on the beach. Cakile edentula, Ammophila breviligulata, and Salix glaucophylloides typically grow on sand beaches. Little vegetative similarity to any other community type. Sand beaches are favorite feeding grounds for shorebirds, and gravel beaches, especially on islands, are used by nesting gulls, terns, cormorants and others.

COBBLE BEACH *

Gently sloping shoreline of large freshwater lakes, studded with cobbles and boulders and easily inundated by storms and periodical high water. Located mainly on Lake Michigan and Huron where weathering of dolomite and limestone creates neutral to slightly alkaline muck and sand between rocks. Species of Interdunal Wetland are well represented, but weedy native and alien species are present because of frequent natural disturbance, as well as dominant and some species of Northern Wet Meadow (Calamagrostis inexpectata, C. canadensis, Myrica gale, Carex aquatilis, C. stricta, etc.) Most similar to INTERDUNAL WETLAND, BEDROCK BEACH and NORTHERN WET MEADOW.

BEDROCK BEACH

A bedrock shoreline of large freshwater lakes--a stressed, potentially unstable environment yet possessing diverse plant assemblages because of the stable substrate. Different rock types create different microtopography and hence influence species composition, as does pH resulting from rock type. Limestone and dolomite are moist and more or less horizontal; sandstones and shales are terraced and usually moist; conglomerate and igneous rocks are massive, cracked, and often marked with pools (which provide intermittent moist habitat in a quickly drying place). Three structural zones are typically present: bare wave- and ice-swept lower beach; middle beach of scattered herbs and some shrubs, especially around moss-edged pools and in cracks; and, still in the splash zone, an upper beach where lessened disturbance permits development of a shrub dominated community invaded by stunted northern tree species. Species of high constancy on Lake Superior include Agrostis hymenale, Arctostaphylos uva-ursi, Campanula aparinoides, Castilleja septentrionalis, Deschampsia caespitosa, Physocarpus opulifolius, Pinguicula vulgaris, Potentilla anserina, Primula mistassinica, Rosa acicularis, Solidago spathulata. Some of these are replaced by Eleocharis elliptica, Juncus balticus, Potentilla fruticosa, and other plants of Interdunal Wetland on Lake Michigan and Huron. Crustose lichens cover bare rocks. Because of cool, moist conditions and sparse vegetative cover due to environmental stresses, several rare species of arctic-alpine distribution grow on Bedrock Beach. Most similar

to COBBLE BEACH, INTERDUNAL WETLAND and OPEN DUNES.

DRY NON-ACID CLIFF *

MOIST NON-ACID CLIFF *

DRY ACID CLIFF *

MOIST ACID CLIFF *

Primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, and liverworts. Nearly all cliffs have a dry upper lip, characterized by such species as Polypodium virginianum, Diervilla lonicera, etc. and a moister base around which, at Moist Cliffs, at least Impatiens capensis often grows. Talus slopes differ insufficiently from associated cliffs to warrant separation as a distinct community type. Cliff vegetation is largely determined by vegetation of the surrounding plant communities, so much of the variation from site to site depends on the distance between sites--a phytogeographical factor. The other important factor affecting vegetation is site moisture, a combination of aspect (north to east vs. south to west), amount of forest canopy, height of cliff (high ones have more exposed cliff face above the surrounding forest), and perhaps, in some cases, proximity to water. Typical of Dry Cliff are Amelanchier sanguinea and Pellaea glabella, as well as several species of dry forests and barrens. Foliose and fruticose lichens are also common. Moist Cliff typically has Cryptogramma stelleri and Cystopteris bulbifera, as well as liverworts. All cliff types are characterized by a high proportion of fern species in their total flora. Exposures are mostly limestone, dolomite, conglomerate, schist, sandstone, shale, and granite. Rock type does not seem to affect species composition significantly since soil in cracks and on ledges is usually neutral to slightly alkaline. But Moist Cliff and Dry Cliff are subdivided, in case it matters, into Acid Cliff of pH below 6.5, and Non-acid Cliff of pH above 6.6. Dry Cliff is most similar to BEDROCK GLADE and DRY-MESIC NORTHERN FOREST; Moist Cliff is most similar to MESIC NORTHERN FOREST.

Soil Conservation Service Soil pH Ranges

below 4.5	extremely acid
4.5-5.0	very strongly acid
5.1-5.5	strongly acid
5.6-6.0	medium acid
6.1-6.5	slightly acid
6.6-7.3	neutral
7.4-7.8	mildly alkaline
7.9-8.4	moderately alkaline
8.5-9.0	strongly alkaline
above 9.0	very strongly alkaline

Appendix VIII

Special Animals and Plants of the Coastal Zone

<u>Organism</u>	<u>Principal Habitat</u>
<u>Fishes</u>	
<u>Acipenser fulvescens</u> , lake sturgeon (T)	Great Lakes
<u>Coregonus alpenae</u> , longjaw cisco (X)	Great Lakes
<u>C. artedii</u> , cisco or lake herring (T)	Great Lakes
<u>C. kiyi</u> , kiyi (SC)	Great Lakes
<u>C. nigripinnis</u> , blackfin cisco (X)	Great Lakes
<u>C. zenithicus</u> , shortjaw cisco (T)	Great Lakes
<u>Cottus ricei</u> , spoonhead sculpin (SC)	Great Lakes
<u>Hiodon tergisus</u> , mooneye (P)	Great Lakes
<u>Hybopsis storeriana</u> , silver chub (P)	Great Lakes
<u>Ictiobus cyprinellus</u> , bigmouth buffalo (P)	Great Lakes
<u>Ictiobus niger</u> , black buffalo (SC)	Great Lakes
<u>Noturus miurus</u> , brindled madtom (SC)	Great Lakes
<u>Noturus stigmosus</u> , northern madtom (E)	Great Lakes
<u>Percina copelandi</u> , channel darter (T)	Great Lakes
<u>Percina shumardi</u> , river darter (P)	Great Lakes
<u>Stizostedion vitreum glaucum</u> , blue pike (X)	Great Lakes
<u>Ammocrypta pellucida</u> , eastern sand darter (T)	Great Lakes (shallow water)
<u>Birds</u>	
<u>Falco peregrinus</u> , peregrine falcon (E)	Cliffs
<u>Charadrius melodus</u> , piping plover (E)	Gravel/Sand Beach with Interdunal Wetland
<u>Phalacrocorax auritus</u> , double-crested cormorant (T)	Gravel Beach
<u>Haliaeetus leucocephalus</u> (T)	Great Lakes Marsh
<u>Pandion haliaetus</u> , osprey (T)	Great Lakes Marsh
<u>Xanthocephalus xanthocephalus</u> , Yellow-headed blackbird (SC)	Great Lakes Marsh
<u>Rallus elegans</u> , king rail (T)	Great Lakes Marsh (Lower Mich.)
<u>Tyto alba</u> , common barn owl (E)	Great Lakes Marsh (Lower Mich.)
<u>Sterna forsteri</u> , Forster's tern (SC)	Great Lakes Marsh (Lower Mich.)
<u>Nycticorax nycticorax</u> , black-crowned night heron (SC)	Gravel/Sand Beach
<u>Sterna hirundo</u> , common tern (T)	Gravel/Sand Beach (esp. islands)
<u>Sterna caspia</u> , Caspian tern (T)	Gravel/Sand Beach (esp. islands)
<u>Reptiles</u>	
<u>Elaphe vulpina gloydi</u> , eastern fox snake (SC)	Great Lakes Marsh (Lower Mich.)

Mollusks

<u>Cyclonaias tuberculata</u> , purple warty-back (SC)	Great Lakes
<u>Dysnomia sulcata</u> , white cat's paw pearly mussel (E)	Great Lakes
<u>Dysnomia torulosa rangiana</u> , northern riffle shell (E)	Great Lakes
<u>Dysnomia triquetra</u> , snuffbox (T)	Great Lakes
<u>Lampsilis fasciola</u> , wavy-rayed lamp-mussel (SC)	Great Lakes
<u>Obovaria subrotunda</u> , round hickory nut (T)	Great Lakes
<u>Villosa fabalis</u> , bean villosa (E)	Great Lakes

Ferns and Allies

<u>Botrychium campestre michiganense</u> , dunewort (NL/T)	Open Dunes
<u>Botrychium hesperium</u> , western moonwort (NL/T)	Open Dunes
<u>Lycopodium selago</u> , fir clubmoss (SC)	Bedrock Beach

Flowering Plants

<u>Boltonia asteroides</u> , boltonia (SC)	Great Lakes Marsh
<u>Eclipta alba</u> , yerba-de-tajo (SC)	Great Lakes Marsh
<u>Hibiscus palustris</u> , marsh mallow (SC)	Great Lakes Marsh
<u>Littorella americana</u> , littorella (SC)	Great Lakes Marsh (northern)
<u>Nelumbo lutea</u> , American lotus (T)	Great Lakes Marsh
<u>Rumex maritimus</u> , golden dock (SC)	Great Lakes Marsh (sand shore)
<u>Sagittaria montevidensis</u> , arrowhead (T)	Great Lakes Marsh (Lk. Erie)
<u>Subularia aquatica</u> , awlwort (T)	Great Lakes Marsh (northern)
<u>Zizania aquatica aquatica</u> , wild rice (T)	Great Lakes Marsh
<u>Solidago houghtonii</u> , Houghton's golden-rod (T)	Interdunal Wetland
<u>Listera auriculata</u> , auricled twayblade (SC)	Northern Shrub Swamp
<u>Carex platyphylla</u> , sedge (T)	Mesic Southern Forest
<u>Panax quinquefolius</u> , ginseng (T)	Mesic Southern Forest
<u>Adlumia fungosa</u> , climbing fumitory (SC)	Dry-mesic Southern Forest (openings)
<u>Chimaphila maculata</u> , spotted winter-green (SC)	Dry-mesic Southern Forest, Great Lakes Barrens
<u>Calypso bulbosa</u> , calypso (T)	Boreal Forest
<u>Carex cocinna</u> , low northern sedge (SC)	Boreal Forest
<u>Cypripedium arietinum</u> , ram's head lady-slipper (SC)	Boreal Forest
<u>Empetrum nigrum</u> , black crowberry (T)	Boreal Forest
<u>Iris lacustris</u> , dwarf lake iris (T)	Boreal Forest (Isle Royale)
<u>Lonicera involucrata</u> , honeysuckle (T)	Boreal Forest
<u>Ribes oxycanthoides</u> , wild gooseberry (SC)	Boreal Forest (Isle Royale)
<u>Viburnum edule</u> , squashberry (T)	Great Lakes Barrens, Dry
<u>Pterospora andromedea</u> , pinedrops (T)	Northern Forest

<u>Salix pellita</u> , willow (SC)	Sand Beach, Open Dunes (Lake Superior)
<u>Bromus pumbellianus</u> (T)	Open Dunes
<u>Cirsium pitcheri</u> , Pitcher's thistle (T)	Open Dunes
<u>Elymus glaucus</u> , wild-rye (SC)	Open Dunes
<u>E. mollis</u> , wild-rye (SC)	Open Dunes, Sand Beach
<u>Orobanche fasciculata</u> , broom-rape (T)	Open Dunes
<u>Stellaria longipes</u> , starwort (SC)	Open Dunes
<u>Tanacetum huronense</u> , Lake Huron tansy (T)	Open Dunes
<u>Allium schoenoprasum</u> , wild chives (T)	Bedrock Beach (Isle Royale)
<u>Antennaria rosea</u> , pussytoes (T)	Bedrock Beach (Isle Royale)
<u>Carex atratiformis</u> , sedge (T)	Bedrock Beach (Isle Royale)
<u>C. media</u> , sedge (T)	Bedrock Beach
<u>C. scirpoidea</u> , sedge (T)	Bedrock Beach
<u>Castilleja septentrionalis</u> , Indian paintbrush (T)	Bedrock Beach
<u>Draba arabisans</u> (T)	Bedrock Beach (Isle Royale)
<u>D. incana</u> (T)	Bedrock Beach (Isle Royale)
<u>D. glabella</u> (NL/T)	Bedrock Beach
<u>Euphrasia arctica</u> , eyebright (T)	Bedrock Beach
<u>Pinguicula vulgaris</u> , butterwort (SC)	Bedrock Beach, Cobble Beach
<u>Poa alpina</u> , bluegrass (T)	Bedrock Beach (Isle Royale)
<u>Polygonum viviparum</u> , alpine bistort (T)	Bedrock Beach
<u>Potentilla pensylvanica</u> , cinquefoil (T)	Bedrock Beach (Isle Royale)
<u>Sagina nodosa</u> , pearlwort (T)	Bedrock Beach
<u>Saxifraga aizoon</u> , yellow mountain saxifrage (T)	Bedrock Beach (Isle Royale)
<u>S. tricuspidata</u> , saxifrage (T)	Bedrock Beach (Isle Royale)
<u>Senecio indecorus</u> , ragwort (T)	Bedrock Beach?
<u>Thalictrum venulosum</u> , meadow-rue (T)	Bedrock Beach, Cobble Beach
<u>Tofieldia pusilla</u> , false asphodel (T)	Bedrock Beach (Isle Royale)
<u>Trisetum spicatum</u> , downy oat-grass (SC)	Bedrock Beach

X=extinct; E=endangered; T=threatened; SC=special concern; NL/T=not listed/proposed threatened; P=peripheral

Natural Heritage Scorecard

QCC NUM	EQ RANK	BRANK SRANK	SITE NAME	SITE CODE	EQ RANK COMMENT	PROTECTION COMMENT
**	WOODED DUNE AND SHALE COMPLEX					
001 B			GULLIVER DUNES	SCHO.001	Large size, good buffer and recovery from select. logging.	
002 C			MC DONALD LAKE	SCHO.001		
**	SOLIDAGO HOUGHTONII					
002 A	6163	S3	WAUGOSHANCE POINT			TNC Registry agreement
021 A	6163	S3	STURGEON BAY			N part of tract only prop for dedic.
001 BC	6163	S3	TRAIL'S END BAY			
046 BC	6163	S3	LAKEVIEW ROAD			
020 C	6163	S3	BIG STONE BAY			
**	LYCOPODIUM SP. NOV.					
001 ?	610	S1	#69 COASTAL MARSH		Survey not quantitative.	
**	CHARADRIUS MELODUS					
006	62	S1	STURGEON BAY POINT			
007	62	S1	STURGEON BAY POINT			
011	62	S1	WAUGOSHANCE POINT			The beach was posted "NO DOGS MAY 1 - AUGUST 31" in 1983.
012	62	S1	STURGEON BAY			
013	62	S1	BLISS TOWNSHIP PARK			
014	62	S1	CROSS VILLAGE			
019	62	S1	POINTE AUX CHENES BAY			
021	62	S1	CATHEAD BAY			
022	62	S1	SLEEPING BEAR BAY			
032	62	S1	NORTH MANITOU ISLAND - DIMMICK'S POINT			
**	ISOTRIA MEDEOLITES					
001 D	62	S1	PEPPERIDGE DUNES PLANT PRESERVE			Pop. monitored by W. Schwab shouldn't be visited by others.
**	COASTAL PLAIN MARSH					
006 B	62	S2	ROSS PROPERTY	VAND.003	19 prevalent species, 6 indicators.	Entire area fenced. Ross may give or sell to TNC.
**	INTERDUNAL WETLAND					
017 A	62	S2	BIG SABLE SWALES	MAGO.003		Nordhouse proposed as wilderness dedicate state land.
021 AB	62	S2	SILVER LAKE STATE PARK	OCEA.006	Species diversity is low--not A-rank.	North 15% of wetland lies in ORV area.
001 B	62	S2	HOG ISLAND	CHAR.004	30(32.7 acres), AB(12.1 acres). Tentative ranking.	High potential for wilderness/natural area designation.
002 B	62	S2	MUSKEGON STATE PARK	MUSK.008		The park is registered with The Nature Conservancy.

Natural Heritage Scorecard

DEC NUM	EQ RANK	GFANK	SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
007	B	62	S2	SABATUCK STATE PARK	ALLE.001	Southernmost sizeable example	Most is private. The Nature Conservancy knows Denison.
012	B	62	S2	STURGEON BAY	EMME.006		Most of the ED is not in the Sturgeon Bay Nature Study Area.
014	B	62	S2	PLATTE RIVER POINT	BENZ.003		Designated natural environment in park plan.
018	B	62	S2	POINTE AUX CHENES BAY			New US-2 will destroy west pond new home possible.
013	BC	62	S2	PLATTE BAY	BENZ.004		Designated as potential wilderness in the park plan.
003	C	62	S2	CATHEAD BAY			Recommended by MNAC as Nature Study Area, 1976.
004	C	62	S2	EAGLE HARBOR	KEWE.001		
008	C	62	S2	KITCHEL (NORTH SHORE) DUNES	OTTA.005		
022	C	62	S2	WAUGOSHANCE POINT	EMME.006		West swales contained in Waugoshance Point Nature Study Pr.
006	CD	62	S2	WARREN DUNES	BERR.003	Small area, low species diversity.	South two pannes not in natural area.
** INTERMITTENT WETLAND							
002	B	62	S2	HIDDEN (ARBUTUS) LAKE			Quality rank criteria not fully developed for this type.
** LAKEPLAIN WET-MESIC PRAIRIE							
007	D	62-3	S1-2	GRAND MERE STATE PARK			
** BOTRYCHIUM SP 1							
001		62T1T2	S1S2	SLEEPING BEAR POINT			
002		62T1T2	S1S2	PYRAMID POINT			
003		62T1T2	S1S2	SLEEPING BEAR DUNE			Monitor for visitor damage.
004		62T1T2	S1S2	EMPIRE BLUFFS			
005		62T1T2	S1S2	SOUTH MANITOU ISLAND			Monitor for visitor damage.
006		62T1T2	S1S2	NORTH MANITOU ISLAND			Monitor for visitor damage.
** COBBLE BEACH							
001	A	63	S2-3	WAUGOSHANCE POINT	EMME.006		Most of the occurrence is outside of the dedicated areas.
005	B	63	S2-3	BIRD CAP	WACH.001		Home built adjacent to 1923 acres coming.
004	C	63	S2-3		CHAR.001		Excellent prospect for wilderness/natural area nomination.
** GREAT LAKES BARRIERS							
003	A	63	S2-3	LUDWIGSTON/WOODHOUSE DUNES	MASS.003	Rank needs field confirmation.	Woodhouse proposed as wilderness, RMA dedicate state land.

Natural Heritage Scorecard

CCC NUM RANK	EQ RANK	SRANK	SRANK	SITE NAME	SITE CODE	EQ RANK COMMENT	PROTECTION COMMENT
004 A	63	S2-3		PLATTE BAY	BENZ.004	Large, diverse, little disturbance.	Designated as potential wilderness in park plan.
000 B	63	S2-3		CATHEAD BAY	LEEL.010	Well buffered, non-exemplary (successional?), undisturbed.	Within state park.
002 B	63	S2-3		SILVER LAKE STATE PARK	OCEA.006	Confirm rank in field.	
005 B	63	S2-3		GOOD HARBOR BAY			Designated potential wilderness in park plan.
001 C	63	S2-3		KITCHEL (NORTH SHORE) DUNES	OTTA.005	Not ranked in field.	
** CIRSIUM PITCHERI							
042	63	S3		NORTH FOX ISLAND			
108	63	S3		HIGH ISLAND DUNES			
097 ?	63	S3		HARBERT			
109 ?	63	S3		COVERT AREA			
015 A	63	S3		NAUSOGSHANCE POINT			
017 A	63	S3		SOUTH MANITOU ISLAND			
032 A	63	S3		BIG SABLE POINT			
047 A	63	S3		STURGEON BAY			
005 B	63	S3		PLATTE RIVER POINT--SOUTH			
007 B	63	S3		PLATTE BAY DUNES			
016 B	63	S3		WARREN DUNES STATE PARK		Need better survey of entire open dune area for this species	
028 B	63	S3		EMPIRE BLUFFS			
029 B	63	S3		GOOD HARBOR BAY DUNES			Monitor pedestrian damage restrict if necessary.
033 B	63	S3		POINT BETSIE DUNES			
048 B	63	S3		CATHEAD BAY			Monitor visitor damage.
090 B	63	S3		BREYCOBT DUNES			
050 B?	63	S3		MCCOBT HILL			
123 B?	63	S3		NORTH MANITOU ISLAND			
025 BC	63	S3		HOFFMASTER NATURAL AREA			The park officials are probably aware of the occurrence.
027 BC	63	S3		DRIFTWOOD BEACH			
044 BC	63	S3		NORTH MANITOU ISLAND			
045 BC	63	S3		PYRAMID POINT			
046 BC	63	S3		SULLIVER LAKE DUNES			
052 BC	63	S3		SOUTH MANITOU ISLAND - HARBOR			Closely monitor pedestrian damage.
118 BC	63	S3		EMPIRE BLUFFS		Need quantitative survey to be certain.	
004 C	63	S3		SAUGATUCK DUNES			
011 C	63	S3		CAMP MINIWANDA			
021 C	63	S3		TOWER-TROY PRESERVE			
022 C	63	S3		STURGEON BAY POINT			
030 C	63	S3		METHODIST CHURCH CAMP			Wesver is aware of the ED and interested in protection. Restrict ORV use.
039 C	63	S3		SOUTH ARCADIA BEACH			
051 C	63	S3		HERRING LAKE EMBAYMENT			

Natural Heritage Scorecard

QCC NUM RANK	EQ RANK	GRANK RANK	SITE NAME	SITE CODE	EQ RANK COMMENT	PROTECTION COMMENT
064 C	63	S3	MT. EDWARDS			The site is threatened by sand mining the MDNR is aware.
111 C	63	S3	LAKEVIEW ROAD			
066 C?	63	S3	TRAIL'S END BAY			
112 C?	63	S3	GILLIGAN LAKE			
116 C?	63	S3	LITTLE POINT SABLE			
073 CD	63	S3	MYCAMP CREEK MOUTH			
117 CD	63	S3	PENTWATER	OCEA.009		
122 CD	63	S3	COOPER CREEK DUNES	MASD.004		
008 D	63	S3	KITCHEL (NORTH SHORE) DUNES			
031 D	63	S3	BASS LAKE DUNES			
034 D	63	S3	FRANKFORT BEACH			
115 D	63	S3	ROSY MOUND	OTTA.004		
113 D?	63	S3	MONA SHORES SCHOOL FOREST			
** IRIS LACUSTRIS						
005 ?	63	S3	WAUGOSHANCE POINT			State Park officials are aware of this occurrence.
031 ?	63	S3	WAUGOSHANCE POINT			
002 B	63	S3	TRAIL'S END BAY			
001 B?	63	S3	BIG STONE BAY			
060 C	63	S3	JOHNSON POINT			
008 C?	63	S3	STURGEON BAY TRAIL			
** OPEN DUNES						
007 A	63	S3	LUDINGTON/NORDBOUSE DUNES	MASD.003	These are the best windblown dunes in the state.	Nordhouse proposed as wilderness, RNA dedicate state land.
010 A	63	S3	SLEEPING BEAR DUNES	LEEL.004		Designated an outstanding natural feature in park plan.
011 A	63	S3	SOUTH MANITOU ISLAND		Confirm rank in field.	Designated outstanding natural feature in park master plan.
017 A	63	S3	SOUTH FOX ISLAND	LEEL.011	High diversity, little human disturbance, no exotics.	
004 AB	63	S3	CATHEAD BAY	LEEL.010		East half recommended by MNAC as Nature Study Area, 1976.
027 AB	63	S3	PLATTE RIVER POINT	BENZ.003		Designated a natural environment in park master plan.
006 B	63	S3	HOFFMASTER STATE PARK	MUSK.001	This is the best series of blowouts in the state.	Seven of the nine blowouts are in Hoffmaster Wild Area.
008 B	63	S3	MUSKEGON STATE PARK	MUSK.006		Partly registered with The Nature Conservancy.
009 B	63	S3	EMPIRE BLUFFS	LEEL.002	Foot traf, part stab. moraine, nat. disturb lowers divers.	Designated potential wilderness in park plan.
021 B	63	S3	SAUSSETUCK STATE PARK	ALLE.001		Benson owns south 2/3rds north 1/3rd proposed nat. area.
002 F	63	S3	HIGH ISLAND DUNES	CHAR.001	Isolation/size limits diversity; undisturbed.	High potential for wilderness/nat area designation-proposed.

Natural Heritage Scorecard

OC NUM	ED RANK	BRANK	SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
023	B	63	63	PYRAMID POINT	LEEL.005	B (57 acres, dunes) BC (40 acres, moraine)	Designated potential wilderness in park plan.
029	B	63	63	STURGEON BAY	EMME.004		Site not included in Sturgeon Bay-Sucker Creek NAF.
032	F	63	63	SILVER LAKE STATE PARK	OCEA.006	Confirm rank in field.	Northern 20% lies in ORV area.
033	B	65	63	PLATTE BAY	BENZ.004		Designated as potential wilderness in park plan.
003	BC	63	63	POINT BETSIE	BENZ.002		
012	9C	63	63	WARREN/BRIDGMAN DUNES	BERR.003	Disturbance lowers the rank.	Only one blowout fully within Warren Dunes Nature Study Area Design. Pot. Wilderness and Natural Environment in pk. plan.
024	BC	63	63	GOOD HARBOR BAY			West part included in Waugoshance Point Nature Study Pres.
028	BC	63	63	WAUGOSHANCE POINT	EMME.006		US-2 widening will further disturb site.
030	BC	63	63	POINTE AUX CHENES BAY	NACK.002		
013	C	63	63	GRAND MERE STATE PARK	BERR.006		
014	C	63	63	KITCHEL (NORTHSHORE) DUNES	OTTA.005		
015	C	63	63	STURGEON BAY POINT	EMME.005	Possibly CD due to severity of disturbance.	Since 1976, several submissions for Land Trust Fund purchase
016	C	63	63	TOWER-TROY PRESERVE			
021	C	63	63	ROSY MOUND	OTTA.004		
025	C	63	63	MCCOY HILL	EMME.003		
031	C	63	63	SOUTH BISSBIE LAKE	OCEA.003	Possibly BC rank.	Blowouts are likely homesites, as at next blowout south.
026	CD	63	63	PALMER-WILCOX-GATES PRESERVE		Confirm rank in field.	
** SAND/GRAVEL BEACH							
002	A	63	63	HIGH ISLAND BAY	CHAR.001	Tentative ranking (no criteria) undisturbed.	Potential wilderness/natural area designation.
003	A	63	63	HIGH ISLAND DUNES		Tentative ranking (no criteria) undisturbed.	Potential wilderness/natural area designation.
001	B	63	63	POINTE AUX CHENES BAY	NACK.002	Quality rank criteria not fully developed for this type.	
004	C	63	63	SOUTH FOX ISLAND	LEEL.011	Tentative ranking.	ORV and vehicle damage on state and private land.
** DRY NORTHERN FOREST							
008	C	63-4	62-3	EAGLE HARBOR	KEVE.001	60%-D, 50%-C0	
** DRY-MESIC SOUTHERN FOREST							
011	B	63-4	62-3	HOFFMASTER STATE PARK	MUCK.002		
009	BC	63-4	62-3	GRAND MERE STATE PARK	BERR.003		
010	BC	63-4	62-3	SAUGATUCK STATE PARK	ALLE.002		Less than half within Natural Area Zone, Park Plan.

Natural Heritage Scorecard

OCG NUM	EC RANK	GFANK RANK	SRANK RANK	SITE NAME	SITE CODE	EG RANK COMMENT	PROTECTION COMMENT
009	C	63-4	S2-3	BETHANY BEACH	ZERR.002		
**				GREAT LAKES MARSH			
010	AB	63-4	S3	WAUGOSHANCE POINT	ZNME.006	Localized boat disturbance.	West fraction included in Waugoshance Pt. Natura Study Pres.
**				MESIC SOUTHERN FOREST			
009	B	63-4	S3	BRIDEMAN DUNES	BERR.003		Sand mining destroyed 20 acres in the SE part.
023	BC	63-4	S3	PALISADES WOODS	VANB.009		Registration probably enough.
026	BC	63-4	S3	DYCKMAN WOODS	VANB.013		"Sponsored by Village Garden Club of Detroit"
027	BC	63-4	S3	ROSY MOUND WOODS	OTTA.004		
**				POTAMOGETON HILLII			
008	B	6364	S253	BIG SUCKER CREEK			
**				ARMORACIA AQUATICA			
018	?	6365	S2	MUSKEGON			
**				PSILOCARYA SCIRPOIDES			
016	BC	6365	S2	HIDDEN (ARBUSUS) LAKE			
**				SEUM VERNUM			
004	?	6366	S3	SHALDA CREEK		Specimen identity should be verified.	
**				POLYSONUM CAREYI			
005	CD	64	S1	ROGERS CREEK			
**				SCLERIA RETICULARIS			
003	B	64	S1	ROSS PROPERTY			
**				ADLUMIA FUNGOSA			
008	?	64	S192	GRAND HAVEN			
003	C	64	S192	BRIDGMAN			
**				CAREX SEDRSA			
009	C	64	S2	DARVICKS DUNES NATURE SANCTUARY			
005	BC	64	S2	DYCKMAN SWAMP			Metastatic natural hydrology
**				GRACANOCHE FASCICULATA			
017		64	S2	SOUTH FOX ISLAND			
019		64	S2	HIGH ISLAND DUNES			
013	?	64	S2	ARCADIA SCENIC TURNOUT			
006	A	64	S2	SLEEPING BEAR DUNES			
011	AB	64	S2	SOUTH MANITOW ISLAND			
001	BC	64	S2	POINT BETSIE DUNES			Protect from CB's. Prevent development.

Natural Heritage Scorecard

CCC NUM	ED RANK	SRANK	SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
007	BC	64	S2	GOOD HARBOR BAY DUNES			
018	BC	64	S2	SOUTH ARCADIA BEACH			Restrict ORV access. Groundskeeper aware of ED, interested in Registry.
002	C	64	S2	METHODIST CHURCH CAMP			
008	C	64	S2	BIG SABLE POINT			
011	C	64	S2	PLATTE BAY DUNES			
012	C	64	S2	LUDINGTON STATE PARK			
016	C	64	S2	PYRAMID POINT	LEEL.005		
013	C?	64	S2	SOUTH MANITOU ISLAND - HARBOR			
010	CD	64	S2	GOOD HARBOR BAY DUNES			
** PANAX QUINQUEFOLIUS							
033		64	S2	CASTLE PARK			
030	?	64	S2	OTTAWA BEACH			
070	?	64	S2	GILLIGAN LAKE		The survey was not quantitative.	
035	A	64	S2	PIGEON LAKE			The site is inadvertently protected by difficulty of access.
045	B	64	S2	MT. EDWARDS			The species has been subject to poaching here.
027	C	64	S2	LUTHER-UHL TRACT			
032	C	64	S2	KITCHEL (NORTHSHORE) DUNES			
071	C	64	S2	HOFFMASTER NATURAL AREA			
019	C?	64	S2	SAUSATUCK		No extensive survey was done.	
** TRIPHORA TRIANTHOPHORA							
008	?	64	S2				
** ELSOCHARIS MELANOCARPA							
031	BC	64	S3	ROSS PROPERTY			Stop mowing the area.
** RHYNCHOSPERA MACROSTACHYA							
029	B?	64	S3S4	ARBUTUS (HIDDEN) LAKE			
039	B?	64	S3S4	ROSS PROPERTY			
** BOREAL FOREST							
001	A	64-5	S2-3	NORTH FOX ISLAND	LEEL.012	Mostly uncut with windthrows and natural mortality.	Owner welcomes research to determine protection needs. May be entirely within Waugoshance Point (proposed) NSP.
012	B	64-5	S2-3	WAUGOSHANCE POINT	EMME.006		
010	B	64-5	S2-3	SOUTH FOX ISLAND	LEEL.011	33% mortality, old-growth but small, two stands.	Exceptionally large white cedars here--spared from logging.
004	BC	64-5	S2-3	CAP'S CABIN	EMME.006		West fraction contained in Waugoshance Point NSA.
005	BC	64-5	S2-3	HIGH ISLAND DUNES		Old-growth but poor shape, historically logged buffer on E	Excellent candidate for wilderness/natural area.

Natural Heritage

E C	ED	CCSRANK	SRANK	SITE NAME
I.002	Ed S2-5		S2-3	POINT BETSIE
	Ed 5		S2-3	SOUTH MANITOU ISLAND
K.009				NORTHERN FOREST S3-4 MUSKEGON STATE PARK
				WENIFER SWAMP S3-4 DEVIL'S KITCHEN
* R.004	Tex SWAMP			6493-4 HOB ISLAND
**				CAV FOREST
027	EL.011			SOUTH MANITOU ISLAND
039	EL.012	E ₂ -5		SOUTH FOX ISLAND
008 A		S4-5		NORTH FOX ISLAND
038 B	EL.014	S4-5		SOUTH MANITOU ISLAND
036 BC		S4-5	S4-5	WILLIAMSPOINT
004 C		S4-5	S4-5	CATHEAD BAY
037 C		S4-5	S4-5	POINT BETSIE
**				JUNCUS BRACHYCARPUS
001 ?		6465	S1	
**				BERULA PUSILLA
028 ?		6465	S2	OTTER CREEK
**				BROMUS PUMPELLIANUS
015 ?		6465	S2	NORTHPORT
006 A		6465	S2	STURGEON BAY
007 B		6465	S2	WYCAMB CREEK MOUTH
012 C		6465	S2	NAUGOSHANCE POINT
016 C		6465	S2	MCCURT HILL
020 CD		6465	S2	FRANKIE POINT
**				LYCOPEDIUM APPRESSUM
015 B?		6465	S2	COASTAL MARSH

Natural Heritage Scorecard

SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
BENZ.002	Rank may be lowered with core study. Confirm rank in field.	
MUSK.009		Needs field confirmation.
CHAR.004	Tentative ranking; small, but buffered and undisturbed.	High potential for wilderness/natural area designation.
LEEL.011	Confirm rank in field--C?	
LEEL.012	Essentially presettlement character, excellent diversity.	Owner welcomes research to determine protection needs.
LEEL.014	Small old-growth, adequate buffer, light historic logging?	
MANI.002		East half recommended by MNAD as Nature Study Area, 1976.
LEEL.010	Site will mature to B-rank in 75 years.	
BENZ.002	Needs confirmation in field.	
	1950 record	Stop ORV traffic reduce human foot traffic through dunes. The Michigan DNR is aware of the area's importance.
		Needs protective ownership adjacent areas are residential.
	Survey, not quantitative.	

Natural Heritage Scorecard

DEC NUM	EC RANK	SRANK	SRANK	SITE NAME	SITE CODE	EC RANK COMMENT	PROTECTION COMMENT
012	C?	6465	S2	#7 COASTAL PLAIN MARSH		Survey not quantitative.	
**				TIPULARIA DISCOLOR			
002	BC	6465	S2			Down to 75 from 400-500 plants may be gone here.	Disturbed by motorcycles and trash dumping.
003	D	6465	S2	GRAND MERE STATE PARK			
**				TRIPLASIS PURPUREA			
008	D	6465	S2	GRAND MERE STATE PARK		A disturbed site.	
002	D?	6465	S2	BRIDGMAN		Local in disturbed habitat.	
**				CAREX CONCINNA			
015	?	6465	S3	BIG STONE BAY		1923 record.	
017	C?	6465	S3	TRAIL'S END BAY		No current data.	
020	C?	6465	S3	SLEEPING BEAR POINT		No current data.	
**				MIMULUS GLABRATUS VAR. MICHIGANENSIS			
009		64T12Q	S1	MICHIGAN MONKEY-FLOWER PLANT PRESERVE			
011	B	64T12Q	S1	MANITOU PAYMENT HIGHBANKS			
012	B	64T12Q	S1	BREVORT			
**				CAREX PLATYPHYLLA			
003	B?	65	S1	43RD STREET DUNES			Some plants may lie on the private Grand Mere Preserve.
002	C	65	S1	WAVELAND BEACH			
**				LUDWIGIA SPHAEROCARPA			
001	B	65	S1	GILLIGAN LAKE			Prevent development of lakeshores.
002	BC	65	S1	ROSS PROPERTY			
**				SISYRINCHIUM ATLANTICUM			
005		65	S1	LITTLE BLACK LAKE			
003	?	65	S1	NONA LAKE			
**				FLUDULUS NOTTI			
008		65	S2	COOK NUCLEAR POWER PLANT			
**				JUNCUS SCIRPOIDES			
005	?	65	S2	#4 COASTAL MARSH		Survey not quantitative.	
007	?	65	S2	SARVICKS' DUNES		Survey not quantitative.	
**				LYCOPEDIUM APPRESSUM			
016		65	S2	#6B COASTAL MARSH			
**				MICROTUS SCHROEDASTER			
001		65	S2	BIRCHWOOD BEACH			

Natural Heritage Scorecard

OCC NUM	EO RANK	GRANK SRANK	SITE NAME	SITE CODE	EO RANK COMMENT	PROTECTION COMMENT
** POTAMOGETON PULCHER						
004 ?	65	S2	GRAND MERE LAKES			
** PTEROSFORA ANDROMEDEA						
003 ?	65	S2	STURGEON BAY			
004 ?	65	S2	TRAIL'S END BAY			
024 ?	65	S2	STURGEON BAY-SUCKER CREEK NATURAL AREA PRESERVE			
035 ?	65	S2	PLATTE BAY DUNES			
002 C	65	S2	BIG STONE BAY			
033 C	65	S2	GOOD HARBOR BAY DUNES			
** STELLARIA LONGIPES						
011	65	S2	HIGH ISLAND DUNES	CHAR.001		
003 ?	65	S2	BREVORT LAKE DUNES			
004 ?	65	S2	MANITOU PAYMENT HIGHBANKS			
006 C?	65	S2	POINTE AUX CHENES			
** TRILLIUM RECURVATUM						
012 ?	65	S2	GRAND MERE STATE PARK			
** LEPISOSTEUS OCVLATUS						
007	65	S2-3	MONA LAKE			
** STERNA HIRUNDO						
026	65	S2-3	SAND PRODUCTS HARBOR			Owners should be asked to cooperate - protection agreement?
027	65	S2-3	EPOUFETTE ISLAND			
038	65	S2-3	PHRAGMITES ISLAND(S)			
039	65	S2-3	WAUGHSHANCE POINT ISLAND-NORTH			
** CAMPTOSORUS RHIZOPHYLLUS						
010 C	65	S3	SOUTH MANITOU ISLAND			
** HIBISCUS MOSCHEUTOS						
013 ?	65	S3	GILLIGAN LAKE			
014 ?	65	S3	GRAND MERE STATE PARK			
** PANICUM SPRETUM						
006 ?	65	S3	#6B COASTAL MARSH			
008 AB	65	S3	ROSS PROPERTY			
002 BC	65	S3	HIDDEN (ARSUTUS) LAKE			Complete state ownership of the lake would be desirable.
** PINGUICULA VULGARIS						
008 ?	65	S3	BIG STONE BAY	1925 record not found in 1981.		
013 ?	65	S3	POINTE AUX CHENES			
039 ?	65	S3	BIG STONE BAY	1964 record not found in 1981.		

Natural Heritage Scorecard

QCC NUM	EQ RANK	GRANK	SRANK	SITE NAME	SITE CODE	EQ RANK COMMENT	PROTECTION COMMENT
005 A	85	53		WAUCCHANCE POINT			
** RHEXIA VIRGINICA							
003 ?	85	53		SALBATUSCK			
018 BC	65	53		ROSS PROPERTY			
** ROTALA RAMOSIOR							
019 ?	85	53		NORDHOUSE LAKE			
** SOLIDAGO REMOTA							
034 ?	65	53		#7 COASTAL MARSH			
036 ?	65	53		BARVICKS' DUNES			
029 AB	65	53		ROSS PROPERTY			
037 B	65	53		#4 COASTAL MARSH			
033 B?	65	53		#6A AND #6B COASTAL MARSH			
040 BC	65	53		JACOBS CHAPEL LAKE	BERR.009		
041 BC	65	53		MUD LAKE	VANB.004		
030 CD	65	53		HIDDEN (ARBUSUS) LAKE			
** MICROTUS PINETORUM							
002	65	53-4		COOK NUCLEAR POWER PLANT			
** ZIZANIA AQUATICA VAR. AQUATICA							
012 ?	65	53		LITTLE PIGEON CREEK MARSH			
013 ?	65	53		PORT SHELTON			
** WOODWARDIA AREOLATA							
001	65	5H		SOUTH HAVEN			
** TANACETUM MURENENSE							
087	65T32	53		SOUTH FOX ISLAND			
040 ?	65T32	53				1960 record.	
021 A	65T32	53		STURGEON BAY			
023 A	65T32	53		BIG STONE BAY			
022 B	65T32	53		TRAIL'S END BAY			
030 B	65T32	53		LIGHTHOUSE POINT			
039 B	65T32	53		BREVORT LAKE DUNES			
025 BC	65T32	53		WYCAMB CREEK MOUTH			
045 C	65T32	53		STURGEON BAY POINT			
083 C	65T32	53		CATHEAD BAY			Monitor visitor damage.
** JUNCUS BIFLORUS							
014 ?	65T5	52S3		GRAND MERE STATE PARK			
** ANCOONTA SUEBIBOOSA							
002	65T7	51		MONA LAKE (PTO SLACK LAKE)			
003	65T7	51		BEAR LAKE			
** ARISTIDA NEOSPINA							
005 ?	82	51S2		#42 COASTAL MARSH			

Natural Heritage Scorecard

OC NUM	ED RANK	GRANK SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
006 ?	6?	S1S2	BARVICKS' DUNES			
** FUIRENA SQUARROSA						
015 C?	6?	S2	HIDDEN (ARBUTUS) LAKE			
** SABATIA ANGULARIS						
004 ?	6?	S2	PEPPERIDGE DUNES PLANT PRESERVE			
014 B	6?	S2	GRAND MERE STATE PARK			
** STROPHOSTYLES HELVOLA						
009 ?	6?	S3	MUSKEGON LAKE			
010 ?	6?	S3	PIGEON LAKE			
019 ?	6?	S3	GRAND MERE STATE PARK			

Natural Heritage Scorecard

CC UN RANK	ED RANK	GRANK RANK	SRANK RANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
* WOODED DUNE AND SHALE COMPLEX							
01	B			GULLIVER DUNES	SCHO.001	Large size, good buffer and recovery from select. logging.	
02	C			MC DONALD LAKE	SCHO.001		
* SOLIDAGO HOUGHTONII							
02	A	6163	93	WAUGOSHANCE POINT			
21	A	6163	93	STURGEON BAY			
* LYCOPodium SP. NOV.							
01	?	610	91	#49 COASTAL MARSH		Survey n	
* CHARADRIUS HELODUS							
06		62	91	STURGEON BAY POINT			
07		62	91	STURGEON BAY POINT			
11		62	91	WAUGOSHANCE POINT			
12		62	91	STURGEON BAY			
13		62	91	BLISS TOWNSHIP PARK			
14		62	91	CROSS VILLAGE			
18		62	91	POINTE AUX CHENES BAY			
21		62	91	CATHEAD BAY			
22		62	91	SLEEPING BEAR BAY			
32		62	91	NORTH MANITOU ISLAND - DINNICK'S POINT			
* ISOTRIA MEDEOLOIDES							
01	D	62	91	PEPPERIDGE DUNES PLANT PRESERVE			Pop. monitored by W. Schwab shouldn't be visited by others.
* COASTAL PLAIN MARSH							
06	D	62	92	ROSS PROPERTY	VAND.003	18 prevalent species, 6 indicators.	Entire area fenced. Ross may give or sell to TNC.
* INTERDUNAL WETLAND							
17	A	62	92	BIG SABLE SWALES	NASO.003		Nordhouse proposed as wilderness dedicate state land.
21	AB	62	92	SILVER LAKE STATE PARK	OCEA.006	Species diversity is low--not A-rank.	North 15% of wetland lies in ORV area.
01	B	62	92	HOG ISLAND	CHAR.004	BC(32.7 acres), AB(12.1 acres). Tentative ranking.	High potential for wilderness/natural area designation.
02	B	62	92	KUSKEGON STATE PARK	KUSK.009		The park is registered with The Nature Conservancy.

Original
Scorecard

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Natural Heritage Scorecard

CC UH RANK	EO RANK	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK COMMENT	PROTECTION COMMENT
07	D	G2	S2	SAUGATUCK STATE PARK	ALLE.001	Southernmost sizeable example	Most is private. The Nature Conservancy knows Denison.
12	B	G2	S2	STURGEON BAY	EMME.006		Most of the EO is not in the Sturgeon Bay Nature Study Area.
14	B	G2	S2	PLATTE RIVER POINT	BENZ.003		Designated natural environment in park plan.
18	B	G2	S2	POINTE AUX CHENES BAY			New US-2 will destroy west pond new home possible.
13	DC	G2	S2	PLATTE BAY	BENZ.004		Designated as potential wilderness in the park plan.
03	C	G2	S2	CATHEAD BAY			Recommended by MNAC as Nature Study Area, 1976.
04	C	G2	S2	EAGLE HARBOR	KEME.001		
08	C	G2	S2	KITCHEL (NORTH SHORE) DUNES	OTTA.005		
22	C	G2	S2	HAUGOSHANCE POINT	EMME.006		West swales contained in Haugoshance Point Nature Study Pr.
06	CD	G2	S2	WARREN DUNES	BERR.003	Small area, low species diversity.	South two pannes not in natural area.
* INTERMITTENT WETLAND							
02	B	G2	S2	HIDDEN (ARBUTUS) LAKE		Quality rank criteria not fully developed for this type.	
* LAKEPLAIN WET-MESIC PRAIRIE							
07	D	G2-3	S1-2	GRAND MERE STATE PARK			
* BOTRYCHIUM SP 1							
01		G2T1T2	S1S2	SLEEPING BEAR POINT			
02		G2T1T2	S1S2	PYRAMID POINT			
03		G2T1T2	S1S2	SLEEPING BEAR DUNE			Monitor for visitor damage.
04		G2T1T2	S1S2	EMPIRE BLUFFS			
05		G2T1T2	S1S2	SOUTH MANITOU ISLAND			Monitor for visitor damage.
06		G2T1T2	S1S2	NORTH MANITOU ISLAND			Monitor for visitor damage.
* CORBLE BEACH							
01	A	G3	S2-3	HAUGOSHANCE POINT	EMME.006		Most of the occurrence is outside of the dedicated areas.
05	B	G3	S2-3	GROS CAP	HACK.001		Home built adjacent in 1985 more coming.
04	C	G3	S2-3		CHAR.001		Excellent prospect for wilderness/natural area nomination.
* GREAT LAKES BARRENS							
03	A	G3	S2-3	LUDINGTON/NORDHOUSE DUNES	MASO.003	Rank needs field confirmation.	Nordhouse proposed as wilderness, RNA dedicate state land.

Natural Heritage Scorecard

CC UN	EO RANK	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK COMMENT	PROTECTION COMMENT
94	A	63	S2-3	PLATTE BAY	BENZ.004	Large, diverse, little disturbance.	Designated as potential wilderness in park plan.
90	B	63	S2-3	CATHEAD BAY	LEEL.010	Well buffered, non-exemplary (successional?), undisturbed.	Within state park.
92	B	63	S2-3	SILVER LAKE STATE PARK	OCEA.006	Confirm rank in field.	
95	B	63	S2-3	GOOD HARBOR BAY			Designated potential wilderness in park plan.
91	C	63	S2-3	KITCHEL (NORTH SHORE) DUNES	OTTA.005	Not ranked in field.	
* CIRSIUM PITCHERI							
92		63	S3	NORTH FOX ISLAND			
98		63	S3	HIGH ISLAND DUNES			
97	?	63	S3	HARBERT			
99	?	63	S3	COVERT AREA			
15	A	63	S3	NAUGOSHANCE POINT			
17	A	63	S3	SOUTH MANITOU ISLAND			
32	A	63	S3	BIG SABLE POINT			
47	A	63	S3	STURGEON BAY			
95	B	63	S3	PLATTE RIVER POINT--SOUTH			
97	B	63	S3	PLATTE BAY DUNES			
16	B	63	S3	WARREN DUNES STATE PARK		Need better survey of entire open dune area for this species	
28	B	63	S3	EMPIRE BLUFFS			
29	B	63	S3	GOOD HARBOR BAY DUNES			Monitor pedestrian damage restrict if necessary.
33	B	63	S3	POINT BETSIE DUNES			
48	B	63	S3	CATHEAD BAY			Monitor visitor damage.
90	B	63	S3	BREVORT DUNES			
50	B?	63	S3	MCCORT HILL			
23	B?	63	S3	NORTH MANITOU ISLAND			
25	BC	63	S3	HOFFMASTER NATURAL AREA			The park officials are probably aware of the occurrence.
27	BC	63	S3	DRIFTHOOD BEACH			
44	BC	63	S3	NORTH MANITOU ISLAND			
45	BC	63	S3	PYRAMID POINT			
46	BC	63	S3	BULLIVER LAKE DUNES			
32	BC	63	S3	SOUTH MANITOU ISLAND - HARBOR			Closely monitor pedestrian damage.
18	BC	63	S3	EMPIRE BLUFFS		Need quantitative survey to be certain.	
94	C	63	S3	SAUGATUCK DUNES			
11	C	63	S3	CAMP KINIWANCA			
21	C	63	S3	TOWER-TROY PRESERVE			
32	C	63	S3	STURGEON BAY POINT			
30	C	63	S3	METHODIST CHURCH CAMP			Weaver is aware of the EO and interested in protection. Restrict ORV use.
39	C	63	S3	SOUTH ARCADIA BEACH			
51	C	63	S3	HERRING LAKE ENBAYMENT			

Natural Heritage Scorecard

DC UN RANK	ED RANK	CRANK	SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
44 C	63		S3	MT. EDWARDS			The site is threatened by sand mining the MDNR is aware.
11 C	63		S3	LAKEVIEW ROAD			
66 C?	63		S3	TRAIL'S END BAY			
12 C?	63		S3	GILLIGAN LAKE			
16 C?	63		S3	LITTLE POINT SABLE			
73 CD	63		S3	WYCARP CREEK MOUTH			
17 CD	63		S3	PENTWATER	OCEA.009		
22 CD	63		S3	COOPER CREEK DUNES	HASD.004		
09 D	63		S3	KITCHEL (NORTH SHORE) DUNES			
31 D	63		S3	BASS LAKE DUNES			
34 D	63		S3	FRANKFORT BEACH			
15 D	63		S3	ROSY MOUND	OTTA.004		
13 D?	63		S3	NONA SHORES SCHOOL FOREST			
* IRIS LACUSTRIS							
05 ?	63		S3	WANGOSHANCE POINT			State Park officials are aware of this occurrence.
31 ?	63		S3	WANGOSHANCE POINT			
02 B	63		S3	TRAIL'S END BAY			
01 B?	63		S3	BIG STONE BAY			
50 C	63		S3	JOHNSON POINT			
06 C?	63		S3	STURGEON BAY TRAIL			
* OPEN DUNES							
07 A	63		S3	LUDINGTON/NORDHOUSE DUNES	HASD.003	These are the best windblown dunes in the state.	Nordhouse proposed as wilderness, RRA dedicate state land.
10 A	63		S3	SLEEPING BEAR DUNES	LEEL.004		Designated an outstanding natural feature in park plan.
11 A	63		S3	SOUTH MANITOU ISLAND		Confirm rank in field.	Designated outstanding natural feature in park master plan.
17 A	63		S3	SOUTH FOX ISLAND	LEEL.011	High diversity, little human disturbance, no exotics.	
04 AB	63		S3	CATHEAD BAY	LEEL.010		East half recommended by MNAC as Nature Study Area, 1976.
27 AB	63		S3	PLATTE RIVER POINT	BENZ.003		Designated a natural environment in park master plan.
06 B	63		S3	HOFFMASTER STATE PARK	MUSK.001	This is the best series of blowouts in the state.	Seven of the nine blowouts are in Hoffmaster Wild Area.
08 B	63		S3	MUSKEGON STATE PARK	MUSK.008		Partly registered with The Nature Conservancy.
09 B	63		S3	EMPIRE BLUFFS	LEEL.002	Foot traf, part stab. moraine, nat. disturb lowers divers.	Designated potential wilderness in park plan.
20 B	63		S3	SAUGATUCK STATE PARK	ALLE.001		Denison owns south 2/3rds north 1/3rd proposed nat. area.
22 B	63		S3	HIGH ISLAND DUNES	CHAR.001	Isolation/size limits diversity undisturbed.	High potential for wilderness/nat area designation-proposed

Natural Heritage Scorecard

DC OR OR OR	ED OR OR OR	SRANK OR OR OR	SRANK OR OR OR	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
23	B	63	63	PYRAMID POINT	LEEL.005	B (57 acres, dunes) BC (40 acres, moraine)	Designated potential wilderness in park plan.
29	B	63	63	STURGEON BAY	EMHE.006		Site not included in Sturgeon Bay-Sucker Creek NAP.
32	B	63	63	SILVER LAKE STATE PARK	OCEA.006	Confirm rank in field.	Northern 20% lies in ORV area.
33	B	63	63	PLATTE BAY	BENZ.004		Designated as potential wilderness in park plan.
03	BC	63	63	POINT BETSIE	BENZ.002		
12	BC	63	63	WARREN/BRIDGMAN DUNES	BERR.003	Disturbance lowers the rank.	Only one blowout fully within Warren Dunes Nature Study Area Design. Pot. Wilderness and Natural Environment in pk. plan.
74	BC	63	63	GOOD HARBOR BAY			West part included in Naugoshance Point Nature Study Pres.
28	BC	63	63	NAUGOSHANCE POINT	EMHE.006		US-2 widening will further disturb site.
30	BC	63	63	POINTE AUX CHENES BAY	HACK.002		
13	C	63	63	GRAND MERE STATE PARK	BERR.006		
14	C	63	63	KITCHEL (NORTHSHORE) DUNES	OTTA.005		
15	C	63	63	STURGEON BAY POINT	EMHE.005	Possibly CD due to severity of disturbance.	Since 1976, several submissions for Land Trust Fund purchase
16	C	63	63	TONER-TROY PRESERVE			
21	C	63	63	ROSY MOUND	OTTA.004		
25	C	63	63	KCCORT HILL	EMHE.003		
31	C	63	63	SOUTH BISSBIE LAKE	OCEA.003	Possibly BC rank.	Blowouts are likely homesites, as at next blowout south.
26	CD	63	63	PALKER-WILCOX-BATES PRESERVE		Confirm rank in field.	
4 SAND/GRAVEL BEACH							
02	A	63	63	HIGH ISLAND BAY	CHAR.001	Tentative ranking (no criteria) undisturbed.	Potential wilderness/natural area designation.
03	A	63	63	HIGH ISLAND DUNES		Tentative ranking (no criteria) undisturbed.	Potential wilderness/natural area designation.
01	B	63	63	POINTE AUX CHENES BAY	HACK.002	Quality rank criteria not fully developed for this type.	
04	C	63	63	SOUTH FOX ISLAND	LEEL.011	Tentative ranking.	ORV and vehicle damage on state and private land.
4 DRY NORTHERN FOREST							
08	C	63-4	62-3	EAGLE HARBOR	KENE.001	50%=C, 50%=CD	
4 DRY-MESIC SOUTHERN FOREST							
11	B	63-4	62-3	HOFFMASTER STATE PARK	MUSK.002		
09	BC	63-4	62-3	GRAND MERE STATE PARK	BERR.006		
10	BC	63-4	62-3	SAUSATUCK STATE PARK	ALLE.002		Less than half within Natural Area Zone, Park Plan.

Natural Heritage Scorecard

CC	EO	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK	PROTECTION
UN	RANK					COMMENT	COMMENT
08	C	63-4	62-3	BETHANY BEACH	BERR.002		
* GREAT LAKES MARSH							
10	AB	63-4	63	WAUGOSHANCE POINT	EMHE.006	Localized boat disturbance.	West fraction included in Waugoshance Pt. Nature Study Pres.
* MEGIC SOUTHERN FOREST							
09	B	63-4	63	BRIDGMAN DUNES	BERR.003		Sand mining destroyed 20 acres in the SE part.
23	BC	63-4	63	PALISADES WOODS	VAND.009		Registration probably enough.
26	BC	63-4	63	DYCKMAN WOODS	VAND.013		"Sponsored by Village Garden Club of Detroit"
27	BC	63-4	63	ROSY MOUND WOODS	OTTA.004		
* POTAMOGETON HILLII							
00	B	6364	6263	BIG SUCKER CREEK			
* ARMORACIA AQUATICA							
18	?	6365	62	MUSKEGON			
* PSILOCARYA SCIRPOIDES							
16	BC	6365	62	HIDDEN (ARBUTUS) LAKE			
* GEUM VERNUM							
04	?	6365	63	SHALDA CREEK		Specimen identity should be verified.	
* POLYGONUM CAREYI							
05	CD	64	61	ROGERS CREEK			
* SELERIA RETICULARIS							
03	B	64	61	ROSS PROPERTY			
* ADLUMIA FUNGOSA							
06	?	64	6162	GRAND HAVEN			
03	C	64	6162	BRIDGMAN			
* CAREX SEORSA							
08	?	64	62	BARVICKS DUNES NATURE SANCTUARY			
09	BC	64	62	DYCKMAN SWAMP			Maintain natural hydrology
* OROBANCHE FASCICULATA							
17		64	62	SOUTH FOX ISLAND			
19		64	62	HIGH ISLAND DUNES			
15	?	64	62	ARCADIA SCENIC TURNOUT			
06	A	64	62	SLEEPING BEAR DUNES			
14	AB	64	62	SOUTH MANITOU ISLAND			
01	BC	64	62	POINT BETSIE DUNES			Protect from ORVs. Prevent development.

Natural Heritage Scorecard

DC JK RANK	EO RANK	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK COMMENT	PROTECTION COMMENT
07	BC	G4	S2	GOOD HARBOR BAY DUNES			
18	BC	G4	S2	SOUTH ARCADIA BEACH			Restrict ORV access. Groundskeeper aware of EO, interested in Registry.
02	C	G4	S2	METHODIST CHURCH CAMP			
08	C	G4	S2	DIG SABLE POINT			
11	C	G4	S2	PLATTE BAY DUNES			
12	C	G4	S2	LUDINGTON STATE PARK			
16	C	G4	S2	PYRAMID POINT	LEEL.005		
13	C?	G4	S2	SOUTH MANITOU ISLAND - HARBOR			
10	CD	G4	S2	GOOD HARBOR BAY DUNES			
* PARAX QUINQUEFOLIUS							
33		G4	S2	CASTLE PARK			
10	?	G4	S2	OTTAWA BEACH			
10	?	G4	S2	GILLIGAN LAKE		The survey was not quantitative.	
35	A	G4	S2	PIGEON LAKE			The site is inadvertently protected by difficulty of access.
45	B	G4	S2	MT. EDWARDS			The species has been subject to poaching here.
27	C	G4	S2	LUTHER-UHL TRACT			
32	C	G4	S2	KITCHEL (NORTHSHORE) DUNES			
71	C	G4	S2	HOFFMASTER NATURAL AREA			
18	C?	G4	S2	SAUBATUCK		No extensive survey was done.	
* TRIPHORA TRIANTHOPHORA							
08	?	G4	S2				
* ELEOCHARIS MELANOCARPA							
31	BC	G4	S3	ROSS PROPERTY			Stop mowing the area.
* RHYNCHOSPORA MACROSTACHYA							
29	B?	G4	S3S4	ARBUTUS (HIDDEN) LAKE			
38	B?	G4	S3S4	ROSS PROPERTY			
* BOREAL FOREST							
01	A	G4-5	S2-3	NORTH FOX ISLAND	LEEL.012	Mostly uncut with windthrows and natural mortality.	Owner welcomes research to determine protection needs.
12	B	G4-5	S2-3	KAUGOSHANCE POINT	EMME.006		May be entirely within Waugoshance Point (proposed) NSP.
13	B	G4-5	S2-3	SOUTH FOX ISLAND	LEEL.011	33% mortality, old-growth but small, two stands.	Exceptionally large white cedars here--spared from logging.
14	BC	G4-5	S2-3	CAP'S CABIN	EMME.006		West fraction contained in Waugoshance Point NSA.
15	BC	G4-5	S2-3	HIGH ISLAND DUNES		Old-growth but poor shape, historically logged buffer on E	Excellent candidate for wilderness/natural area.

Natural Heritage Scorecard

CC	ED	GRANK	SRANK	SITE NAME	SITE CODE	ED RANK COMMENT	PROTECTION COMMENT
02	C	64-5	S2-3	POINT BETSIE	BENZ.002	Rank may be lowered with core study.	
03	C	64-5	S2-3	SOUTH MANITOU ISLAND		Confirm rank in field.	
* DRY-MESIC NORTHERN FOREST							
16	C	64-5	S3-4	MUSKOGON STATE PARK	MUSK.009		
* HARDWOOD-CONIFER SWAMP							
25	C	64-5	S3-4	DEVIL'S KITCHEN		Needs field confirmation.	
* RICH CONIFER SWAMP							
03	B	64-5	S3-4	HOG ISLAND	CHAR.004	Tentative ranking: small, but buffered and undisturbed.	High potential for wilderness/natural area designation.
* MESIC NORTHERN FOREST							
27		64-5	S4-5	SOUTH MANITOU ISLAND		Confirm rank in field--C?	
39		64-5	S4-5	SOUTH FOX ISLAND	LEEL.011		
06	A	64-5	S4-5	NORTH FOX ISLAND	LEEL.012	Essentially presettlement character, excellent diversity.	Owner welcomes research to determine protection needs.
38	B	64-5	S4-5	SOUTH MANITOU ISLAND	LEEL.014	Small old-growth, adequate buffer, light historic logging?	
36	BC	64-5	S4-5	WILLIAMSPORT	MANI.002		
04	C	64-5	S4-5	CATHEAD BAY	LEEL.010	Site will mature to B-rank in 75 years.	East half recommended by MNAC as Nature Study Area, 1976.
37	C	64-5	S4-5	POINT BETSIE	BENZ.002	Needs confirmation in field.	
* JUNCUS BRACHYCARPUS							
01	?	6465	S1				
* BERULA PUSILLA							
28	?	6465	S2	OTTER CREEK			
* BRONNUS PUMPELLIANUS							
15	?	6465	S2	NORTHPORT		1950 record	
06	A	6465	S2	STURGEON BAY			Stop ORV traffic reduce human foot traffic through dunes.
07	B	6465	S2	HYCAMP CREEK MOUTH			The Michigan DNR is aware of the area's importance.
12	C	6465	S2	WAUGOSHANCE POINT			
14	C	6465	S2	MCCORT HILL			Needs protective ownership adjacent areas are residential.
10	CD	6465	S2	PYRAMID POINT			
* LYCOPODIUM APPRESSUM							
15	B?	6465	S2	#4 COASTAL MARSH		Survey not quantitative.	

Natural Heritage Scorecard

CC	EO	SRANK	SRANK	SITE NAME	SITE CODE	EO RANK	PROTECTION
UM	RANK					COMMENT	COMMENT
12	C?	6465	S2	#7 COASTAL PLAIN MARSH			Survey not quantitative.
* TIPULARIA DISCOLOR							
02	BC	6465	S2				Down to 75 from 400-500 plants may be gone here.
03	D	6465	S2	GRAND MERE STATE PARK			Disturbed by motorcycles and trash dumping.
* TRIPLASIS PURPUREA							
08	D	6465	S2	GRAND MERE STATE PARK			A disturbed site.
02	D?	6465	S2	BRIDGMAN			Local in disturbed habitat.
* CAREX CONCINNA							
15	?	6465	S3	BIG STONE BAY			1923 record.
17	C?	6465	S3	TRAIL'S END BAY			No current data.
20	C?	6465	S3	SLEEPING BEAR POINT			No current data.
* NIMULUS GLABRATUS VAR. MICHIGANENSIS							
09		64120	S1	MICHIGAN MONKEY-FLOWER PLANT PRESERVE			
11	B	64120	S1	MARITOU PAYMENT HIGHBANKS			
12	B	64120	S1	BREVORT			
* CAREX PLATYPHYLLA							
03	B?	65	S1	43RD STREET DUNES			
02	C	65	S1	WAVERLAND BEACH			Some plants may lie on the private Grand Mere Preserve.
* LUDWIGIA SPHAEROCARPA							
01	B	65	S1	GILLIGAN LAKE			Prevent development of lakeshores.
02	BC	65	S1	ROSS PROPERTY			
* SISYRINCHIUM ATLANTICUM							
05		65	S1	LITTLE BLACK LAKE			
03	?	65	S1	HONA LAKE			
* FUNDULUS NOTTI							
08		65	S2	COOK NUCLEAR POWER PLANT			
* JUNCUS SCIRPOIDES							
05	?	65	S2	#4 COASTAL MARSH			Survey not quantitative.
07	?	65	S2	BARVICKS' DUNES			Survey not quantitative.
* LYCOPODIUM APPRESSUM							
16		65	S2	#66 COASTAL MARSH			
* MICROTUS OCHROGASTER							
01		65	S2	BIRCHWOOD BEACH			

Natural Heritage Scorecard

CC	EO	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK	PROTECTION
UM	RANK					COMMENT	COMMENT
* POTAMOGETON PULCHER							
04 ?	G5	S2		GRAND MERE LAKES			
* PTEROSPORA ANDROMEDEA							
03 ?	G5	S2		STURGEON BAY			
04 ?	G5	S2		TRAIL'S END BAY			
04 ?	G5	S2		STURGEON BAY-SUCKER CREEK			
				NATURAL AREA PRESERVE			
05 ?	G5	S2		PLATTE BAY DUNES			
02 C	G5	S2		BIG STONE BAY			
03 C	G5	S2		GOOD HARBOR BAY DUNES			
* STELLARIA LONGIPES							
11	G5	S2		HIGH ISLAND DUNES	CHAR.001		
03 ?	G5	S2		BREVORT LAKE DUNES			
04 ?	G5	S2		KANITOU PAYMENT Highbanks			
06 C?	G5	S2		POINTE AUX CHENES			
* TRILLIUM RECURVATUM							
12 ?	G5	S2		GRAND MERE STATE PARK			
* LEPISOSTEUS OCVLATUS							
07	G5	S2-3		KONA LAKE			
* STERNA HIRUNDO							
26	G5	S2-3		SAND PRODUCTS HARBOR			Owners should be asked to cooperate - protection agreement?
27	G5	S2-3		EPOUFETTE ISLAND			
30	G5	S2-3		PHRAGMITES ISLAND(S)			
39	G5	S2-3		WAUGOSHANCE POINT ISLAND-NORTH			
* CAMPTOSORUS RHIZOPHYLLUS							
10 C	G5	S3		SOUTH MANITOU ISLAND			
* HIBISCUS MOSCHEUTOS							
13 ?	G5	S3		GILLIGAN LAKE			
14 ?	G5	S3		GRAND MERE STATE PARK			
* PANICUM SPRETUM							
06 ?	G5	S3		#48 COASTAL MARSH			
05 AB	G5	S3		ROSS PROPERTY			
02 BC	G5	S3		HIDDEN (ARRUTUS) LAKE			Complete state ownership of the lake would be desirable.
* PINGUICULA VULGARIS							
08 ?	G5	S3		BIG STONE BAY		1925 record not found in 1981.	
13 ?	G5	S3		POINTE AUX CHENES			
09 ?	G5	S3		BIG STONE BAY		1966 record not found in 1981.	

Natural Heritage Scorecard

CC	EO	GRANK	SRANK	SITE NAME	SITE CODE	EO RANK	PROTECTION
JK	RANK					COMMENT	COMMENT
05	A	65	93	WAUGOSHANCE POINT			
* RHEXIA VIRGINICA							
03	?	65	93	SAUBATUCK			
18	BC	65	93	ROSS PROPERTY			
* ROTALA RANOSIOR							
19	?	65	93	NORDHOUSE LAKE			
* SOLIDAGO REMOTA							
34	?	65	93	#7 COASTAL MARSH			
36	?	65	93	BARVICKS' DUNES			
39	AB	65	93	ROSS PROPERTY			
37	B	65	93	#4 COASTAL MARSH			
33	B?	65	93	#6A AND #6B COASTAL MARSH			
40	BC	65	93	JACOBS CHAPEL LAKE	BERR.009		
41	BC	65	93	MUD LAKE	VANB.004		
30	CD	65	93	HIDDEN (ARBUTUS) LAKE			
* MICROTUS PINETORUM							
02		65	93-4	COOK NUCLEAR POWER PLANT			
* ZIZANIA AQUATICA VAR. AQUATICA							
12	?	65	9?	LITTLE PIGEON CREEK MARSH			
13	?	65	9?	PORT SHELDON			
* WOODWARDIA AREOLATA							
01		65	SH	SOUTH HAVEN			
* TANACETUM HURONENSE							
37		65T30	93	SOUTH FOX ISLAND			
40	?	65T30	93			1960 record.	
21	A	65T30	93	STURGEON BAY			
23	A	65T30	93	BIG STONE BAY			
22	B	65T30	93	TRAIL'S END BAY			
30	B	65T30	93	LIGHTHOUSE POINT			
39	B	65T30	93	BREVORT LAKE DUNES			
25	BC	65T30	93	WYCAMF CREEK MOUTH			
65	C	65T30	93	STURGEON BAY POINT			
33	C	65T30	93	CATHEAD BAY			Monitor visitor damage.
* JUNCUS BIFLORUS							
14	?	65T5	9253	GRAND NERE STATE PARK			
* ANODONTA SUBGIBBOSA							
02		65T?	91	KONA LAKE (BIG BLACK LAKE)			
03		65T?	91	BEAR LAKE			
* ARISTIDA NEOPINA							
05	?	6?	9192	#6B COASTAL MARSH			

Natural Heritage Scorecard

IC	ED	GRANK	SRANK	SITE NAME	SITE CODE	EQ RANK	PROTECTION
IN	RANK					COMMENT	COMMENT
16	?	6?	S1S2	BARVICKS' DUNES			
* FUIGERA SCARROSA							
15	6?	6?	S2	HIDDEN (ARBUTUS) LAKE			
* SABATIA ANGULARIS							
14	?	6?	S2	PEPPERIDGE DUNES PLANT PRESERVE			
14	B	6?	S2	GRAND MERE STATE PARK			
* STROPHOSTYLES HELVOLA							
17	?	6?	S3	HUSKEGOR LAKE			
10	?	6?	S3	PIGEON LAKE			
19	?	6?	S3	GRAND MERE STATE PARK			