FINAL REPORT ON THE NATURAL AREA INVENTORY OF THE MANISTEE NATIONAL FOREST

(Lake, Manistee, Mason, Mecosta, Montcalm, Muskegon, Newaygo, Oceana, and Wexford Counties)

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by

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ABSTRACT

In 1987, the Michigan Natural Features Inventory initiated a multi-year Natural Areas Inventory of the Huron-Manistee National Forest (HMNF) under a cooperative agreement between the Wildlife Division, Michigan Department of Natural Resources and the HMNF. The initial survey of all counties within the Manistee National Forest was completed during 1990. The purpose of this inventory was to systematically survey the entire land surface of the HMNF to locate and to evaluate all remaining tracts of high quality and relatively undisturbed native vegetation. This document contains the results of the surveys on the Manistee National Forest and resulting recommendations for management of natural areas found during the surveys. Recommendations for continuation of special plant and animal surveys are also presented.

While human land uses have altered much of the native landscape within the Manistee National Forest, this study demonstrates that remnant natural areas continue to exist and that most lack conscious protection of their natural feature values. Conservation of the best examples identified of the remaining natural communities and their native plant and animal populations can ensure maintenance of the Manistee National Forest's diverse natural heritage. To foster such action, specific conservation actions have been suggested for sites that were identified as being clearly in need of protection. The suggested actions, or other equally protective measures, will help insure the preservation of the biological diversity of the forest for future generations.

INTRODUCTION AND OVERVIEW

A Regional Landscape Ecosystem Classification was developed for Michigan by Albert, et al. (1986). Within this ecosystem classification, Manistee National Forest lands occupy Subdistrict 8.2, District 9, and District 10 (Figure 1 (modified) and Table 1, from Albert, et al. 1986). The majority of the Manistee National Forest's lands fall within District 9, the Newaygo District, which is characterized by flat, dry, sandy outwash plain. A much lower percentage of the Forest's land occupies the sandy moraine ridges of Subdistrict 8.1 (Cadillac Subdistrict) and the sandy lacustrine and morainal deposits of District 10 (Manistee District).

8.2: Cadillac Subdistrict. The district is characterized by large, sandy end-moraine ridges. These ridges are typically well drained, but small bogs are common in ice-block kettles between or on the moraines. Outwash channels separate large blocks of end moraine; portions of these channels are excessively drained, whereas others are poorly drained and support large wetlands.

Original vegetation: On the moraines, the characteristic Mesic Northern Forests were dominated by American beech, sugar maple, basswood, yellow birch, and eastern hemlock. White pine and red oak were also common. Bogs were occasionally found in small kettle depressions on the moraines, but many of these depressions were well drained and supported hardwood forests.

Dry portions of the outwash plains within the district supported Barrens, typically dominated by jack pine and northern pin oak. Outwash deposits were much less extensive in this district than further to the west.

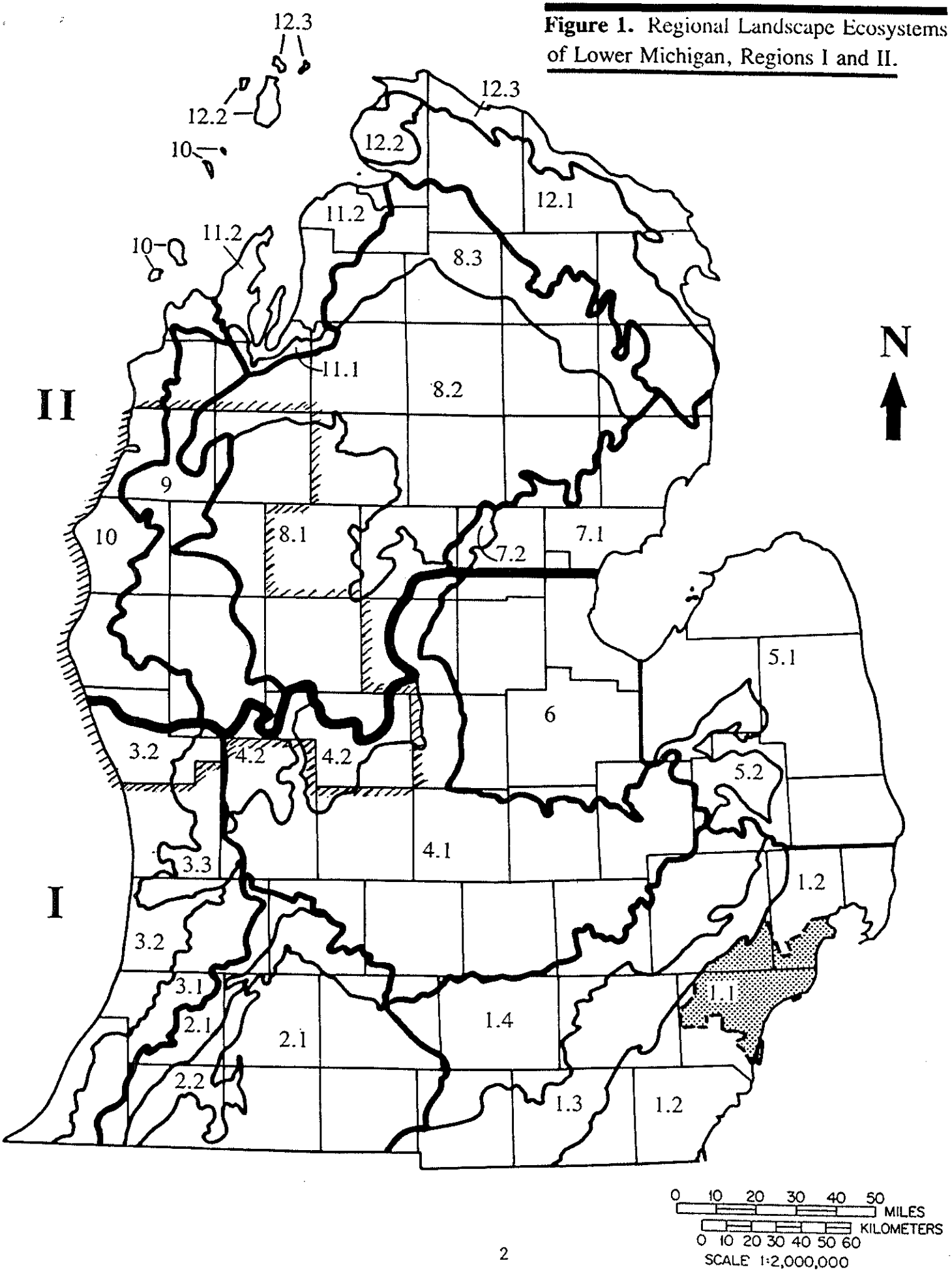

Figure 1. Regional Landscape Ecosystems of Lower Michigan, Regions I and II.

Table 1. Regional Landscape Ecosystems of Lower Michigan, Regions I and II.

No.	District	Subdistrict	Site Condition	Area Sq Mi (km^2)
Region 1: Southern Lower Michigan				
1.1	Washtenaw	Detroit	Heat island	
1.2		Maumee	Lake plain	2300 (5960)
1.3		Ann Arbor	Fine and medium-textured moraine	1635 (4235)
1.4		Jackson	Interlobate; coarse-textured end moraine, outwash, and ice-contact typography	2060 (5335)
2.1	Kalamazoo	Battle Creek	Outwash and ground moraine	2770 (7175)
2.2		Cassopolis	Coarse-textured and end moraine and ice-contact terrain	720 (1865)
3.1	Allegan	Berrien Springs	End and ground moraine	760 (1970)
3.2		Benton Harbor	Lake plain	1355 (3510)
3.3		Jamestown	Fine-textured end and ground moraine	490 (1270)
4.1	Ionia	Lansing	Medium-textured ground moraine	4810 (12460)
4.2		Greenville	Coarse-textured end and ground moraine	760 (1970)
5.1	Huron	Sandusky	Lake plain	3210 (8319)
5.2		Lum	Medium and coarse-textured end-moraine ridges and outwash	480 (1245)
6.1	Saginaw		Lake plain	2390 (6190)
Region II: Northern Lower Michigan				
7.1	Arenac	Standish	Lake plain	1295 (3355)
7.2		Wiggins Lake	Fine-textured end and ground moraine	110 (285)
8.1	Highplains	Cadillac	Coarse-textured end moraine	2860 (7405)
8.2		Grayling	Outwash	4085 (10580)
8.3		Vanderbilt	Steep end- and ground-moraine ridges	1505 (3900)
9	Newaygo		Outwash	1920 (4975)
10	Manistee		End moraine and sand lake plain	1480 (3835)
11.1	Leelanau	Williamsburg	Coarse-textured end-moraine ridges	100 (260)
11.2		Traverse City	Coarse-textured drumlin fields on ground moraine	750 (1940)
12.1	Presque Isle	Onaway	Drumlin fields on coarse-textured ground moraine	1845 (4780)
12.2		Stutsmanville	Steep and ridges	270 (700)
12.3		Cheboygan	Lake plain	835 (2165)

Within the district wetlands were concentrated on the outwash plains, where swamp forest and bogs were sometimes quite extensive in area. Bogs typically occupied kettle depressions in pitted outwash plains. Conifer-dominated swamp forests often surrounded the bogs.

Vegetation responses to logging: Following logging, hemlock and white pine regeneration was generally poor within the Mesic Northern Forest. No mesic northern forests with good hemlock and white pine regeneration were encountered during the survey; **any stands with good regeneration of these species should be considered for Special Interest Areas.**

Bogs occupying kettle depressions on the end moraine were not generally greatly impacted by logging of the upland forests. Most of these small bogs contained little or no harvestable timber. There has been little peat mining within these bogs.

Many barrens on the outwash plains now have more closed canopies than originally due to lack of fire, but the overstory composition of the barrens has not generally changed. Slightly moister sites that originally supported white oak, white pine, and black oak, have been greatly altered by logging; black oak is now a codominant with white oak and often there is little white pine regeneration.

Most of the bogs on the outwash do not appear to have changed significantly following logging of adjacent forests, but the swamp forests have often gone from conifer to hardwood dominance.

9.0: Newaygo District. The district consists primarily of droughty sand outwash plains. Poor drainage occurs on pitted outwash plains, which are relatively common within the district. Poor drainage can also occur on flat

portions of the outwash streams where the surface outwash sands are underlain by fine-textured till or lacustrine deposits. Surface features maps of the state (Farrand 1982) show areas of sandy end moraine within the district, but recent work by George Host (1987) and coworkers on the Manistee N. F. have shown that the moraines are actually deltaic deposits rather than moraines.

Original vegetation: The droughty outwash plains were generally dominated by jack pine and northern pin oak; these forests were called barrens or savannas because of the short stature of the trees and the openness of the stands. Fires occurred at short intervals within the barrens. Small, dry kettles within the barrens were often grass rather than tree dominated; these grasslands are presently called Dry Sand Prairie, or when the bottoms of the depressions are more mesic, Mesic Sand Prairie. Either micro-climatic conditions or different responses of the kettle depressions to fire may be responsible for the grass-dominated depressions. Red pine and white pine also occurred occasionally within the barrens, as did white oak and black oak. Moister portions of the outwash plain, often supported white pine and white oak.

Wet depressions on the outwash often supported swamp forest dominated by tamarack, black spruce, or occasionally white pine. Where water-level fluctuations were extreme, herb-dominated emergent marshes or Coastal Plain Marshes were typically found. The Coastal Plain Marshes supported several disjunct plant species from the Atlantic and Gulf coastal plains of the United States. Small lakes and ponds within the outwash plain typically developed into Bogs surrounded by narrow zone of black spruce or tamarack swamp (Poor Conifer Swamp).

The original floodplain forests generally dominated by silver maple and red

ash in moist depressions of the first bottom, with beech, sugar maple, and other mesic northern hardwoods on the second bottom. Northern white-cedar was often common in seepage areas and on steep northern slopes.

The small areas of steep end moraine or deltaic deposits generally supported Dry-Mesic Northern Forests. Dominants included white oak, black oak, red pine, and white pine.

Vegetation responses to logging: Many changes have occurred within the forest since logging began in this district during the 1800's. The forest composition of most of the Dry-Mesic Northern Forests changed following logging - white pine regeneration was poor, resulting in forests dominated by white oak, black oak, and large-toothed aspen. Almost no stands were found in the survey with good white pine regeneration. Any moderate sized oak-dominated stands with good white pine regeneration should be considered candidates for RNA or Special Management.

The plant composition and structure of the barrens has not changed considerably, except where fire suppression has been successful. Even with fire suppression, extremely droughty conditions can allow some open barrens to persist. Both the barrens and the more open white pine-white oak forests are important potential habitat for Lycaeides samuelis (Karner blue), a federally threatened butterfly with important populations within the Manistee National Forest.

Dry Sand Prairies and Mesic Sand Prairies have persisted in many small kettle depressions, but their plant composition may have changed considerably due to lack of fire. Response of similar prairie areas following fire management has been dramatic at Shakey Lakes Barrens in the Upper Peninsula; little blue stem and other prairie grasses have become much more dominant,

replacing Pennsylvania sedge. ORV damage and planting of white pine or red pine within the depressions has degraded many of the remaining sand prairies, but several restorable sand prairies were found in this survey.

Turn-of-the-century harvesting of the conifer swamps often resulted in the regeneration of the swamp forests to hardwoods, especially black, red ash, American elm, trembling aspen, and red maple. Following logging, conifer regeneration locally occurred in many of the swamps.

Many of the floodplain forests along the major rivers of the district have undergone few major changes in overstory species composition as a result of logging. The exceptions are those stands that on the second bottom that originally contained stands of eastern hemlock or white pine; neither of these species regenerated well on the floodplain following logging. In many cases Northern white-cedar stands regenerated well following logging.

Bogs and low productivity black spruce stands adjacent to bogs were often not harvested for either peat or timber. Many bogs may have undergone few changes from their original vegetation composition. Of the black spruce and tamarack stands that were harvested for pulp, many have also regenerated well.

Marshes within the larger kettle depressions or along the shorelines of the larger rivers do not appear to have undergone major changes in vegetation following logging.

Coastal Plain Marshes persist in several areas within the district. Hydrologic changes for agricultural development, planting of white pines or red pines within drier portions of the openings, and ORV damage threaten many of the coastal plain marshes.

10.0: Manistee District. This district is characterized as sandy end-moraine

ridges and sandy lake plain, including large coastal sand dunes. Numerous large outwash channels separate the sandy end moraines. The Manistee National Forest within this district primarily occupies either the driest outwash plains, such as the outwash in southern Oceana and northern Muskegon Counties, and droughty or poorly drained lacustrine sands, such as those in Mason County (including Nordhouse dunes). U.S.F.S. lands also include small areas of steep end moraine in southeastern Mason County and northeastern Oceana County.

Original vegetation: Pitted outwash and droughty lacustrine sands supported either Barrens, dominated by jack pine and northern pin oak, or Dry-Mesic to Dry Northern Forests dominated by white oak, white pine, and black oak. Dry or Mesic Sand Prairies occupied dry depressions in the pitted outwash. All of the upland forests were characterized by reoccurring fires.

Common wetlands on pitted outwash and sandy lacustrine deposits include Coastal Plain Marshes and Bogs. Coastal plain marshes occupy depressions (either small embayments of the lake plain or ice-block kettles on the pitted outwash) that undergo major water-level fluctuations. The bogs occupy depressions that are more consistently saturated.

Vegetation responses to logging: White pine regeneration has generally been poor in Dry-Mesic Northern Forests. The overstory of many barrens has become more closed canopy with fire suppression, causing population declines for species like the Karner blue and its host plant, lupine. On some of the droughtiest sites, the overstory canopies of the barrens remain open.

Coastal Plain Marshes persist in many of the moist depressions of the sand lake plain and pitted outwash. Many of the best areas of coastal plain marsh and adjacent uplands have been heavily degraded by planting of pine

plantations or ORV use.

Most of the bogs found in the district remain in relatively intact condition. Upland cutting may have caused enlargement of the moat and post-logging fires may have reduced plant diversity of the bog, but neither of these impacts is well documented. ORV use threatens only a few of the bogs. Harvesting of tamarack or black spruce from the margins of bogs has generally had minor documentable impact; conifer regeneration is typically good in these Poor Conifer Swamps.

RESULTS OF NATURAL AREA INVENTORIES ON THE MANISTEE NATIONAL FOREST

The results of the inventory have been provided to the Manistee National Forest in three documents:

1. Interim Report on a Natural Areas Inventory of the Huron-Manistee National Forest (Wexford, Manistee, Mason, and Oceana Counties), May, 1988.
2. Draft Report on a Natural Areas Inventory of Manistee County, Michigan, March, 1989.
3. Recommended Management Area Designations and Conservation Protection Strategies for Natural Areas Within the Manistee National Forest (Muskegon, Oceana, Mason, Manistee, Wexford, Lake, Mecosta, Montcalm, and Newaygo Counties), 1990 and April, 1991.

Rather than duplicating the results of these documents, all of which have been sent to the Forest Ranger's Office in Cadillac, the results of these documents will be briefly summarized here:

1. <u>Recommended management Area Designations and Conservation Protection</u>

Strategies for Natural Areas Within the Manistee National Forest (Muskegon, Oceana, Mason, Manistee, Wexford, Lake, Mecosta, Montcalm, and Newaygo Counties).

The OVERVIEW of this document contains four tables, one for the Natural Areas inventoried in each Ranger District (See Table 2, an example of the format used in the overview). For each natural area the following are listed: Site Name, Natural Community Type, Acreage, Regional Landscape Ecosystem (from Albert etal. 1986), Global (G) Rank, State (S) Rank, Element Occurrence (EO) Rank and Size Class, Ownership, and Suggested Conservation Action.

APPENDIX I contains site maps (see Figure 2, a sample site map) and element records (see Figure 3, a sample Element Record) for each natural area, including those areas described in the Interim Report on a Natural Areas Inventory of the Huron-Manistee National Forest and in the Draft Report on a Natural Areas Inventory of Manistee County. The site maps are produced on a 1:24,000 topographic map. The element records contain the information summarized in the overview, plus additional information, including description of the natural community and more ownership and management information.

2. Interim Report on a Natural Areas Inventory of the Huron-Manistee National Forest.

This report begins with an overview of Wexford, Manistee, Mason, and Oceana Counties, based on Landscape Ecosystems of Michigan (Albert etal. 1986). A summary of the Michigan Natural Features Inventory (MNFI) methodologies, database, and natural community classification follows. Results of the inventory follow; each natural area is briefly described. General recommendations for management and natural area protection follow. Appendices

I-IV contain MNFI's natural community classification, global and state rankings for communities, criteria for determining natural quality and condition grades, and natural area inventory forms. Appendix V contains maps of the natural areas surveyed within the four counties.

3. Draft Report on a Natural Areas Inventory of Manistee County.

This report is done in the same format as the above report (Interim Report on a Natural Areas Inventory of the Huron-Manistee National Forest). Appendix V also contains the Element Occurrence Records for each natural area within Manistee County.

Table 2. Example of Overview from Recommended Management Area Designations and Conservation Protection Strategies for Natural Areas Within the Manistee National Forest.

Summary of results for sites qualifying as natural areas within the Cadillac Ranger District.

Site Name	Natural Community Type(s)	Acre-age	RLE1	G-Rank	S-Rank	EO Rank/ Size-Cl.	Ownership	Suggested Conservation Action: Mgmt. Area	Suggested Conservation Action: Designation/Action
Benson Bog	Bog	37	2H1	G3	S3	C3	U.S. Forest Service Multiple private	9.1	 NA Registry, acquisition
Brandy Creek Wetlands	Bog	151	2H1	G3	S3	B1	U.S. Forest Service	9.2	Potential Res. Nat. Area
	Hardwood Conifer Swamp	60	2H1	G3	S3	BC2	U.S. Forest Service	9.2	Potential Res. Nat. Area
	Muskeg	128	2H1	G4	S4?	AB3	U.S. Forest Service	9.2	Potential Res. Nat. Area
	Poor Conifer Swamp	40	2H1	G4	S4	AB3	U.S. Forest Service	9.2	Potential Res. Nat. Area
	Rich Conifer Swamp	43	2H1	G4	S4?	B3	U.S. Forest Service	9.2	Potential Res. Nat. Area
	Sandy Lakeplain/Outwash Landscape Complex	422[2]	2H1	-	-	B	U.S. Forest Service	9.2	Potential Res. Nat. Area
Cadillac Bog	Bog	188	2H1	G3	S3	AB1	Multiple private		NA Registry
North Branch Pine River Swamp	Rich Conifer Swamp	69	2H1	G4	S4?	B3	U.S. Forest Service State of Michigan Multiple private	9.1	 Protective management NA Registry
Selma Center	Bog	18	2H1	G3	S3	B3	U.S. Forest Service	8.1	Special Interest Area
	Mesic Northern Forest	32	2H1	G4	S4	C3	U.S. Forest Service	8.1	Special Interest Area
	Poor Conifer Swamp	33	2H1	G4	S4	C3	U.S. Forest Service	8.1	Special Interest Area
South Olga Bog	Bog	54	2H1	G3	S3	B2	U.S. Forest Service	9.1	

1 Regional Landscape Ecosystems: 2H1 = Highplains District, Cadillac Subdistrict.
2 Total of acreages of each natural community.

Figure 2. Example of Site Map from Recommended Management Area Designations and Conservation Protection Strategies for Natural Areas Within the Manistee National Forest..

YONKERS MEADOW
T.20N., R.15W.
Scale 1:24,000

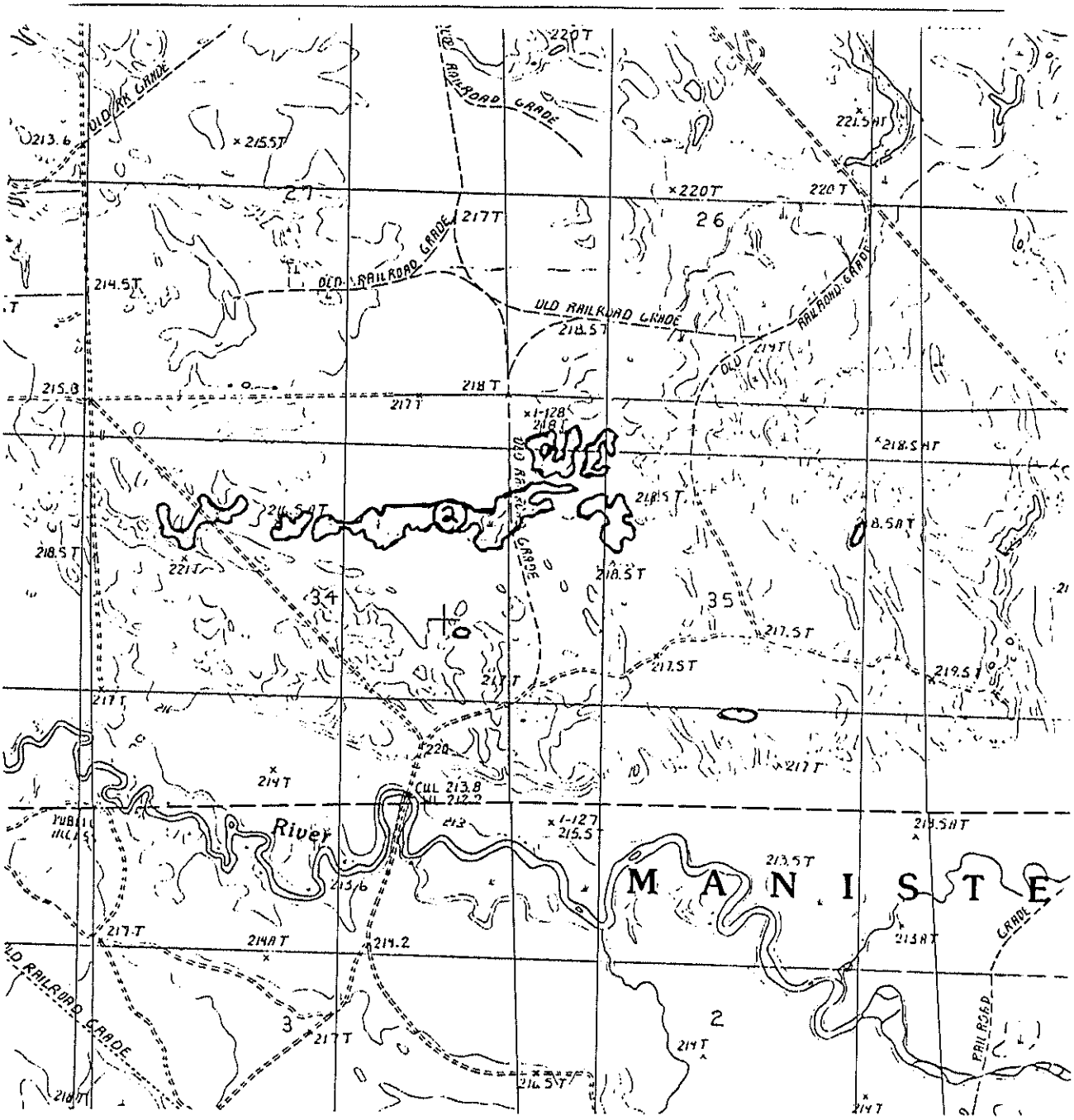

Figure 3. Example of Scorecard from Recommended Management Area Designations and Conservation Protection Strategies for Natural Areas Within the Manistee National Forest.

NATURAL DIVERSITY SCORECARD FOR NEWAYGO COUNTY

EO#:	EO Rank	Grank	Srank	Site Name:	EO Rank Comment
** COASTAL PLAIN MARSH					
026	BC	G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA - EAST	Degraded by orv use, high coastal plain marsh diversity for this far north.
027		G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA - NW	Ponds not degraded by ORV's.
028	B	G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA - WEST	Most of the ponds and marshes in this complex not yet degraded by orvs, high coastal plain marsh diversity for this far north.
029	BC	G2	S2	LOON LAKE	Drainage ditch through entire complex - closing of ditch would probably improve quality of marsh complex. Determine impact of ditch.
030	BC	G2	S2	PINE-PETTIT MARSH	Localized peat mining in past. Weedy, old field to southwest.
** DRY SAND PRAIRIE					
001	A	G3	S2	SECTION 27 BOWL PRAIRIE	Unplowed, some ORV damage, good diversity.
002	A	G3	S2	FINGER PRAIRIE	Unplowed, ORV damage, good diversity.
003	B	G3	S2	ORE-IDA PRAIRIE	Unplowed, ORV damage severe in west opening.
004	B	G3	S2	HIGH ROLLWAY PRAIRIE	Unplowed, moderate ORV damage, pines planted (removal recommended).
005	C	G3	S2	FOSS PARK PRAIRIE	Unplowed, fair diversity, blowouts present, probably grazed.
006	C	G3	S2	CROTON BOWL PRAIRIE	6 acres unplowed, local ORV damage in bowl, good diversity.
007	C	G3	S2	NEWAYGO PRAIRIE (MNA)	Plowed 1885-90, ORV trails.
008	C	G3	S2	NEWAYGO PRAIRIE (USFS)	Previously plowed, light ORV damage, low diversity.
015	A	G3	S2	INDIAN LAKE	Undisturbed, excellent species richness, could use fire management.
** BOG					
066	AB	G3	S3	RICHMOND LAKE	High diversity, ORV trail across herbaceous zone.
067	B	G3	S3	ALLEY LAKE	Relatively low diversity but not disturbed.
** RICH CONIFER SWAMP					
024	B	G4	S4	BROOKS LAKE	White pine stumps in adjacent upland; cedars and other conifers 90-100 yrs. old.
** DRY-MESIC NORTHERN FOREST					
009	B	G4	S4	WEST TRACT FOREST	Second growth white pine/black oak, 80-105 yrs. old.

SCORECARD FOR THE NATURAL AREAS OF THE MANISTEE NATIONAL FOREST

To organize the MNFI data and set conservation priorities, each natural feature is ranked using factors of rarity and threat on a state-wide (state element ranking) and range-wide (global element ranking) basis. MNFI works with The Nature Conservancy and other state Heritage programs to develop these rankings. The SCORECARD is a list of natural areas ranked for rarity and threat; natural communities on the scorecard are listed in order of rarity and threat. The scorecard for the Manistee National Forest (Table 3) contains all natural areas resulting from MNFI's surveys. Note that the Natural Areas are also listed by Ranger District and County in Table 4 to facilitate use by Manistee National Forest staff.

NATURAL AREAS OF THE MANISTEE N. F. ORGANIZED BY RANGER DISTRICT AND COUNTY

For more convenient use by Manistee National Forest staff, the information contained on the Scorecard has also been organized by ranger district and county (Table 4).

Table 4.

NATURAL COMMUNITY OCCURRENCES IN THE MANISTEE NATIONAL FOREST
MICHIGAN NATURAL FEATURES INVENTORY
MICHIGAN DEPARTMENT OF NATURAL RESOURCES - WILDLIFE DIVISION
April 26, 1991

Community Name	Occ. Num.	EO Rank	G Ranks	S	Site Name	EO Rank Comments
BALDWIN RANGER DISTRICT:						
** LAKE COUNTY						
PINE BARRENS	001	C	G3	S3	TUSSING PRAIRIE	Young to mature, 2nd growth. Associated with dry sand prairie and mesic sand prairie.
MESIC SAND PRAIRIE	006	B	G1?	S1	TUSSING PRAIRIE	Moderate to low diversity; little disturbance noted.
DRY SAND PRAIRIE	014	B	G3	S2	TUSSING PRAIRIE	Moderate species richness, little artificial disturbance.
SOUTHERN FLOODPLAIN FOREST	018	BC	G3?	S3	BOWMAN BRIDGE	Good diversity of mature hardwoods with few conifers as a result of past logging.
DRY-MESIC NORTHERN FOREST	024	C	G4	S4	RAILROAD LAKE	Mature 2nd growth oaks; pine eliminated.
** MASON COUNTY						
SOUTHERN FLOODPLAIN FOREST	008	BC	G3?	S3	BIG SOUTH	Local cutting of conifers, recovering from Dutch elm disease.
SUBMERGENT MARSH	005	B?	GU	S4?	CASIN LAKE	Unaltered hydrology since 1938 aerial photos, not floristically diverse.
BOG	040	B?	G3	S3	CASIN LAKE	Unaltered hydrology, floristically poor, grades into submergent marsh.
BOG	053	BC	G3	S3	MILLERTON BOGS	Low diversity, adjacent forest composition altered by logging; little tamarack, white pine regeneration.
EMERGENT MARSH	015	C	GU	S4	WHELAN LAKE	Emergent marsh may be result of pre-1978 burn; completely bog in 1938.
INTERMITTENT WETLAND	014	AB	G2	S2	WHELAN LAKE	High diversity of wetland types within the complex, little human disturbance, excellent zonation.
BOG	041	B	G3	S3	WHELAN LAKE	Good zonation. Incomplete survey due to flooded conditions.
OAK BARRENS	019	C	G2?	S2	WHELAN LAKE	Originally pine/oak dominated, pine now present as saplings only, numerous pine stumps, low herbaceous diversity.
** OCEANA COUNTY						
BOG	043	B	G3	S3	JEFFERSON BOGS	Low diversity, buffer disturbed, some hydrological impacts.
MANISTEE RANGER DISTRICT:						
** LAKE COUNTY						
BOG	059	C	G3	S3	POMEROY BOGS	Low species richness, mature pine all dead, boundaries well-buffered.
** MANISTEE COUNTY						
RICH CONIFER SWAMP	018	AB	G4	S4	ARQUILLA CREEK	Good recovery from moderate cutting of cedar. Diverse ground cover.
RICH CONIFER SWAMP	019	BC	G4	S4	BROWNS BAYOU	2nd growth conifer swamp, good conifer regeneration, high tree density, mosaic of natural disturbance.
EMERGENT MARSH	012	BC	GU	S4	BROWNS BAYOU	Artificial hydrology changes; diverse cover types; stumps within marsh.
NORTHERN WET MEADOW	008	BC	G4	S4	BROWNS BAYOU	Artificial hydrology from dam water release.
SUBMERGENT MARSH	006	C	GU	S4?	BORSKI BAYOU	Artificial water level fluctuation; low diversity, significant as a component of a wetland complex including Southern Floodplain forest, wet meadow and marsh.
EMERGENT MARSH	017	BC	GU	S4	BORSKI BAYOU	Artificial water level fluctuation; low diversity, significant as a component of a wetland complex including Southern Floodplain forest, wet meadow and marsh.

Table 4.

NATURAL COMMUNITY OCCURRENCES IN THE MANISTEE NATIONAL FOREST
MICHIGAN NATURAL FEATURES INVENTORY
MICHIGAN DEPARTMENT OF NATURAL RESOURCES - WILDLIFE DIVISION
April 26, 1991

Community Name	Occ. Num.	EO Rank	G Ranks	S	Site Name	EO Rank Comments
SOUTHERN FLOODPLAIN FOREST	017	B	G3?	S3	BORSKI BAYOU	Unlogged, windthrow common, all-aged, good conifer regeneration.
NORTHERN WET MEADOW	009	C?	G4	S4	BORSKI BAYOU	Hydrologic impact from dam. Significant as a component of a wetland complex including Southern Floodplain forest, wet meadow and marsh.
INUNDATED SHRUB SWAMP	002	C?	GU	SU	BORSKI BAYOU	Young growth. Significant as a component of a wetland complex including Southern Floodplain forest, wet meadow and marsh.
DRY-MESIC NORTHERN FOREST	020	B	G4	S4	DEER LAKE BAYOU	Historic white pine logging, sparse white pine regeneration; mature 2nd-growth hardwoods abundant.
MESIC NORTHERN FOREST	046	B	G4	S4	DEER LAKE BAYOU	Historic white pine logging, sparse white pine regeneration.
SOUTHERN SWAMP	014	A	G3	S3	HOPPERS SWAMP	Lacks conifers (cedar, tamarack) due to historic logging.
BOG	042	C	G3	S3	LAKE OF THE WOODS BOG	Good diversity of plant communities, 25 species noted, adjacent uplands cut.
INTERMITTENT WETLAND	003	B	G2	S2	TIMMERMAN LAKE	Low diversity, unaltered hydrology, no human disturbance except minor ORV tracks.
** MASON COUNTY						
RICH CONIFER SWAMP	010	B	G4	S4	BEAR SWAMP	White pine logged out, hydrology altered locally.
SOUTHERN SWAMP	008	AB	G3	S3	BEAR SWAMP	Selectively logged in past. Windthrows common. Forest mature to overmature.
BOG	052	BC	G3	S3	FROG MARSH	Needs better survey. Private.
BOG	049	B	G3	S3	GREEN ROAD BOGS	Low diversity, essentially undisturbed.
BOG	051	C	G3	S3	GUN BOG	Low species richness, essentially undisturbed. Surrounded by upland forest.
BOG	050	AB	G3	S3	LAKE MEADE	Moat has enlarged since 1938, probably as a result of upland logging; high diversity.
BOG	036	C	G3	S3	LASALLE BOG	Low species richness. Ditched, burnt, fenced. Private ownership.
BOG	046	C	G3	S3	MODJESKI BOG	Low species richness, few cover types, hydrology change due to lack of culverts conifers have regenerated poorly.
INTERDUNAL WETLAND	017	A	G2?	S2	NORDHOUSE DUNES	26 herbaceous species noted by inventory staff.
OPEN DUNES	007	A	G3	S3	NORDHOUSE DUNES	These are the best windblown dunes in the state.
GREAT LAKES BARRENS	003	A	G3	S2?	NORDHOUSE DUNES	25 plant species noted in surveys.
INTERMITTENT WETLAND	015	B	G2	S2	YONKERS MEADOW	Low diversity, poor zonation.
CADILLAC RANGER DISTRICT:						
** LAKE COUNTY						
BOG	058	B	G3	S3	SOUTH OLGA BOG	Moderately low species richness and plant community diversity; resistant to hydrological impacts. Adjacent uplands recently logged.
** WEXFORD COUNTY						
BOG	031	C	G3	S3	BENSON BOG	Late successional, low diversity, but good zonation.
RICH CONIFER SWAMP	016	B	G4	S4	BRANDY CREEK WETLANDS	Mature 2nd growth, good conifer regeneration.
POOR CONIFER SWAMP	005	AB	G4	S4	BRANDY CREEK WETLANDS	Large Larix, diverse understory, little cutting.
HARDWOOD-CONIFER SWAMP	007	BC	G4	S3	BRANDY CREEK WETLANDS	Little disturbance, well buffered.
BOG	029	B	G3	S3	BRANDY CREEK WETLANDS	Large size, little disturbance, good buffer.
MUSKEG	004	AB	G4	S4	BRANDY CREEK WETLANDS	Little human disturbance; large, well-buffered wetland.
BOG	019	AB	G3	S3	CADILLAC BOG	Little human disturbance. Moderate diversity.
RICH CONIFER SWAMP	023	B	G4	S4	NORTH BRANCH PINE RIVER SWAMP	Good cedar regeneration following turn of the century selective logging; diverse groundcover flora.
POOR CONIFER SWAMP	006	C	G4	S4	SELMA CENTER	Historically logged, good regeneration of tamarack and black spruce.

Table 4.

NATURAL COMMUNITY OCCURRENCES IN THE MANISTEE NATIONAL FOREST
MICHIGAN NATURAL FEATURES INVENTORY
MICHIGAN DEPARTMENT OF NATURAL RESOURCES - WILDLIFE DIVISION
April 26, 1991

Community Name	Occ. Num.	EO Rank	G Ranks	S	Site Name	EO Rank Comments
BOG	030	B	G3	S3	SELMA CENTER	High diversity of plant communities; little human disturbance.
MESIC NORTHERN FOREST	047	C	G4	S4	SELMA CENTER	Abundant stumps from an old cut, but conifer well stocked.
WHITE CLOUD RANGER DISTRICT:						
** NEWAYGO COUNTY						
BOG	067	B	G3	S3	ALLEY LAKE	Relatively low diversity but not disturbed.
RICH CONIFER SWAMP	024	B	G4	S4	BROOKS LAKE	2nd growth conifer swamp (90-100 yrs), good conifer regeneration, windthrows common.
DRY SAND PRAIRIE	006	C	G3	S2	CROTON BOWL PRAIRIE	Local ORV damage in bowl, access easily blocked, possible grazing in past.
DRY SAND PRAIRIE	002	A	G3	S2	FINGER PRAIRIE	Unplowed, fire management may be needed; some ORV damage.
DRY SAND PRAIRIE	005	C	G3	S2	FOSS PARK PRAIRIE	Unplowed, fair diversity, blowouts present.
DRY SAND PRAIRIE	004	B	G3	S2	HIGH ROLLWAY PRAIRIE	32 native species. Adjacent overmature oaks, white pine selectively removed.
DRY SAND PRAIRIE	015	A	G3	S2	INDIAN LAKE	Undisturbed, excellent species richness.
COASTAL PLAIN MARSH	026	BC	G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA - EAST	Degraded by ORV use.
COASTAL PLAIN MARSH	027	B	G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA - NW	Little ORV damage to wetland.
COASTAL PLAIN MARSH	028	B	G2	S2	LITTLE ROBINSON LAKE OPPORTUNITY AREA-WEST	Most of the ponds and marshes in this complex not yet degraded by ORVS.
COASTAL PLAIN MARSH	029	BC	G2	S2	LOON LAKE	Drainage ditch through entire complex - closing of ditch would probably improve quality of marsh complex.
DRY SAND PRAIRIE	007	C	G3	S2	NEWAYGO PRAIRIE (MNA)	PRIVATE PRESERVE - Michigan Nature Association.
DRY SAND PRAIRIE	008	C	G3	S2	NEWAYGO PRAIRIE (USFS)	Previously plowed, light ORV damage.
DRY SAND PRAIRIE	003	B	G3	S2	ORE-IDA PRAIRIE	PRIVATE PRESERVE - The Nature Conservancy.
COASTAL PLAIN MARSH	030	BC	G2	S2	PINE-PETTIT MARSH	Localized peat mining in past. Weedy, old field to SW.
BOG	066	AB	G3	S3	RICHMOND LAKE	Private, high diversity, some ORV damage.
DRY SAND PRAIRIE	001	A	G3	S2	SECTION 27 BOWL PRAIRIE	
DRY-MESIC NORTHERN FOREST	009	B	G4	S4	WEST TRACT FOREST	
** MUSKEGON COUNTY						
DRY SAND PRAIRIE	012	BC	G3	S2	GRASS LAKE PRAIRIE	Developments at west edge (private).
DRY SAND PRAIRIE	013	BC	G3	S2	LITTLE BLUE PRAIRIE	Moderate species richness; woody invasion, adjacent forest similar to presettlement forest.
COASTAL PLAIN MARSH	018	A	G2	S2	PINE ISLAND MARSH RNA	34 prevalent and 12 indicator Coastal Plain Marsh species; minor ORV traffic.
COASTAL PLAIN MARSH	019	B	G2	S2	PINE ISLAND MARSH RNA (RAYMOND MARSH)	24 prevalent, 4 indicator Coastal Plain Marsh species; poor zonation; essentially undisturbed.
COASTAL PLAIN MARSH	020	B	G2	S2	PINE ISLAND MARSH RNA (NORTH MARSH)	15 prevalent, 2 indicator Coastal Plain Marsh species; essentially undisturbed.
GREAT LAKES MARSH	045	B	GU	S3	WHITE RIVER ESTUARY	Relatively low species richness. Locally hayed.
** OCEANA COUNTY						
POOR CONIFER SWAMP	007	AB	G4	S4	CAMPBELL LAKE BOG	Private, needs buffer. Too small to recommend acquisition.

Table 4.

NATURAL COMMUNITY OCCURRENCES IN THE MANISTEE NATIONAL FOREST
MICHIGAN NATURAL FEATURES INVENTORY
MICHIGAN DEPARTMENT OF NATURAL RESOURCES - WILDLIFE DIVISION
April 26, 1991

Community Name	Occ. Num.	EO Rank	G Ranks	S	Site Name	EO Rank Comments
BOG	033	B	G3	S3	CAMPBELL LAKE BOG	Private ownership. Low diversity, poor buffer, recently logged uplands.
BOG	034	C	G3	S3	CAMPBELL LAKE SWAMP	26 species noted.
POOR CONIFER SWAMP	010	A	G4	S4	FAIRCHILD LAKE	Selectively logged circa 1957.
BOG	039	A	G3	S3	FAIRCHILD LAKE	No artificial disturbance. 26 species noted.
NORTHERN WET MEADOW	004	C	G4	S4	KNAPP PRAIRIE	Relatively low diversity, but associated with high diversity mesic sand prairie, some ORV damage.
OAK BARRENS	012	C	G2?	S2	KNAPP PRAIRIE	Few old trees, limited forb diversity, some ORV damage.
MESIC SAND PRAIRIE	002	B	G1?	S1	KNAPP PRAIRIE	Some ORV damage.
DRY SAND PRAIRIE	010	C	G3	S2	KNAPP PRAIRIE	Low diversity, but associated with high diversity mesic sand prairie, some ORV damage.
NORTHERN WET MEADOW	007	BC	G4	S4	NORTH BRANCH WHITE RIVER	Transitional to alder thicket.
BOG	045	BC	G3	S3	NORTH BRANCH WHITE RIVER	Low plant species richness, essentially undisturbed.
DRY SAND PRAIRIE	011	B	G3	S2	SISCHO PRAIRIES	Good plant species richness. Woody succession due to fire suppression, some ORV damage.
OAK BARRENS	011	B	G2?	S2	SKEEL CREEK BARRENS	Would improve with burning.
DRY SAND PRAIRIE	009	B	G3	S2	SKEEL CREEK PRAIRIE	32 native species. Adjacent overmature oaks, white pine selectively removed.
BOG	044	BC	G3	S3	YONKER BOG	Exceptionally low plant species richness, recent logging along East boundary.

DESCRIPTION OF NATURAL AREAS OF THE MANISTEE N. F. (BY RANGER DISTRICT/COUNTY)

BALDWIN RANGER DISTRICT

LAKE CO.

Bowman Bridge (Lake Co. PNA #10). This Southern Floodplain Forest of approximately 250 acres, is located four miles west of Baldwin. Ownership of the tract is shared by the U.S.F.S., the Sacred Heart Sportsman Club, and several small owners. The site is dominated by hardwoods, primarily silver maple, black ash, and green ash. Following logging white pine regeneration has been poor. The present level of protection is probably adequate.

Millerton Bogs (Lake Co./Mason Co. PNA #52). This group of 5 small bogs, 3, 16, 17, 2, and 1 acres in area, is located on pitted outwash about 7.5 miles northeast of Walhalla. No special plants or animals were found during the survey of these wetlands. Part of the tract is owned by the U.S.F.S. and part by Amil Mashke. Although originally recommended for 9.1 management, small complexes of bogs such as these are relatively common on the outwash of the Manistee National Forest and should probably be recommended for special management only when found in complex with other high quality natural communities.

Railroad Lake (Lake Co. PNA #11). This C-ranked Dry-Mesic Northern Forest is located approximately 3 miles west of Baldwin. Although of relatively large size (191 acres) all of the tract was logged in the past and most of the tract has poor white pine regeneration. Because of its low rank and private ownership, action by the U.S.F.S. is not recommended.

Tussing Prairie (Lake Co. PNA #14). This complex of B-ranked Mesic

Sand Prairie and Dry Sand Prairie and C-ranked Barrens is located approximately 5 miles north of Baldwin. The complex occupies an area of approximately 50 acres. No special plants or animals are known from the site. There are several small ownerships, as well as some ownership by the U.S.F.S. The site should be considered for acquisition and management, but due to the small size of the prairie area and the lack of either special plants or animals, other tracts listed in the Recommendations and Discussion section probably demand more immediate attention.

MASON CO.

Whelan Lake (Mason Co. PNA #31). This complex of wetlands is located approximately five miles southeast of Custer. It is characterized by a 25 acre Intermittent Wetland of Exceptional significance, as well as an Oak Barrens with a Threatened plant population (Cirsium hillii) and a Bog and Emergent Marsh. These latter three natural community occurrences are of Notable significance.

The entire site is in Forest Service ownership, except for a small portion of the Oak Barrens. There appear to be no present threats to these areas. Conservation action for this site (as well as any potentially damaging management activities) should be deferred until the inventory is completed for the region, allowing a determination of their significance in relation to all other known occurrences.

Big South (Mason Co. PNA #32). This site, located about four miles southwest of Walhalla along the Big South Branch of the Pere Marquette River, was surveyed and evaluated as a Candidate Research Natural Area by Albert in 1986, and was recommended for RNA designation. The area of the proposed RNA is approximately 225 acres. Most of the floodplain is dominated by silver

maple and red ash, but there are small pockets of mesic northern forest and seepage areas dominated by northern white cedar. The upland sandy outwash deposits above the floodplain have largely been planted to jack pine or red pine. The Whelan Lake site (PNA #31), is immediately to the northeast of Big South, and could be linked for Natural Areas management.

Casin Lake (Mason Co. PNA #34). This site is located 2.25 miles south-southeast of Walhalla. It is characterized by a 16 acre Bog and 45 acre Submergent Marsh, both of Notable significance. Special Interest Area designation is recommended for the small acreage of U.S. Forest Service ownership at the north end of the site. Additional acquisition of private acreage within this natural area was originally recommended to protect the wetland, but based on the large number of small bogs and marshes encountered in the survey of the Manistee National Forest, protection of such wetlands would best be carried out within a complex of other high quality natural communities.

NEWAYGO CO.

No Natural Areas were identified in the Newaygo County portion of the Baldwin Ranger District.

OCEANA CO.

Jefferson Bogs (Oceana Co. PNA #52). This complex of 14 bogs on sandy pitted outwash deposits is located approximately 7 miles east of Pentwater. The bogs cover approximately 77 acres; the entire complex of forested ridges and swales covers approximately 160 acres. It is considered a B-ranked natural community. The majority of the site is in private ownership, with multiple owners. The species composition is similar to that encountered in some of the depressions at Yonkers Meadow (Manistee R. D., Mason Co.) and also

at Little Robinson Lake O. A. (White Cloud R. D., Newaygo Co.). I would recommend protection of these two higher-ranking sites that are already owned by the U.S.F.S., rather than acquiring additional lands at Jefferson Bogs.

CADILLAC RANGER DISTRICT

LAKE CO.

South Olga Bog (Lake Co. PNA #24). This bog is located on pitted outwash approximately 9 miles northeast of Luther. The bog, which is surrounded by recently logged hardwood forests, covers approximately 54 acres and is B-ranked. The plant diversity of the peatland is relatively low. The bog is entirely owned by the U.S.F.S. Management Area designation 9.1 should provide adequate protection for the wetland.

MANISTEE CO.

No Natural Areas were identified in the Manistee County portion of the Cadillac Ranger District.

WEXFORD CO.

Brandy Creek Wetlands (Wexford Co. PNA #6). This site is located approximately seven miles west of Cadillac. It is characterized by an intact wetland Landscape Complex comprised of Bog, Muskeg, Hardwood-Conifer Swamp, Poor Conifer Swamp and Rich Conifer Swamp. Both the Bog and Landscape Complex are of Exceptional significance. Along with the other four natural communities of Notable significance, it is recommended for Research Natural Area designation. This site represents an opportunity to preserve a large (422 acre) wetland with a diverse complement of all the natural community types to be expected in such a landscape. Ownership is entirely U.S. Forest Service.

Selma Center (Wexford Co. PNA #10). This site is located five miles northwest of Cadillac. It is characterized by a headwaters Bog surrounded by a Poor Conifer Swamp and a nearby Mesic Northern Forest, all of Notable significance. Ownership is all U.S. Forest Service. No conservation action is presently proposed for this site due to the commonness of these community types.

Benson Bog (Wexford Co. PNA #12). Benson Bog lies one mile north of Benson, approximately 0.25 mile north of the intersection of M-55 and No.33 Road. The bog portion of the wetland occupies 37 of the 82 acre site and is of Notable significance. Ownership is entirely U. S. Forest Service. No conservation action is presently proposed for this site due to the abundance of Bogs, of this or greater size, in the region.

North Branch Pine River Swamp (Wexford Co. PNA #13). This swamp lies six miles southwest of Cadillac. It begins 1000' upstream and 2000' downstream from the North Branch Pine River bridge on 48 1/2 Mile Road. It is comprised of two Notable significance stands (23 and 47 acres each) connected by poorer grade swamp. These stands have regenerated well from old light to moderate selective cutting of cedar, and should be left as old growth with Special Interest Area designation. Ownership is indicated in the 1986 Wexford Co. Plat Book as U.S. Forest Service, State of Michigan, and private. However, Matt Sands (1988, personal communications), indicated that this tract was recently traded out of federal ownership.

MANISTEE RANGER DISTRICT

LAKE CO.

Bear Swamp (Mason Co./Lake Co. PNA #51). See Mason Co., Manistee

Ranger District.

Pomeroy Bogs (Lake Co. PNA #05). This 161 acre bog is located on pitted outwash approximately 19 miles northwest of Baldwin, near Beartrack Campground (U.S.F.S.). It is C-ranked due to low diversity, but is well buffered by mature hardwoods. Ownership is almost entirely U.S.F.S. Due to its low diversity no conservation action is recommended.

MANISTEE CO.

Arquilla Creek (Manistee Co. PNA #18). This site is located approximately eight miles east-southeast of Brethren, along the floodplain of the Manistee River. It is characterized by a Rich Conifer Swamp of Notable significance. This site has the oldest northern white cedars found in the region. Two contiguous stands, totaling 49 acres are recommended for Special Interest Area designation. Ownership is U.S. Forest Service and Consumer's Power. The Consumer's Power portion of the tract may be protected through a management agreement if not acquired.

Borski Bayou (Manistee Co. PNA #6). This site lies within the floodplain of the Manistee River, approximately nine miles east north-east of Manistee and four miles north of Star Corners. It is characterized by five natural community occurrences: Emergent Marsh, Inundated Shrub Swamp, Northern Wet Meadow, Southern Floodplain Forest, and Emergent Marsh. These five types represent a landscape complex in which no individual community type is of sufficient natural quality and condition to stand alone as a natural area. However, when considered together, this site is of notable significance. Regulation of water levels by Tippy Pond Dam and local invasion of Purple loosestrife prevent this site from having a higher significance level. Wildlife value is high for all such herbaceous wetlands along major rivers.

This site should be protected within a National Scenic River corridor. Some Consumers Power Company land is present with the natural area boundaries, as well as small private tracts. These should be acquired and protected, partially to increase public ownership of lands important for wildlife.

Browns Bayou (Manistee Co. PNA #17). This site lies within the floodplain of the Manistee River, approximately 3.5 miles southwest of Brethren. It is characterized by an complex of several natural community types. Three of these communities, the Emergent Marsh, Northern Wet Meadow and Rich Conifer Swamp, are of Notable significance. The marsh and meadow are under an unnatural hydrological regime due to Tippy Pond Dam discharges, but still qualify the site as a natural area due to natural floristic composition. This 207 acre area is recommended for inclusion in a National Scenic River designation for the Manistee River, and/or Special Interest Area designation for the site itself. Most of the site is in U.S. Forest Service ownership and no acquisition is necessary to protect the site at this time.

Deer Lake Bayou (Manistee Co. PNA #13). This 17 acre forested hill lies within the floodplain of the Manistee River, approximately four miles southwest of Brethren. It is characterized by Mesic Northern Forest and Dry-Mesic Northern Forest, both of Notable significance. The site is primarily old and old second-growth hardwoods with pine and hemlock regeneration. Ownership is entirely U.S. Forest Service. It is recommended for inclusion in a National Scenic River designation for the Manistee River, and/or Special Interest Area designation for the site itself.

Hoppers Swamp (Manistee Co./Mason Co. PNA #16). This site lies 5.5 miles southwest of Wellston. It is characterized by a 597 acre Southern Swamp of exceptional significance. Mature to old-growth Silver maple are dominant

throughout this windthrown swamp. A Great Blue Heron rookery is established within this tract. This site is owned by Packaging Corporation of America, the U.S. Forest Service, and one private owner. The Forest Service property will be recommended for Research Natural Area (RNA) designation. A portion is already within the boundaries of the Udell Experimental Forest. The acreage owned by Packaging Corporation of America and one private landowner should be registered as a Natural Area by the Michigan Chapter of The Nature Conservancy and acquired as an addition to the RNA.

Lake of the Woods Bog (Manistee Co. PNA #45). This site lies approximately 5 miles southwest of Wellston, near Timmerman Lake and Hoppers Swamp. It is characterized by a notably significant seventeen acre Bog with a good diversity of cover types. Ownership is entirely U.S. Forest Service. Due to the relative commonness of this type, no conservation action is proposed for this site.

Timmerman Lake (Manistee Co. PNA #43). This site lies four miles west-southwest of Wellston. It is characterized by a seasonally inundated, sandy meadow classified by MNFI as an Intermittent Wetland. This 97 acre, high quality occurrence is of exceptional significance and the U. S. Forest Service acreage may merit Research Natural Area status. However, due to the relatively large number of additional Intermittent Wetlands slated for 1988 field survey, the limited understanding of this type, the mix of public and private ownership, and an apparent lack of threats, conservation action on this site should be deferred until the inventory is completed for the region. Further plant surveys are scheduled for the late summer, 1991, to resolve the status of this site.

MASON CO.

Bear Swamp (Mason Co. PNA #51). The area within the Candidate Research Natural Area boundaries was surveyed and evaluated by Albert in 1986. The Rich Conifer Swamp and was recommended for Special Interest Area designation only, since the majority of the landscape had been highly disturbed. However, a 130 acre area of the Rich Conifer Swamp is presently one of the best remaining stands surveyed in the region. Additionally, up to 340 acres of Southern Swamp (partially contained within the Candidate RNA boundaries) is of Exceptional Significance. The Southern Swamp is dissected by USFS highway 5205, probably a reason not to recommend it for RNA consideration. Special Interest Area is probably an adequate designation for its protection.

Frog Marsh (Mason Co. PNA #15). This bog, located approximately 3.3 miles east-southeast of Freesoil, has low diversity and is completely in private ownership. I would recommend no conservation action by the U.S.F.S.

Green Road Bogs (Mason Co. PNA #09). This complex of bogs, located approximately ten miles north-northeast of Ludington, is included within the Nordhouse Dunes Wilderness Area. Further restriction of ORVs is needed, as some ORV damage was noted during the field survey.

Gun Bog (Mason Co. PNA #15). This 16 acre bog is located approximately 3.2 miles southeast of Freesoil. The bog has low diversity and is completely in private ownership; no conservation action is recommended to the U.S.F.S.

Hoppers Swamp (Mason Co./Manistee Co. PNA #16). See Manistee Ranger District/Manistee Co.

Lake Meade (Mason Co. PNA #15). This 22 acre bog is located

approximately four miles east-southeast of Freesoil on property owned by the Packaging Corporation of America. Plant diversity is high, but upland logging has increased the size of the bog's moat considerably. No conservation action is recommended to the U.S.F.S.

LaSalle Bog (Mason Co. PNA #36). This 30 acre bog is located approximately 2.5 miles northwest of Kings Road on privately owned lands. The diversity is low and disturbances include ditching, fire, and fencing. No conservation action is recommended to the U.S.F.S.

Modjeski Bog (Mason Co. PNA #11). This 68 acre bog is located 6.5 miles south of Manistee on U.S.F.S. lands. An old railroad grade crosses the bog; lack of culverts has impacted the bog mat. Plant diversity is low. Because of hydrologic disturbance and low plant diversity, no conservation action is recommended to the U.S.F.S.

Yonkers Meadow (Mason Co. PNA #20). This B-ranked Intermittent Wetland is located approximately 6 miles east of Freesoil on U.S.F.S. lands. The boundaries have been enlarged to include additional wetlands to the east and south also known to contain state threatened plant species (replace the old map and Element Occurrence record with those enclosed). The quality of these wetlands and the adjacent open swamp forest might be improved by prescribed burning. Special Interest Area management is recommended for the site.

WHITE CLOUD RANGER DISTRICT

MECOSTA CO.

No Natural Areas were identified in the Mecosta County portion of the White Cloud Ranger District.

MONTCALM CO.

No Natural Areas were identified in the Montcalm County portion of the White Cloud Ranger District.

MUSKEGON CO. — Blue Lake Area

Grass Lake Prairie (Muskegon Co. PNA #18). This mosaic of several small Dry Sand Prairies totalling approximately 55 acres is located 8 miles east-northeast of Whitehall. The quality rank of this complex is BC and there is one state special concern species on the site. Ownership is entirely private; no conservation action is recommended to the U.S.F.S.

Little Blue Prairie (Muskegon Co. PNA #26). This 15 acre Dry Sand Prairie is located approximately 6 miles east of Whitehall. The site is ranked BC and is owned by the Blue Lakes Fine Arts Camp. The site will be suggested to The Nature Conservancy for registry; no conservation action is recommended to the U.S.F.S.

Pine Island Marsh (Muskegon Co. PNA #21 (Raymond Marsh), #22 (North Marsh), and #29). Pine Island Marsh, a series of wetlands located on pitted outwash, is located approximately 4 miles west of Holton. The site consists of several wetlands containing plants disjunct from the Atlantic and Gulf Coastal Plains of the United States. The tracts have been recommended as a Research Natural Area by MNFI. The wetland tracts are owned by private owners (Arthur and Davis Boven, Dolejs Realtors) and the U.S.F.S.

NEWAYGO CO.

Alley Lake (Newaygo Co. PNA #22). Alley Lake is a bog located approximately 2.5 miles west of White Cloud. The 60 acre bog, with a rank of B, has not been disturbed, but has relatively low plant diversity. The bog has been recommended for designation of 9.1, which would provide additional

protection. MNFI would not recommend land acquisition because of the low priority of the community coupled with multiple private ownerships.

Brooks Lake (Newaygo Co. PNA #37). No action has been requested for this Rich Conifer Swamp, which has both private (L. Maleer, R. Fox, and Wm. Armantrout) and U.S.F.S. ownership. Several factors are responsible for MNFI seeking no action, including relatively small size of the tract, combined with multiple ownership and relatively low priority of the community.

Croton Bowl Prairie (Newaygo Co.). This nine acre Dry Sand Prairie is located approximately 1.8 miles east-northeast of Croton. The prairie is C-ranked. There is no sign of past plowing of the prairie, but there is some ORV use and there may have been past grazing. The prairie is isolated from several prairies located 3-5 miles further to the west. The prairie is owned by Herbert Jordan. No conservation action is requested from the U.S.F.S.

Finger Prairie (Newaygo Co.). This A-ranked Dry Sand Prairie of 8 acres is approximately 4.5 miles southeast of Newaygo. This prairie is partially owned by the U.S.F.S. and is designated as the Newaygo Prairies Research Natural Area.

Foss Park Prairie (Newaygo Co.). This 11 acre, C-ranked Dry Sand Prairie is six miles northeast of Newaygo. The prairie is unplowed; it is located at the northeastern edge of the historic Marengo Prairie. Blowouts are present and the prairie has probably been grazed. Acquisition of the parcel should be considered to enlarge the potential areas in Sections 1-4 for Karner Blue and prairie management (using prescribed burns).

High Rollway Prairie (Newaygo Co.). This 18 acre, B-ranked Dry Sand Prairie is located four miles east-southeast of Newaygo on the south side of M-82. it is an unplowed bowl prairie with good plant diversity. The prairie

is a Special Area with 8.1 Management Area designation.

Indian Lake (Newaygo Co. PNA #25). This 240 acre site is located approximately 2 miles south of Brohman. The site consists of numerous depressions located on pitted outwash; dry to wet prairies are found in the open depressions. The adjacent forest consists of low quality Dry-Mesic Northern Forest and local Oak Barrens. Small areas of Coastal Plain Marsh are found along the edges of Indian Lake. Surveys for Karner Blue Butterflies are being conducted during the summer of 1991, both within the proposed natural area (see map) and in the small openings further to the west, in Sections 27, 28, and 29. Acquisition of the private parcels owned by E. J. Watterworth, M. Young, and C. Wrung is recommended. Special Interest Area designation is recommended, with prescribed burns probably necessary to improve both the Dry Sand Prairie and the Oak Barrens.

Little Robinson Lake Opportunity Area East, Northwest, West (Newaygo Co.). This complex of Coastal Plain Marshes is located approximately 3 miles southwest of White Cloud on U.S.F.S. property. The Coastal Plain Marshes are found in numerous depressions within a broad area of pitted outwash. Species diversity is moderate; many Coastal Plain Marsh species are not found this far north in the state. Generally the condition of the marshes, which are ranked B and BC, is good, but ORV damage is locally severe in the East complex. Many of the depressions support low diversity bogs with no or few plant species characteristic of Coastal Plain Marshes. Surveys will be conducted during the early summer of 1991 for lupine and Karner Blue butterflies in the open oak forests. Management designation of 8.1 is recommended to protect the Coastal Plain Marshes. In drought years, experimental prescribed burns could be used on some of the bogs and more heavily vegetated marshes to improve their value

for waterfowl; such burns might also improve the habitat for Coastal Plain Marsh plants, some of which may persist in repressed condition or as part of the seed bank within these wetlands.

Loon Lake (Newaygo Co. PNA #26). This complex of Coastal Plain Marshes covering an area of approximately 600 acres is located approximately 7.5 miles north of White Cloud, just east of M-37. The wetlands contain two state threatened species and three state special concern species characteristic of Coastal Plain Marshes. The marshes are ranked BC, with some marshes relatively undisturbed and others probably impacted by hydrologic changes caused by ditching. Due to the large size of the marshes, further plant survey is recommended during the summer and fall of 1991. An early survey is also recommended for lupine, which was seen at nearby Indian Lake to the west. The open oak forests adjacent to Coastal Plain Marshes sometimes provide good habitat for lupine and the Karner Blue Butterfly. The proposed natural area is owned by the U.S.F.S. and several private owners. Further management and acquisition recommendations will be based on the results of 1991 special plant and animal surveys.

Newaygo Prairie (MNA) (Newaygo Co.). This 23 acre, C-rank Dry Sand Prairie is located about 4 miles east-northeast of Newaygo. The tract is a second-growth sand prairie that was plowed near the turn of the century. The tract is privately owned and managed by the Michigan Nature Association.

Newaygo Prairie (USFS) (Newaygo Co.). This 70 acre, C-ranked Dry Sand Prairie is located approximately 5 miles east of Newaygo. Plow lines are still visible in the prairie and ORV damage is light and ongoing. Species diversity is generally low. The area is designated as the Newaygo Prairie Ecological Study Area in the Forest Plan. Management of this and several

other nearby Dry Sand Prairies is being coordinated with the Michigan Field Office of The Nature Conservancy. Prescribed burning will probably improve overall species diversity and the quality of the habitat for the Karner Blue Butterfly.

Ore-Ida Prairie (Newaygo Co.). This 50 acre, B-ranked Dry Sand Prairie is located approximately 3.5 miles northeast of Newaygo. The prairie opening have not been plowed, but there is some severe ORV damage in the western opening. Owners include several private individuals and the Michigan Chapter of The Nature Conservancy. It is assumed that The Nature Conservancy is pursuing additional acquisitions of private inholdings; no conservation actions are being recommended to the U.S.F.S.

Pine-Pettit Marsh (Newaygo Co. PNA #46). This 20 acre, BC-ranked Coastal Plain Marsh is located six miles east of Newaygo near M-82. The site supports one state threatened and one state special concern species. There has been localized peat mining within the wetland in the past. The site is not considered a high priority for acquisition due to the low number of Coastal Plain Marsh species present, its management history, and its nearness to both a major road and several residences.

Richmond Lake (Newaygo Co. PNA #24). This 80 acre, AB-ranked bog is less than a mile northeast of Brohman. Typical kettle bog zonation is well developed at this site. There is low level of ORV damage within the wetland. No protection activity has been requested for this privately-owned bog.

Section 27 Bowl Prairie (Newaygo Co.). This 11 acre, A-ranked Dry Sand Prairie is located 3.5 miles east-southeast of Newaygo. The prairie has not been plowed, but has suffered some ORV damage and pine plantation is located nearby. Species diversity is good; the site also contains several

special plants and animals. The site is designated a Special Area, Management Area 8.1. The U.S.F.S. is presently managing some of the Dry Sand Prairies in this area in cooperation with the Michigan Chapter of The Nature Conservancy.

West Tract Forest (Newaygo Co. PNA #40). This 40 acre, B-ranked Dry-Mesic Northern Forest is located approximately four miles northeast of Newaygo. The stand is a second growth white pine/black oak forest growing on sand. The tract is part of the Newaygo Experimental Forest.

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Campbell Lake Bog (Oceana Co. PNA #19) and Campbell Lake Swamp (Oceana Co. PNA #25). These areas, located 2.5-3.0 miles southwest of Klondike, contain an 80 acre, B-rank and a 16 acre, C-rank bog and a 16 acre, AB-rank Poor Conifer Swamp. The bog at Campbell Lake Swamp is owned by the U.S.F.S., but all other ownership is private. There is a tire boardwalk on the bog mat of the U.S.F.S. land. No further management is recommended. No acquisition of the private land is recommended.

Fairchild Lake (Oceana Co. PNA #12). This A-rank, 39 acre bog is located approximately 5.5 miles north-northwest of Hesperia. The bog is located in a depression within sandy end moraine. No human disturbance was noted within the bog; species diversity was relatively low. The bog has several private owners. Due to the commonness of bogs within the Manistee National Forest and the distance from adjacent U.S.F.S. land, acquisition by the U.S.F.S. is not being recommended.

Knapp Prairie (Oceana Co. PNA #35). This wetland/prairie complex lies approximately 8 miles southwest of Hesperia. It is characterized by two depressional wetlands surrounded by sand prairie and barrens. The wetlands were former bogs that were dredged for peat. A fairly wide zone of prairie

and meadow exists between the wetlands and the Oak Barrens (and Dry-Mesic Northern Forest) on the uplands. The vegetation is progressively more xeric with increasing elevation and distance from the wetlands, passing successively through zones of Northern Wet Meadow, Mesic Sand Prairie and Dry Sand Prairie.

The outstanding feature of this site is a Mesic Sand Prairie of Exceptional significance. This natural community occurrence, along with its floristically related meadow, prairie and barrens (all of Notable Significance), is recommended for Research Natural Area designation. The Mesic Sand Prairie is presently threatened by a recent hand planting of White Pine.

North Branch White River (Oceana Co. PNA #61). This site, which includes 23 acres of BC-ranked Northern Wet Meadow and 54 acres of BC-ranked Bog, is located approximately six miles northwest of Hesperia. The ownership is part private and part U.S.F.S. Management area designation of 9.1 on federal lands is adequate for maintaining wildlife values. Acquisition of adjacent private land holdings is not high priority.

Skeel Creek Prairie (Oceana Co. PNA #38). This site was surveyed and evaluated as a Candidate Research Natural Area by Reese in 1987, and was recommended for RNA designation. Registry and eventual acquisition of additional private land is needed and being sought by The Nature Conservancy's Michigan Field Office, to protect the entire occurrence of Dry Sand Prairie found here.

Sischo Prairies (Oceana Co. PNA #36). This 18 acre, B-rank Dry Sand Prairie is located approximately 8 miles southwest of Hesperia. The prairie occupies small depressions on a pitted outwash plain and is associated with second growth Dry-Mesic Northern Forest and young Oak Barrens. The tract is entirely on U.S.F.S. land. The site was recommended for 8.1 Management Area

(Special Interest Area) designation in 1989. Further study of the aerial photos indicates that it might be possible to link management of this area to Knapp Prairie, which has been recommended for RNA consideration.

Yonker Bog (Oceana Co. PNA #13). This 14 acre, BC-ranked Bog is located approximately 3 miles northwest of Hesperia. The bog is surrounded by upland hardwoods, some of which have been recently logged along the east side of the bog. The bog has low species diversity; only 11 species were noted during the field survey. The bog is privately owned. No conservation action is requested from the U.S.F.S.

ADDITIONAL SURVEY NEEDS

Additional surveys will be conducted during the 1991 field season. These surveys are for Lycaeides samuelis (Karner blue) and its host plant, Lupinus perennis (lupine), or for plant species characteristic of Coastal Plain Marshes and Intermittent Wetlands. Coastal Plain Marshes and Intermittent Wetlands are characterized by fluctuating water tables. The water table fluctuations result is tremendous year to year changes in species composition within these communities. More than one survey is generally required to adequately survey these natural communities. Sites that will require additional surveys for the above species include Loon Lake, Indian Lake, Whelan Lake, Timmerman Lake, Yonkers Meadow, Little Robinson Lake O. A., Knapp Prairie, and Sischo Prairie.

DISCUSSION AND RECOMMENDATIONS

Eleven of the most significant sites or group of sites on the Manistee National Forest are listed below. These sites are ordered according to Range-wide and State-wide rankings of Natural Communities. The Karner Blue butterfly, which has been recommended for federal threatened status, is an important element at several of the following sites; its presence will certainly be the basis for further emphasis of sites in the future.

1. Knapp Prairie, Skeel Creek Prairie and Barrens, Sischo Prairie (White Cloud Ranger District). All of these sites are located within a four mile stretch on both sides of the White River. Skeel Creek and Knapp Prairie have been recommended for RNA status and Sischo Prairie for Special Interest Area. Due to the large amount of private ownership at Skeel Creek, it may be more effective to concentrate efforts toward RNA designation or management on Knapp Prairie, with potential expansion of barrens/sand prairie management along the White River to Sischo Prairie, rather than concentrating on Skeel Creek acquisition. Karner Blue surveys within the Knapp Prairie and Sischo Prairie sites are recommended; an unsuccessful search for Karner Blue has already been conducted at Skeel Creek.

2. Pine Island Marsh (White Cloud Ranger District). Several wetlands around Pine Island Lake contain disjunct plant species from the Atlantic and Gulf Coastal Plain of the United States. The area has been recommended for RNA status, but private ownership restricts consideration of this area for an RNA. Probably equally important in the area is management for the Karner Blue butterfly, which has been found on adjacent Barrens to the west. Prescribed burn management of the consolidated U.S.F.S. ownership to the west in Sections

25 and 26 would improve the habitat for Karner Blue and might also open up the wetland margins sufficiently to allow Coastal Plain Marsh plants to flourish. There are also two nearby isolated privately owned occurrences of Dry Sand Prairie at Grass Lake Prairie and Little Blue Prairie that are lower priority for acquisition and management because of small size and isolated private ownership.

3. Little Robinson Lake (White Cloud Ranger District). Several wetlands containing Atlantic Coastal Plain disjunct plant species have been identified in the Little Robinson Lake Opportunity Area. The quality of these Coastal Plain Marshes is high, but the diversity is lower than those at Pine Island Marsh in Muskegon County, probably due to the more northerly location of the Little Robinson Lake marshes. These wetlands were divided into three areas (Little Robinson Lake O. A. East, West, and Northwest) for mapping purposes; the entire area included in these three sites could be managed as a single management area. White-oak and black-oak dominated forest surround most of the wetlands, indicating past fire history. Both the wetlands and uplands might be expected to respond well to fire management. Exclusion of ORVs will be necessary to stop destruction of this wetland complex. Lupine and Karner Blue butterflies may be present within the area, which is only five miles north of known Karner Blue populations.

4. Loon Lake (White Cloud Ranger District). Loon Lake consists of a large complex of shallow depressions in an outwash plain. The site is slated for further special plant surveys in 1991. It is known to support two state threatened plants and three state special concern plants. The impact of ditching to the north must be further evaluated. The site is immediately east of Indian Lake; the upland areas adjacent to Loon Lake should also be searched

for lupine and the Karner Blue butterfly.

5. Big South/Whelan Lake (Baldwin Ranger District). The proposed Big South RNA, a floodplain along the Big South Branch of the Manistee River, is separated from the Whelan Lake wetlands and barrens by less than an eighth of a mile. Natural Area management of the two areas could be consolidated. There are also barrens west of Whelan Lake in Section 32 (T18N R15W) that could possibly be improved with fire management. There are also wetlands and barrens immediately west of the river in T17N R16W S. 1 and in T18N R16W S. 36. Although these barrens and wetland areas have obviously undergone heavy management in the past, they may have potential for restoration with fire management.

6. Bear Swamp/Yonkers Meadow (Manistee Ranger District). Although Bear Swamp, a proposed RNA, was not recommended for RNA status by MNFI staff because of heavy logging and major alterations to the hydrology of large portions of the swamp, high quality Southern Swamp and Rich Conifer Swamp are found within the wetland complex. Yonkers Meadows, a B-ranked collection of small Intermittent Wetlands was also found in Sections 34 and 35 (T20N R15W) to the west of Bear Swamp. The boundaries of Yonkers Meadows has been modified to include three other small areas of wetland in Sections 34 and 35 that had been located in the 1986 RNA survey of Bear Swamp. Several of the Intermittent Wetlands are located between low transverse dunes that formed either at the edge of a glacial outwash plain or on a shallow temporary glacial lake bed. The Intermittent Wetlands contain some Atlantic Coastal Plain disjunct plants, along with some other state-threatened plant species. The moist to wet forest of trembling aspen that surrounds the open Intermittent Wetlands may contain other species with Coastal Plain affinities

that will only appear in years when moisture conditions are appropriate. Fires may have been important for maintaining the vegetation within this wetland complex, but no prescribed-burn management has been conducted on such wetlands to date.

7. Hoppers Swamp, Lake of the Woods Bog, Timmerman Lake (Manistee Ranger District). Timmerman Lake is an Intermittent Wetland that needs further plant survey work. Hoppers Swamp is of high quality and is well buffered by forested lands; it has been recommended for RNA designation with acquisition of private lands recommended to increase the size and significance of the RNA. Wildlife values alone would justify the acquisition of the private lands surrounding Lake of the Woods.

8. Nordhouse Dunes (Manistee Ranger District). Nordhouse Dunes is already protected, with designation as a Research Natural Area. Green Road Bogs, located within the Nordhouse Dunes Wilderness Area, is still being used by ORVs.

9. Newaygo Prairies (White Cloud Ranger District). There are two areas in Newaygo County where Dry Sand Prairie is concentrated. The first area, in T12N R12W Sections 25-27 and Sections 34-36, contains High Rollway, Section 27 Prairie, Newaygo Prairie (USFS) and Finger Prairie. The consolidated U.S.F.S. ownership in this area makes it a prime area to concentrate management for Dry Sand Prairie and associated high priority species, especially the Karner Blue butterfly. Portions of this area probably will require restoration (prescribed burns) to improve the quality of the Sand Prairies and Barrens. Acquisition of private inholdings is also recommended. The second area, in T12N R12W Sections 1-4 and Section 11, contains the Michigan Nature Association's Newaygo Prairie Preserve, The Nature

Conservancy's Ore-Ida Prairie Preserve, and Foss Park Prairie. U.S.F.S. ownership is much more fragmented in this area, but restoration (prescribed burns) of Dry and Mesic Sand Prairie and Barrens are also recommended.

10. Indian Lake (White Cloud Ranger District). The Indian Lake site is a complex of small Dry Sand Prairies, Oak Barrens, and oak-dominated Dry-Mesic Northern Forest, with small areas of Coastal Plain Marsh along the shoreline of Indian Lake. Only the Dry Sand Prairies were of natural area quality. Lupine, the host plant for the Karner Blue butterfly, was found in some of the openings. Based on the presence of lupine and several small openings in the oak forest west of Indian Lake, further inventories will be conducted during the summer of 1991 for both lupine and Karner Blues. If these inventories are successful, the large block of federally owned oaks west of Indian Lake would be a good candidate for Karner Blue management.

11. Brandy Creek Wetlands (Cadillac Ranger District). This large wetland complex supports a diversity of forested wetland communities. It has been recommended for RNA status on the basis of this community diversity. It contains no high priority plants, animals, or natural communities, but is characteristic of the wetland diversity of the Manistee National Forest.

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