Rare Plant Surveys of Proposed Wind Energy Turbine Sites in the Vicinity of the Little Garlic River, Marquette County, Michigan

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan Natural Features Inventory

Prepared by: Bradford S. Slaughter and Michael R. Penskar

Michigan Natural Features Inventory
P.O. Box 30444
Lansing, MI 48909-7944

For:
The Forestland Group, LLC

July 27, 2009
Report Number 2009-08

Suggested Citation:

Slaughter, B.S., and M.R. Penskar. 2009. Rare plant surveys of proposed wind energy turbine sites in the vicinity of the Little Garlic River, Marquette County, Michigan. Michigan Natural Features Inventory Report No. 2009-08, Lansing, MI. 47 pp.

Cover photographs: Mature mesic northern forest dominated by sugar maple (*Acer saccharum*) comprises a significant portion of Parcel 1 (center). Male fern (*Dryopteris filix-mas*), a rare fern listed as special concern in Michigan, occurs in three of the six parcels on thin soils over bedrock exposures (lower left). All photos in report by Bradford Slaughter.

Table of Contents

List of Figures

List of Tables

List of Appendices

INTRODUCTION

In spring 2009, The Forestland Group, LLC, commissioned Michigan Natural Features Inventory (MNFI) to conduct surveys for rare plant species on six five-acre proposed wind energy turbine sites (hereafter, parcels) and their environs located in Marquette County north and northwest of the city of Marquette, in Township 49 North, Range 27 West, in the Southwest ¼ of Section 13, and in Township 49 North, Range 26 West, Sections 19 and 29 (Figure 1). The purpose of the MNFI study was to search for and document the location(s) of state-listed vascular plant species and high quality occurrences of natural communities, particularly those species and communities listed as critically imperiled (S1) or imperiled (S2) in Michigan (for an explanation of state and global element ranks, see Appendix 1), and to provide recommendations for reducing the threats to these elements posed by improvement of access roads and development of wind energy turbine pads. This report summarizes the findings of the MNFI surveys and provides recommendations aimed at minimizing threats to rare plant species and natural communities in the vicinity of the parcels.

Landscape Setting

Regional landscape ecosystems in Michigan have been delineated based on a combination of abiotic and biotic factors, including climate, bedrock, soils, and natural vegetation (Albert 1995). The proposed wind energy turbine sites occur in Ecological Subsection IX.2, referred to as the Michigamme Highland. This ecoregion is characterized by a continental climate with extremely cold winters and heavy snowfall, large areas of exposed Precambrian bedrock (some capped by aeolian silt), and vegetation dominated by northern hardwoods, with mixed conifer-oak forests on narrow ridgetops and forested and non-forested wetlands in generally small drainages (Albert 1995). The environs of the study parcels supported mesic northern forest circa 1800 according to digital maps created by MNFI ecologists on the basis of notes taken by the Michigan General Land Office surveyors in the mid-1800s (Comer et al. 1995). Examination of 1998 and 2005 aerial photos of the area revealed that the majority of the region is still characterized by mesic northern forest, although widespread alteration of canopy composition and structure has resulted from logging activities. Small areas of dry-mesic northern forest and other natural community types also occur in the region (see Methods and Results).

METHODS

Prior to field surveys, we reviewed the MNFI statewide database to compile a list of target species of potential occurrence within the study area. This list was based on the proximity of documented records in habitats similar to those in the study area, primarily rock outcrops (i.e., granite bedrock glade) and upland forest natural communities (dry-mesic northern forest and mesic northern forest). Following database review, we studied and interpreted aerial photographs of the study area and searched the MNFI Rare Species Explorer to develop a complete list of rare plant species known to be associated with the natural community types interpreted to potentially occur in the study area (MNFI 2009) (Table 1).

Systematic meander searches for rare plant species were conducted in all six parcels. Late spring surveys were conducted June 15-17, 2009, and mid-summer surveys were conducted July 13-16, 2009. A Floristic Quality Assessment (FQA) was conducted for each parcel (Herman et al. 2001), and each parcel was classified and described in context of the MNFI natural community classification (Kost et al. 2007). Plant species that were not identified in the field were collected and preserved in a plant press for later identification. Population data for rare plant taxa were recorded and transcribed for entry into the MNFI statewide database. Global Positioning System (GPS) waypoints and tracks were taken in the field on Garmin and HP iPAQ units to document survey coverage of the parcels and to assist in the mapping of rare plant populations and high quality natural features. Photographs representing natural community types and characteristic plant species were taken in each parcel.

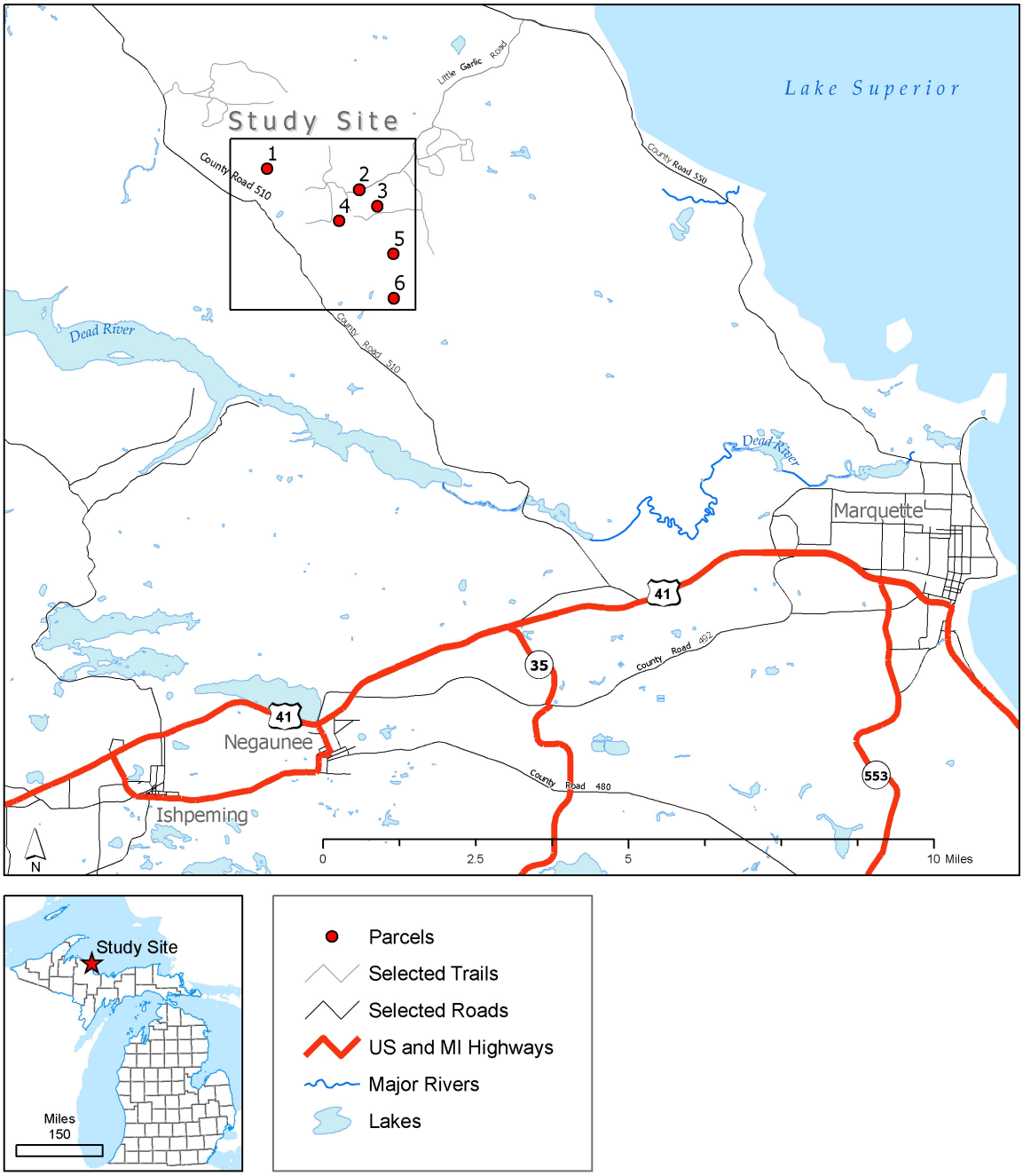

Figure 1. Map of the study area. Parcel locations are as follows. Parcel 1: T49N R27W S13. Parcels 2-4: T49N R26W S19. Parcels 5-6: T49N R26W S29.

Table 1. Rare plants associated with natural communities occurring within or near the study area. Primary survey targets (listed in **bold**) were determined based on presence of apparently suitable habitat within the study area and documented occurrences in the vicinity of the study area.

Community	Scientific Name	Common Name	State Status
Mesic Northern Forest			
	Asplenium rhizophyllum	walking fern	T
	Asplenium scolopendrium var. *americanum*	Hart's-tongue fern	E
	Asplenium trichomanes-ramosum	**green spleenwort**	**SC**
	Botrychium mormo	**goblin moonwort**	**T**
	Carex assiniboinensis	Assiniboia sedge	T
	Carex novae-angliae	New England sedge	T
	Cystopteris laurentiana	Laurentian fragile fern	SC
	Dentaria maxima	large toothwort	T
	Dryopteris filix-mas	**male fern**	**SC**
	Elymus glaucus	**blue wild-rye**	**SC**
	Galearis spectabilis	showy orchis	T
	Galium kamtschaticum	bedstraw	E
	Gnaphalium sylvaticum	cudweed	T
	Panax quinquefolius	ginseng	T
	Prosartes hookeri	fairy bells	E
	Tipularia discolor	cranefly orchid	E
	Triphora trianthophora	three-birds orchid	T
	Viola novae-angliae	New England violet	T
Granite Bedrock Glade			
	Collinsia parviflora	**small blue-eyed Mary**	**T**
	Crataegus douglasii	**Douglas's hawthorn**	**SC**
	Draba arabisans	**rock whitlow-grass**	**SC**
	Dryopteris filix-mas	**male fern**	**SC**
	Dryopteris fragrans	**fragrant cliff woodfern**	**SC**
	Moehringia macrophylla	**big-leaf sandwort**	**T**
	Opuntia fragilis	fragile prickly-pear	E
	Ribes oxyacanthoides	**northern gooseberry**	**SC**
	Woodsia alpina	**northern woodsia**	**E**
Granite Cliff			
	Collinsia parviflora	**small blue-eyed Mary**	**T**
	Dryopteris filix-mas	**male fern**	**SC**
	Dryopteris fragrans	**fragrant cliff woodfern**	**SC**
	Gymnocarpium jessoense	**northern oak fern**	**E**
	Huperzia appalachiana	**mountain fir-moss**	**SC**
	Moehringia macrophylla	**big-leaf sandwort**	**T**
	Pterospora andromedea	**pine-drops**	**T**
	Woodsia alpina	**northern woodsia**	**E**
	Woodsia obtusa	**blunt-lobed woodsia**	**T**
Dry-mesic Northern Forest			
	Arnica cordifolia	heart-leaved arnica	E
	Clematis occidentalis	purple clematis	SC
	Dalibarda repens	false violet	T

Table 1, continued.

	Erigeron acris	fleabane	T
	Isotria verticillata	whorled pogonia	T
	Oplopanax horridus	devil's-club	T
	Osmorhiza depauperata	sweet cicely	T
	Pterospora andromedea	**pine-drops**	**T**
	Senecio indecorus	rayless mountain ragwort	T
Hardwood-Conifer Swamp			
	Berula erecta	cut-leaved water parsnip	T
	Carex seorsa	sedge	T
	Dentaria maxima	large toothwort	T
	Hydrastis canadensis	goldenseal	T
	Lonicera involucrata	black twinberry	T
	Mimulus michiganensis	Michigan monkey flower	E
	Poa paludigena	bog bluegrass	T
	Trillium undulatum	painted trillium	E
Rich Conifer Swamp			
	Amerorchis rotundifolia	small round-leaved orchis	E
	Aster modestus	great northern aster	T
	Calypso bulbosa	calypso	T
	Carex heleonastes	Hudson Bay sedge	E
	Cypripedium arietinum	ram's head lady's-slipper	SC
	Empetrum nigrum	black crowberry	T
	Erigeron hyssopifolius	hyssop-leaved fleabane	T
	Gymnocarpium robertianum	limestone oak fern	T
	Lonicera involucrata	black twinberry	T
	Mimulus michiganensis	Michigan monkey flower	E
	Parnassia palustris	marsh grass-of-Parnassus	T
	Pinguicula vulgaris	butterwort	SC
	Ranunculus lapponicus	Lapland buttercup	T
	Senecio indecorus	rayless mountain ragwort	T
	Solidago houghtonii	Houghton's goldenrod	T
	Stellaria crassifolia	fleshy stitchwort	E
	Vaccinium vitis-idaea	mountain cranberry	E

RESULTS

Rare Plant Surveys

One state-listed vascular plant species, male fern (*Dryopteris filix-mas*), was documented in the study area (Figures 2a-b). Populations of male fern were discovered in Parcels 2, 3, and 4, where the species occurs on slopes and bases of greenstone bedrock outcroppings near and on crests of hills where the bedrock is covered by a thin layer of till and/or a surface layer of leaf litter or moss. Plants occur as scattered individuals or, more commonly, in small to large colonies that sometimes contain greater than 100 individuals. The combined populations are estimated to contain over 1,000 individuals. Despite its local abundance in Parcels 2, 3, and 4, male fern was not found in Parcels 1, 5, and 6, and appears to be sparsely distributed or absent in the matrix forest downslope of the outcroppings, where the bedrock is covered by a thicker layer of glacial till. No other state-listed vascular plant species were documented from the study area (see Discussion). A voucher specimen of male fern was collected for herbarium deposition.

Floristic Quality Assessments

The number of vascular plant taxa identified to species ranged from 71 to 107 per parcel (Table 2). The number of native taxa identified to species ranged from 67 to 103. Native mean coefficient of conservatism (*C*) values ranged from 4.5 to 5.1; mean *C* values including adventive (non-native) taxa ranged from 4.2 to 4.9 (Table 2). Native Floristic Quality Index (FQI) values ranged from 37.0 to 48.6; FQI values including adventive taxa ranged from 35.7 to 47.7 (Table 2). A total of 173 vascular plant taxa were documented within the six parcels, including 162 native species and 11 adventive species (Appendix 2). Refer to Appendices 3a-f for complete Floristic Quality Assessments of each parcel.

Table 2. Floristic Quality Assessment (FQA) summary for Parcels 1-6.

Parcel	Native species	Total species	Native mean *C*	Mean *C* with adventives	Native FQI	FQI with adventives
1	78	75	5.1	4.9	43.8	42.9
2	107	103	4.8	4.6	48.6	47.7
3	86	80	5.0	4.6	44.6	43.0
4	85	80	4.8	4.5	42.9	41.7
5	72	67	4.5	4.2	37.0	35.7
6	81	78	4.6	4.5	40.9	40.1

Parcel Descriptions

The matrix forest in the study area is strongly dominated by sugar maple (*Acer saccharum*), and is classified as mesic northern forest (Cohen 2000, Kost et al. 2007). Sugar maple-dominated forest covered the majority of the acreage in all six parcels. Hemlock (*Tsuga canadensis*) replaced sugar maple as the dominant species on steep north-facing slopes and protected areas near rock faces, where it associated with yellow birch (*Betula alleghaniensis*). Dry-mesic northern forest, dominated by white pine, red pine, and red oak, occurred locally on south-facing slopes and well-drained bedrock exposures (Cohen 2002, Kost et al. 2007). Second-growth dry-mesic northern forest was particularly prevalent in the vicinity of Parcel 1, where white pine, red pine, hemlock, balsam fir, paper birch, and red oak form closed-canopy stands on steep-sided relatively narrow ridgetops. A small area of granite bedrock glade (less than ¼ acre, or 0.1 ha) occurs just west of Parcel 1 (Kost et al. 2007). Small inclusions of hardwood-conifer swamp

Figure 2a. The metapopulation of male fern (*Dryopteris filix-mas*) in the environs of Parcels 2, 3, and 4 represents the fifth known occurrence of the species in Marquette County. The species occurs on slopes and bases of greenstone bedrock outcroppings near and on crests of hills where the bedrock is covered by a thin layer of till and/or a surface layer of leaf litter or moss.

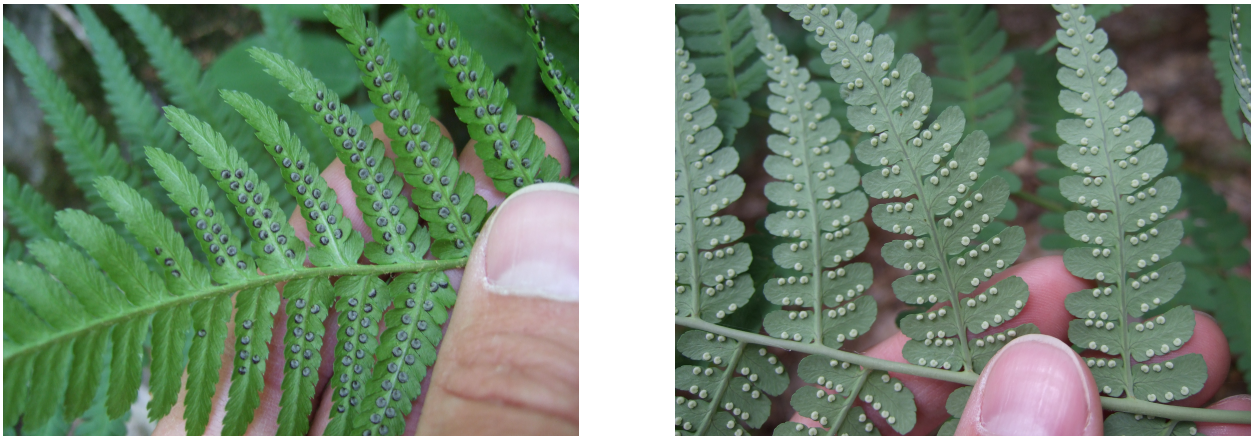

Figure 2b. Male fern (left) can be distinguished from the superficially similar marginal wood fern (*Dryopteris marginalis*) (right) by its sori, which occur well within the margins of the leaf surface.

occurred in Parcels 2 and 5 (Kost et al. 2007, Slaughter et al. 2007). Small areas of rich conifer swamp with canopies dominated by old-growth northern white-cedar (*Thuja occidentalis*) occurred in the vicinity of Parcels 1 and 2 (Kost 2002, Kost et al. 2007). Site-specific summaries are provided in the following parcel descriptions.

Parcel 1

Parcel 1 (Figure 3) is situated on the crest of a steep-sided hill with numerous exposures of greenstone and granite. South-facing slopes and the hill crest are characterized by second-growth dry-mesic northern forest dominated by red pine (*Pinus resinosa*), white pine (*P. strobus*), and hemlock (*Tsuga canadensis*). Gentle to moderate north-facing slopes are characterized by mature mesic northern forest dominated by old-growth sugar maple (*Acer saccharum*), associated with red oak (*Quercus rubra*) and basswood (*Tilia americana*) (Figure 4). The understory of the mesic northern forest portion of the parcel is characterized by ironwood *(Ostrya virginiana*), sugar maple, and striped maple (*Acer pensylvanicum*). Common ground layer species include sugar maple seedlings, wild sarsaparilla (*Aralia nudicaulis*), big leaved aster (*Aster macrophyllus*), sedge (*Carex deweyana*), marginal woodfern (*Dryopteris marginalis*), hairy sweet cicely (*Osmorhiza claytonii*), and downy Solomon-seal (*Polygonatum pubescens*). A small area of granite bedrock glade occurs 50 m west of the parcel and is characterized by scattered, stunted red oak, white pine, and red pine, with a ground layer of blueberry (*Vaccinium angustifolium*), bush honeysuckle (*Diervilla lonicera*), poverty grass (*Danthonia spicata*), and hair grass (*Deschampsia flexuosa*) (Figure 5). No state- or federally-listed vascular plant species were documented in Parcel 1, but the parcel does contain a portion of a small but high quality mesic northern forest, a state rare (S3) community.

Parcel 2

Parcel 2 (Figure 6) is situated on the crest of a steep-sided hill and is characterized by second-growth mesic northern forest dominated by sugar maple (*Acer saccharum*), associated with basswood (*Tilia americana*), red oak (*Quercus rubra*), and, locally, hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) (Figure 7). Scattered old-growth specimens of canopy species are present within the parcel. The understory is characterized by ironwood (*Ostrya virginiana*), striped maple (*Acer pensylvanicum*), and sugar maple. Areas of exposed greenstone and granite contain patches of choke cherry (*Prunus virginiana*) and serviceberry (*Amelanchier interior*) (Figure 8). Common ground layer species in the matrix forest include sugar maple seedlings, wild sarsaparilla (*Aralia nudicaulis*), sedges (primarily *Carex arctata*, *C. deweyana*, and *C. leptonervia*), Canada mayflower (*Maianthemum canadense*), hairy sweet cicely (*Osmorhiza claytonii*), and false melic (*Schizachne purpurascens*), the latter a woodland grass. Common shrubs and herbaceous species of open bedrock exposures include dryland bitter cress (*Cardamine parviflora*), wild basil (*Clinopodium vulgare*), pink corydalis (*Corydalis sempervirens*), poverty grass (*Danthonia spicata*), hair grass (*Deschampsia flexuosa*), wood millet (*Milium effusum*), prickly gooseberry (*Ribes cynosbati*), and snowberry (*Symphoricarpos albus*). Characteristic species of protected rock crevices and walls include wild columbine (*Aquilegia canadensis*), maidenhair spleenwort (*Asplenium trichomanes*), fragile fern (*Cystopteris tenuis*), common polypody (*Polypodium virginianum*), northern holly fern (*Polystichum lonchitis*), northern beech fern (*Thelypteris phegopteris*), great spurred violet (*Viola selkirkii*), and rusty woodsia (*Woodsia ilvensis*). This parcel contains a portion of a large population of male fern (*Dryopteris filix-mas*), a state rare (S3) species listed as special concern.

Parcel 3

Parcel 3 (Figure 6) is situated on a hill crest characterized by second-growth mesic northern forest dominated by small-diameter sugar maple (*Acer saccharum*), associated with white ash (*Fraxinus americana*), basswood (*Tilia americana*), and red oak (*Quercus rubra*). A small area of mature trees occurs in the central portion of the parcel. The understory of the matrix forest is characterized by sugar

maple, striped maple (*Acer pensylvanicum*), and ironwood (*Ostrya virginiana*). Areas of exposed greenstone and granite contain patches of choke cherry (*Prunus virginiana*), associated with serviceberry (*Amelanchier interior*) and hawthorn (*Crataegus* sp.). Common ground layer species in the matrix forest include sugar maple seedlings, wild sarsaparilla (*Aralia nudicaulis*), sedge (*Carex deweyana*), evergreen wood fern (*Dryopteris intermedia*), Dutchman's breeches (*Dicentra cucullaria*), wood millet (*Milium effusum*), hairy sweet cicely (*Osmorhiza claytonii*), and hairy yellow violet (*Viola pubescens*) (Figure 9). Common shrubs and herbaceous species on open bedrock exposures include dryland bitter cress (*Cardamine parviflora*), wild basil (*Clinopodium vulgare*), pink corydalis (*Corydalis sempervirens*), poverty grass (*Danthonia spicata*), hair grass (*Deschampsia flexuosa*), prickly gooseberry (*Ribes cynosbati*), and snowberry (*Symphoricarpos albus*). Characteristic species of sheltered rock crevices and walls include wild columbine (*Aquilegia canadensis*), maidenhair spleenwort (*Asplenium trichomanes*), fragile fern (*Cystopteris tenuis*), common polypody (*Polypodium virginianum*), northern holly fern (*Polystichum lonchitis*), great spurred violet (*Viola selkirkii*), and Oregon woodsia (*Woodsia oregana*) (Figure 10). This parcel contains a portion of a relatively large population of male fern (*Dryopteris filix-mas*), a state vulnerable (S3) species of special concern.

Parcel 4

Parcel 4 (Figure 6) occurs on a hill crest in the vicinity of the south branch of the Little Garlic River, and is characterized by second-growth mesic northern forest dominated by sugar maple (*Acer saccharum*), associated with red oak (*Quercus rubra*) (Figure 11). The parcel contains significant areas of greenstone outcroppings and boulders, which support an open canopy of stunted hardwoods and a patchy understory dominated by choke cherry (*Prunus virginiana*) with such associates as serviceberry (*Amelanchier interior*) and prickly gooseberry (*Ribes cynosbati*). Sugar maple saplings, ironwood (*Ostrya virginiana*), and striped maple (*Acer pensylvanicum*) are common understory species in areas with deeper soil. Common ground layer species in the matrix forest include big leaved aster (*Aster macrophyllus*), wood millet (*Milium effusum*), Canada mayflower (*Maianthemum canadense*), and rough-leaved rice grass (*Oryzopsis asperifolia*). Relatively open bedrock exposures support dryland bitter cress (*Cardamine parviflora*), wild basil (*Clinopodium vulgare*), pink corydalis (*Corydalis sempervirens*), hair grass (*Deschampsia flexuosa*), western fescue (*Festuca occidentalis*), bottlebrush grass (*Hystrix patula*), snowberry (*Symphoricarpos albus*), and a variety of other species uncommon or absent in the matrix forest. Characteristic species of sheltered rock crevices and walls include wild columbine (*Aquilegia canadensis*), maidenhair spleenwort (*Asplenium trichomanes*), fragile fern (*Cystopteris tenuis*), common polypody (*Polypodium virginianum*), Braun's holly fern (*Polystichum braunii*), northern holly fern (*P. lonchitis*), northern beech fern (*Thelypteris phegopteris*), and great spurred violet (*Viola selkirkii*). This parcel contains a portion of a relatively large population of male fern (*Dryopteris filix-mas*), a state vulnerable (S3) species of special concern.

Parcel 5

Parcel 5 (Figure 12) occurs on a gently sloping hill crest at an elevation of >1400 ft (430 m). The parcel is characterized by second- and third-growth mesic northern forest dominated by small-diameter sugar maple (*Acer saccharum*), associated with red oak (*Quercus rubra*) (Figure 13). The high density of sugar maple saplings and seedlings observed in this parcel is the result of relatively recent selective removal of canopy trees, including old-growth red oak (Figure 14). The understory is dominated by sugar maple, ironwood (*Ostrya virginiana*), and striped maple (*Acer pensylvanicum*). Common ground layer species include sugar maple seedlings, wild sarsaparilla (*Aralia nudicaulis*), sedges (primarily *Carex arctata* and *C. deweyana*), Canada mayflower (*Maianthemum canadense*), bluegrass (*Poa saltuensis*), downy Solomon-seal (*Polygonatum pubescens*), and false melic (*Schizachne purpurascens*). Small areas of greenstone outcroppings occur within the parcel, and support several ferns. The southwestern portion of the parcel contains a small area of a narrow drainage characterized by hardwood-conifer swamp with an

open canopy of hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*). No state- or federally-listed vascular plant species or high quality natural community occurrences were documented in Parcel 5.

Parcel 6

Parcel 6 (Figure 12) occurs on the crest of a hill east of Nash Lake at an elevation of >1400 ft (430 m). The parcel is characterized by second-growth mesic northern forest on broken, uneven topography with numerous greenstone outcroppings and boulders. The canopy is generally dominated by sugar maple (*Acer saccharum*), associated with red oak (*Quercus rubra*). At the base of a significant vertical bedrock exposure in the south portion of the parcel, hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*) dominate the canopy (Figure 15). Common understory species include ironwood (*Ostrya virginiana*), striped maple (*Acer pensylvanicum*), sugar maple, and choke cherry (*Prunus virginiana*). Common ground layer species include sugar maple seedlings, starflower (*Trientalis borealis*), downy Solomon-seal (*Polygonatum pubescens*), false melic (*Schizachne purpurascens*), rough-leaved rice grass (*Oryzopsis asperifolia*), and sedge (*Carex deweyana*). Greenstone exposures support several species otherwise uncommon or absent in the matrix forest, including wild columbine (*Aquilegia canadensis*), maidenhair spleenwort (*Asplenium trichomanes*), pink corydalis (*Corydalis sempervirens*), fragile fern (*Cystopteris tenuis*), common polypody (*Polypodium virginianum*), northern holly fern (*Polystichum lonchitis*), and Oregon woodsia (*Woodsia oregana*). No state- or federally-listed vascular plant species or high quality natural community occurrences were documented in Parcel 6.

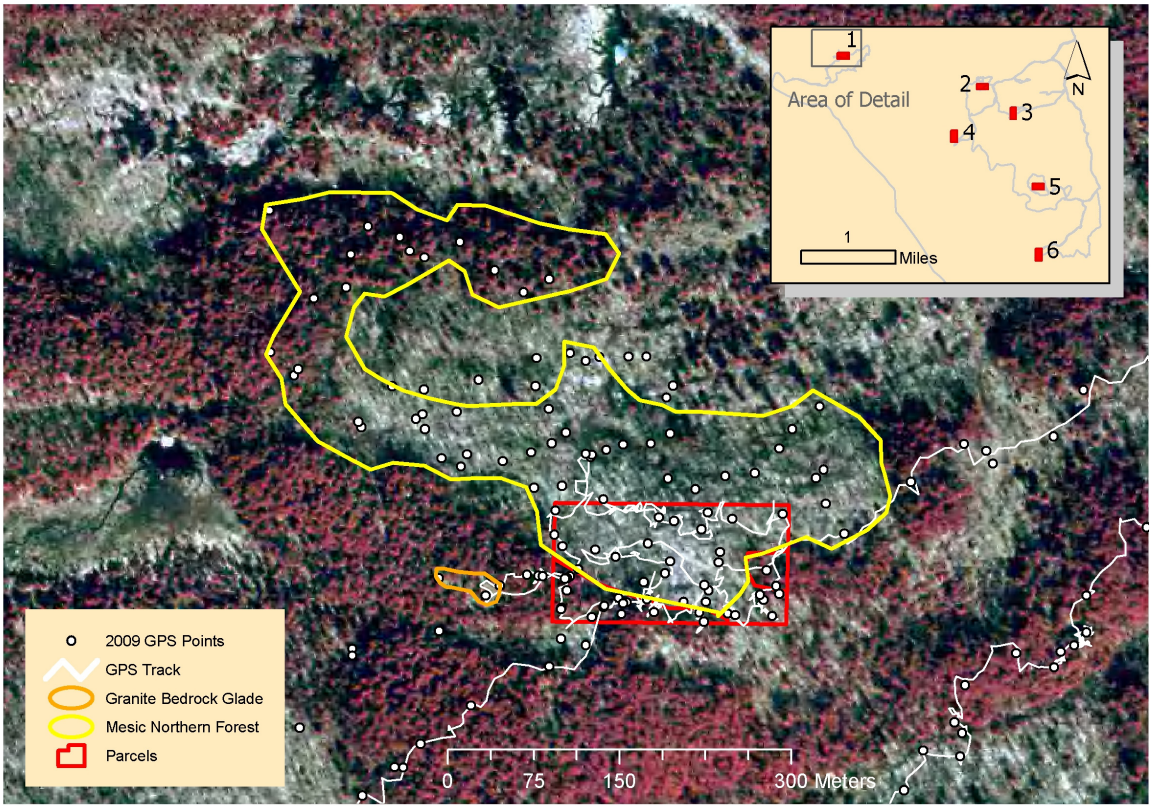

Figure 3. Parcel 1 and environs, including GPS track and points (white) and boundaries of high quality mesic northern forest (yellow) and granite bedrock glade (orange).

Figure 4. Mature mesic northern forest dominated by old-growth sugar maple (*Acer saccharum*) occurs on gentle to moderate north-facing slopes in Parcel 1.

Figure 5. A small granite bedrock glade occurs west of Parcel 1. Exposed rock surfaces support patchy cover of lichens (*Cladina* spp.), blueberry (*Vaccinium angustifolium*), bush honeysuckle (*Diervilla lonicera*), poverty grass (*Danthonia spicata*), and hair grass (*Deschampsia flexuosa*).

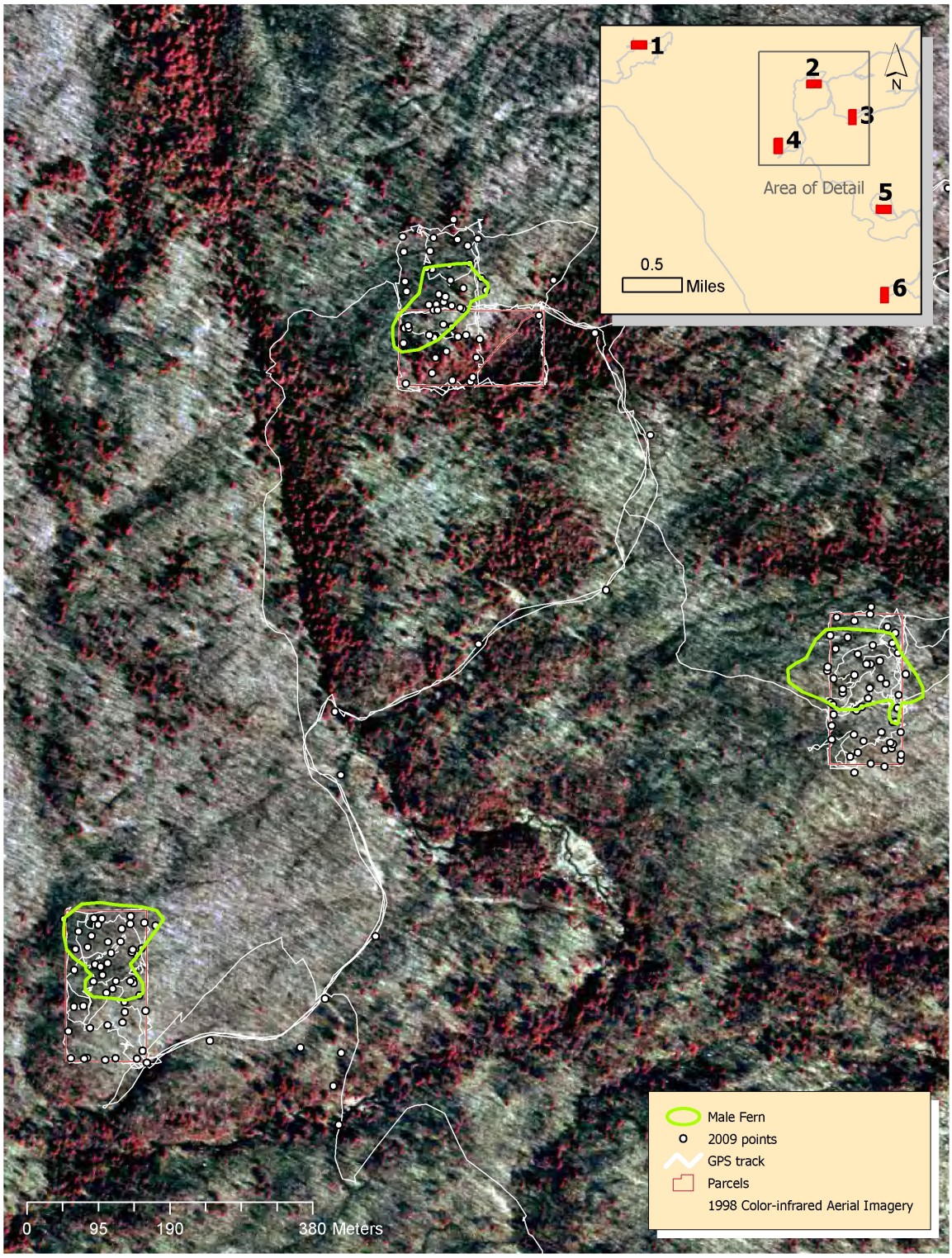

Figure 6. Parcels 2, 3, and 4 and environs, including GPS track and points (white) and distribution of male fern (*Dryopteris filix-mas*) populations (green). The boundaries of Parcel 2 were changed in the field to avoid a wetland area, and roughly follow the outline of the GPS track.

Figure 7. White pine (*Pinus strobus*) associates with small-diameter sugar maple (*Acer saccharum*) and red oak (*Quercus rubra*) on exposed bedrock in Parcel 2.

Figure 8. Open exposures of granitic bedrock support numerous shrubs and forbs that serve as summer nectar "oases" within the matrix forest. These nectar sources are defended by territorial males of butterfly species such as mourning cloak (*Nymphalis antiopa*) and white admiral (*Limenitis arthemis arthemis*).

Figure 9. Wood millet (*Milium effusum*) is locally abundant on partially forested rock outcrops in Parcel 3.

Figure 10. Sheltered rock crevices and walls provide habitat for numerous ferns and forbs, including fragile fern (*Cystopteris tenuis*), great spurred violet (*Viola selkirkii*), and downy Solomon-seal (*Polygonatum pubescens*).

Figure 11. Sloping, undulating topography with thin till over bedrock characterizes Parcel 4.

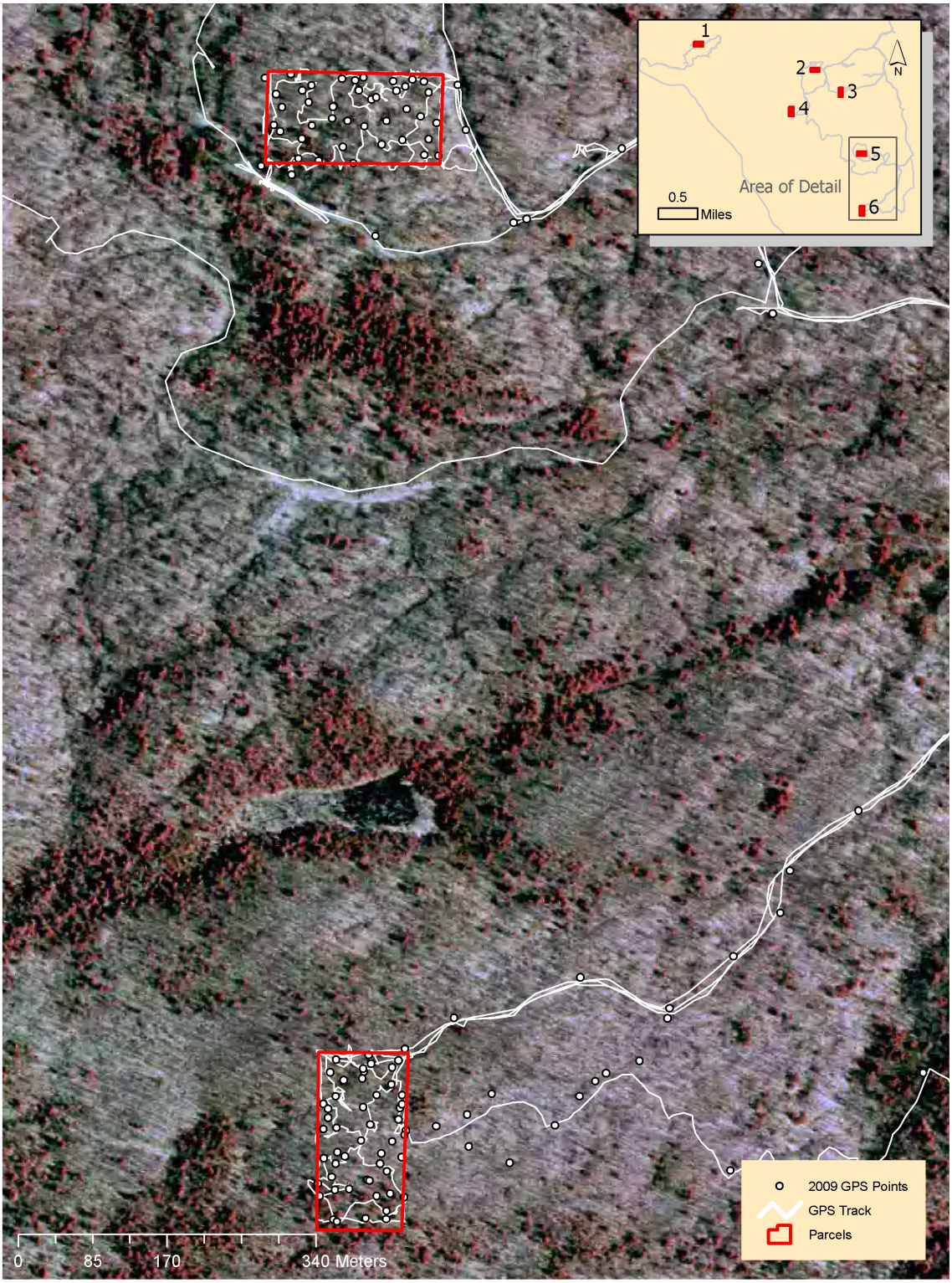

Figure 12. Parcels 5 and 6 and environs, including GPS track and points (white). No rare species or significant natural features were located in this area.

Figure 13. Young mesic northern forest containing small areas of exposed bedrock occurs throughout Parcel 5.

Figure 14. A high density of young sugar maple (*Acer saccharum*) stems creates dense shade in the understory of Parcel 5. Recent logging activity removed mature canopy trees, including one red oak that contained at least 260 growth rings.

Figure 15. The base of a significant vertical bedrock exposure in Parcel 6 supports hemlock (*Tsuga canadensis*), associated with yellow birch (*Betula alleghaniensis*) and other hardwoods. Forest structure and canopy composition in the study area are strongly influenced by slope, aspect, and soils.

DISCUSSION

Rare Plant Surveys

Male fern is considered vulnerable (S3) in Michigan, with 25 documented occurrences, concentrated in Ontonagon, Keweenaw, and Marquette counties. Only nine of these populations are considered of good or excellent viability (MNFI 2009). The sizable populations of male fern documented in and near Parcels 2, 3, and 4 comprise a metapopulation that ranks among the largest occurrences of the species in the state. Male fern appears to be restricted to bedrock outcroppings and areas of thin till on upper slopes and hill crests under partial to complete canopy closure. These high elevation areas are particularly vulnerable to development of wind turbine sites. Additional surveys of upper slopes and hill crests in the region may reveal more populations of this rare fern.

Although only one rare plant species (male fern) was documented in the surveys, there is potential for the occurrence of state special concern Douglas's hawthorn (*Crataegus douglassii*), a state rare to apparently secure (S3S4) hawthorn that is known from approximately 50 occurrences on thin-soiled bedrock glades and hilltops in upper Michigan (MNFI 2009). A hawthorn not identified to the species level was documented from open-canopied bedrock outcrops in Parcels 1 and 3, and may represent Douglas's hawthorn. Douglas's hawthorn can be identified by its characteristic purplish-black fruits which develop in late summer and fall. The species was in flower during the surveys, with no fruits apparent in either June or July. A late season visit to the study parcels may determine if Douglas's hawthorn occurs in the area.

Location and identification of several other target species would have benefited from surveys at different times of the growing season. For example, small blue-eyed Mary (*Collinsia parviflora*, state threatened), a species of bedrock outcrops, flowers early (May), and is difficult to locate after flowering. Species such as Douglas's hawthorn, pine-drops (*Pterospora andromedea*, state threatened), and goblin moonwort (*Botrychium mormo*, state threatened) are more evident and/or easier to identify in late summer (Penskar and Higman 1996, Higman and Penskar 1999, MNFI 2009). Additional surveys in mid-spring and late summer/early fall would complement the late spring and mid-summer surveys and provide a more complete documentation of the flora, including rare species, of the study area.

Floristic Quality Assessments

Mean *C* values between 4.5 and 5.1 (native taxa only) or 4.2 and 4.9 (including adventive taxa), and FQI values between 37.0 and 48.6 (including native taxa only) or 35.7 and 47.7 (including adventive taxa) indicate an intact native flora in all six study parcels. Parcel 2 registered a particularly high FQI due to the presence of a wetland area and associated species within the parcel. Parcel 5, which had the lowest mean *C* and FQI values, was also the most disturbed parcel, having been impacted by relatively recent logging activity. All six parcels were dominated by native plant species. Most of the adventive species documented in the study parcels, including lamb's quarters (*Chenopodium* sp.), common hemp nettle (*Galeopsis tetrahit*), orange hawkweed (*Hieracium aurantiacum*), glaucous king devil (*H. piloselloides*), Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), sheep sorrel (*Rumex acetosella*), common dandelion (*Taraxacum officinale*), and common mullein (*Verbascum thapsus*) occurred on relatively open bedrock openings, and many of these species have the potential to threaten diversity and community structure in granite bedrock glade and associated natural communities (Kost et al. 2007). In most parcels, these species were local or were distributed throughout the habitat at low frequency. Maintenance of a mature, forested buffer around bedrock glades can serve to isolate these open habitats from open, disturbed areas that serve as source populations. One species, marsh thistle (*Cirsium palustre*), occurs in wetlands and appears to readily invade moist areas along logging roads and trails. The impacts of this species on wetlands can be minimized by maintaining canopy closure and preventing new road

construction in wetland areas. In general, the low numbers of non-native plants in all six parcels can likely be attributed to the continuous presence of forest in the study area (i.e., the land was never converted to another intensive use), and the relative lack of soil disturbance outside the logging trails.

Natural Communities

The small but high quality example of old-growth mesic northern forest documented in and outside of Parcel 1 will be considered for inclusion in the MNFI statewide database (Figure 3). Despite the imperiled status (S2) of granite bedrock glade in Michigan, the example near Parcel 1 is too small to be recognized in the MNFI statewide database. The majority of the forest in the study area has been disturbed by logging and an associated reduction in canopy diversity, and does not meet criteria for inclusion in the MNFI statewide database.

SUMMARY AND RECOMMENDATIONS

Field surveys revealed the presence of one state rare (S3) plant species listed as special concern, male fern (*Dryopteris filix-mas*), in Parcels 2, 3, and 4. An unidentified hawthorn (*Crataegus* sp.) that may represent Douglas's hawthorn (*Crataegus douglasii*), another species of special concern, was documented from Parcels 1 and 3. No critically imperiled (S1) or imperiled (S2) vascular plant species were documented in the proposed wind energy turbine sites, but early season and late season surveys are recommended to determine if early-flowering rare species, or rare species that emerge later in the summer, are present in the parcels. The parcels encompasses portions of three natural community types, mesic northern forest, dry-mesic northern forest, and hardwood-conifer swamp. Small examples of granite bedrock glade and rich conifer swamp occurred in the environs of the study parcels. Parcel 1 contained a portion of an old-growth mesic northern forest that will be considered for inclusion in the MNFI statewide database as a high quality occurrence.

Wherever possible, wind energy turbine pads should be located in areas within the study parcels that do not contain sensitive natural features. This will be difficult in Parcel 1, where most of the parcel is of high ecological integrity (Figure 3). In Parcels 2, 3, and 4, placement of these pads should avoid, where possible, sensitive rock outcrop habitats that support populations of male fern (Figure 6). No rare plants or significant natural features were discovered in Parcels 5 and 6 (Figure 12). A combination of early and late season rare plant surveys, in addition to surveys of high elevation forests and outcrops in the area surrounding the proposed pad sites, will provide a better understanding of whether development of wind energy turbine pad sites will have significant impacts on the overall population numbers of male fern in the area and on the acreage of sensitive rock outcrop habitat in the region.

LITERATURE CITED

Albert, D.A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: A working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. Northern Prairie Wildlife Research Center Home Page. Available http://www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm (Version 03JUN98) (Accessed 26 July 2009).

Cohen, J.G. 2000. Natural community abstract for mesic northern forest. Michigan Natural Features Inventory, Lansing, MI. 7 pp.

Cohen, J.G. 2002. Natural community abstract for dry-mesic northern forest. Michigan Natural Features Inventory, Lansing, MI. 12 pp.

Comer, P.J., D.A. Albert, H.A. Wells, B.L. Hart, J.B. Raab, D.L. Price, D.M. Kashian, R.A. Corner, and D.W. Schuen. 1995. Michigan's presettlement vegetation, as interpreted from the General Land Office Surveys 1816-1856. Michigan Natural Features Inventory, Lansing, MI. Digital map.

Herman, K. D., L. A. Masters, M. R. Penskar, A. A. Reznicek, G. S. Wilhelm, W. W. Brodovich, and K. P. Gardiner. 2001. Floristic Quality Assessment with Wetland Categories and Examples of Computer Applications for the State of Michigan – Revised, 2nd Edition. Michigan Department of Natural Resources, Wildlife, Natural Heritage Program. Lansing, MI. 19 pp. + Appendices.

Higman, P.J., and M.R. Penskar. 1999. Special plant abstract for *Pterospora andromedea* (pine-drops). Michigan Natural Features Inventory, Lansing, MI. 2 pp.

Kost, M.A. 2002. Natural community abstract for rich conifer swamp. Michigan Natural Features Inventory, Lansing, MI. 9 pp.

Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural Communities of Michigan: Classification and Description. Michigan Natural Features Inventory Report No. 2007-21, Lansing, MI. 314 pp.

Michigan Natural Features Inventory (MNFI). 2009. Rare Species Explorer [Web application]. Michigan Natural Features Inventory, Lansing, MI. Available http://web4.msue.msu.edu/mnfi/explorer/index.cfm (Accessed: 12 June 2009).

Penskar, M.R., and P.J. Higman. 1996. Special plant abstract for *Botrychium mormo* (goblin moonwort). Michigan Natural Features Inventory, Lansing, MI. 3 pp.

Slaughter, B.S., J.G. Cohen, and M.A. Kost. 2007. Natural community abstract for hardwood-conifer swamp. Michigan Natural Features Inventory, Lansing, MI. 19 pp.

ACKNOWLEDGEMENTS

Funding for this project was provided by The Forestland Group, LLC. We thank Shawn Hagan of The Forestland Group for initiating the surveys and for providing feedback on survey goals and the drafting of the final report. We thank Nate Nelson of Cold Springs Forestry for marking the boundaries of the parcels and for assisting in late spring field surveys. We especially thank Nate for furnishing a GPS unit with maps to the first author for use in the field after an unexpected equipment failure threatened to scuttle the use of the latest modern technology during field surveys. Todd Bishop of Cold Springs Forestry provided maps and shapefiles of the study area and parcels, and downloaded and provided GPS tracks for use in the report. Identification of unknown plants was assisted by Robert Preston and A. A. Reznicek of the University of Michigan Herbarium. We thank several MNFI staff for supporting the project, including Helen Enander, who developed Figures 1, 3, 6, and 12, and Brian Klatt, Nancy Toben, and Sue Ridge for administrative support.

Appendix 1. Global and state element ranking criteria.

GLOBAL RANKS

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

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

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

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

G5 = secure: common; widespread.

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

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

G? = incomplete data.

STATE RANKS

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

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

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

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

S5 = common and widespread in the state.

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

S? = incomplete data.

Appendix 2. Summary list of vascular plants documented in proposed wind turbine parcels. Capitalized scientific names indicate non-native species.

Scientific Name	Common Name	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 5	Parcel 6
Abies balsamea	BALSAM FIR	x	x		x	x	x
Acer pensylvanicum	STRIPED MAPLE	x	x	x	x	x	x
Acer rubrum	RED MAPLE	x	x	x	x	x	x
Acer saccharum	SUGAR MAPLE	x	x	x	x	x	x
Acer spicatum	MOUNTAIN MAPLE			x			
Achillea millefolium	YARROW			x			
Actaea pachypoda	DOLL'S EYES						x
Actaea sp.	DOLL'S EYES	x	x		x		
Agropyron trachycaulum	SLENDER WHEAT GRASS		x	x			
Agrostis hyemalis	TICKLEGRASS		x				
Alnus rugosa	TAG ALDER		x				
Amelanchier arborea	JUNEBERRY		x	x		x	x
Amelanchier interior	SERVICEBERRY	x	x	x	x	x	
Amelanchier sanguinea	ROUND LEAVED SERVICEBERRY	x	x				
Antennaria howellii	SMALL PUSSYTOES	x	x				
Apocynum androsaemifolium	SPREADING DOGBANE		x	x	x	x	
Aquilegia canadensis	WILD COLUMBINE	x	x	x	x		x
Aralia nudicaulis	WILD SARSAPARILLA	x	x	x	x	x	x
Aralia racemosa	SPIKENARD		x				x
Arisaema triphyllum	JACK IN THE PULPIT		x				x
Asplenium trichomanes	MAIDENHAIR SPLEENWORT	x	x	x	x		x
Aster ciliolatus	NORTHERN HEART LEAVED ASTER				x		x
Aster lateriflorus	SIDE FLOWERING ASTER		x				
Aster macrophyllus	BIG LEAVED ASTER	x	x	x	x	x	x
Aster sagittifolius	ARROW LEAVED ASTER			x			
Aster umbellatus	TALL FLAT TOP WHITE ASTER						x
Athyrium filix-femina	LADY FERN		x	x	x	x	x
Betula alleghaniensis	YELLOW BIRCH		x	x	x	x	x
Betula papyrifera	PAPER BIRCH	x			x		x
Botrychium virginianum	RATTLESNAKE FERN	x	x	x	x		x
Brachyelytrum erectum	LONG AWNED WOOD GRASS	x	x	x	x	x	x
Calamagrostis canadensis	BLUE JOINT GRASS					x	x
Caltha palustris	MARSH MARIGOLD		x				
Cardamine parviflora	DRYLAND BITTER CRESS	x	x	x	x		
Carex arctata	SEDGE	x	x	x	x	x	x
Carex backii	SEDGE			x			
Carex brunnescens	SEDGE			x		x	
Carex deweyana	SEDGE	x	x	x	x	x	x
Carex disperma	SEDGE					x	
Carex gynandra	SEDGE					x	x
Carex intumescens	SEDGE		x	x	x	x	x
Carex leptalea	SEDGE		x				
Carex leptonervia	SEDGE	x	x		x	x	x
Carex pedunculata	SEDGE		x	x	x	x	x

Appendix 2, continued.

Scientific Name	Common Name	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 5	Parcel 6
Carex sp.	SEDGE						x
Chelone glabra	TURTLEHEAD		x				
Chenopodium sp.	LAMB'S QUARTERS		x				
Chrysosplenium americanum	GOLDEN SAXIFRAGE		x				
Cinna latifolia	WOOD REEDGRASS	x		x	x	x	x
CIRSIUM PALUSTRE	MARSH THISTLE					x	x
Claytonia caroliniana	CAROLINA SPRING BEAUTY			x	x		
Clinopodium vulgare	WILD BASIL		x	x	x	x	
Clintonia borealis	BLUEBEAD LILY; CORN LILY		x		x		
Conopholis americana	SQUAWROOT	x		x			
Coptis trifolia	GOLDTHREAD				x	x	
Corallorhiza maculata	SPOTTED CORAL ROOT	x	x				
Corydalis sempervirens	PINK or PALE CORYDALIS		x	x	x	x	x
Corylus cornuta	BEAKED HAZELNUT		x	x			
Crataegus sp.	HAWTHORN	x		x			
Cypripedium acaule	PINK LADY'S SLIPPER		x				
Cystopteris tenuis	FRAGILE FERN		x	x	x	x	x
Danthonia spicata	POVERTY GRASS; OATGRASS	x	x	x			
Dentaria laciniata	CUT LEAVED TOOTHWORT			x	x		
Deschampsia flexuosa	HAIR GRASS	x	x	x	x	x	x
Dicentra cucullaria	DUTCHMAN'S BREECHES		x	x			
Diervilla lonicera	BUSH HONEYSUCKLE	x	x	x	x		
Diphasiastrum digitatum	GROUND CEDAR				x	x	
Dirca palustris	LEATHERWOOD	x					
Dryopteris carthusiana	SPINULOSE WOODFERN					x	
Dryopteris cristata	CRESTED SHIELD FERN		x			x	
Dryopteris filix-mas	MALE FERN		x	x	x		
Dryopteris intermedia	EVERGREEN WOODFERN	x	x	x	x	x	x
Dryopteris marginalis	MARGINAL WOODFERN	x		x			
Epilobium coloratum	CINNAMON WILLOW HERB					x	
Equisetum arvense	COMMON HORSETAIL		x				x
Equisetum sylvaticum	WOODLAND HORSETAIL					x	
Festuca occidentalis	WESTERN FESCUE	x			x		x
Fragaria sp.	WILD STRAWBERRY	x					
Fraxinus americana	WHITE ASH			x	x		
Fraxinus nigra	BLACK ASH		x				
GALEOPSIS TETRAHIT	COMMON HEMP NETTLE					x	
Galium triflorum	FRAGRANT BEDSTRAW	x	x	x	x	x	x
Gaylussacia baccata	HUCKLEBERRY	x					
Geranium robertianum	HERB ROBERT			x			
Glyceria striata	FOWL MANNA GRASS		x				x
Gnaphalium obtusifolium	OLD FIELD BALSAM					x	x
Goodyera oblongifolia	MENZIES' RATTLESNAKE PLANTAIN	x	x		x		
Gymnocarpium dryopteris	OAK FERN	x	x	x			x
Hepatica americana	ROUND LOBED HEPATICA	x	x	x	x		
HIERACIUM AURANTIACUM	ORANGE HAWKWEED			x		x	

Appendix 2, continued.

Scientific Name	Common Name	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 5	Parcel 6
Hieracium kalmii	KALM'S HAWKWEED		x				
HIERACIUM PILOSELLOIDES	GLAUCOUS KING DEVIL	x	x	x	x	x	
Huperzia lucidula	SHINING CLUBMOSS	x	x		x	x	x
Hystrix patula	BOTTLEBRUSH GRASS			x	x		
Impatiens capensis	SPOTTED TOUCH ME NOT		x				
Iris versicolor	WILD BLUE FLAG						x
Juncus effusus	SOFT STEMMED RUSH					x	
Lactuca canadensis	TALL LETTUCE			x	x		x
Linnaea borealis	TWINFLOWER	x					
Lonicera canadensis	AMERICAN FLY HONEYSUCKLE	x	x	x	x	x	x
Lonicera hirsuta	HAIRY HONEYSUCKLE	x		x			
Lycopodium clavatum	RUNNING GROUND PINE				x		
Lycopus uniflorus	NORTHERN BUGLE WEED		x			x	
Maianthemum canadense	CANADA MAYFLOWER	x	x	x	x	x	x
Matteuccia struthiopteris	OSTRICH FERN						x
Melampyrum lineare	COW WHEAT	x					
Milium effusum	WOOD MILLET	x	x	x	x	x	
Mitchella repens	PARTRIDGE BERRY		x		x	x	x
Mitella nuda	NAKED MITERWORT		x				
Onoclea sensibilis	SENSITIVE FERN		x				x
Oryzopsis asperifolia	ROUGH LEAVED RICE GRASS	x	x	x	x	x	x
Oryzopsis pungens	RICE GRASS	x	x	x	x		
Osmorhiza claytonii	HAIRY SWEET CICELY	x	x	x	x		x
Osmunda claytoniana	INTERRUPTED FERN						x
Osmunda regalis	ROYAL FERN						x
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	x	x	x	x	x	x
Picea glauca	WHITE SPRUCE	x	x		x	x	x
Pinus resinosa	RED PINE	x					
Pinus strobus	WHITE PINE	x	x				
Platanthera orbiculata	LARGE ROUND LEAVED ORCHID						x
POA COMPRESSA	CANADA BLUEGRASS			x			
POA PRATENSIS	KENTUCKY BLUEGRASS	x	x	x			
Poa saltuensis	BLUEGRASS		x	x	x	x	x
Polygonatum pubescens	DOWNY SOLOMON SEAL	x	x	x	x	x	x
Polygonum cilinode	FRINGED FALSE BUCKWHEAT	x	x	x	x	x	x
Polypodium virginianum	COMMON POLYPODY	x	x	x	x		x
Polystichum braunii	BRAUN'S HOLLY FERN				x	x	
Polystichum lonchitis	NORTHERN HOLLY FERN	x	x	x	x	x	x
Populus grandidentata	BIG TOOTHED ASPEN		x				
Populus tremuloides	QUAKING ASPEN	x	x				x
Prunus virginiana	CHOKE CHERRY	x	x	x	x	x	x
Pteridium aquilinum	BRACKEN FERN	x	x	x	x	x	x
Pyrola elliptica	LARGE LEAVED SHINLEAF				x	x	
Quercus rubra	RED OAK	x	x	x	x	x	x
Ranunculus abortivus	SMALL FLOWERED BUTTERCUP		x	x	x		
Ranunculus recurvatus	HOOKED CROWFOOT						x

Appendix 2, continued.

Scientific Name	Common Name	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 5	Parcel 6
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	x	x	x	x	x	x
Rosa acicularis	WILD ROSE	x		x			
Rubus parviflorus	THIMBLEBERRY	x	x	x	x	x	x
Rubus pubescens	DWARF RASPBERRY		x				
Rubus strigosus	WILD RED RASPBERRY	x	x	x	x	x	x
RUMEX ACETOSELLA	SHEEP SORREL				x		
Salix sp.	WILLOW					x	
Sambucus racemosa	RED BERRIED ELDER	x	x	x			x
Saxifraga virginiensis	EARLY SAXIFRAGE	x					
Schizachne purpurascens	FALSE MELIC	x	x	x	x	x	x
Scirpus atrovirens	BULRUSH					x	x
Scirpus cyperinus	WOOL GRASS					x	x
Scutellaria lateriflora	MAD DOG SKULLCAP		x				
Smilacina racemosa	FALSE SPIKENARD		x	x	x	x	x
Streptopus roseus	ROSE TWISTED STALK	x	x	x		x	x
Symphoricarpos albus	SNOWBERRY	x	x	x	x		
TARAXACUM OFFICINALE	COMMON DANDELION	x	x	x	x	x	x
Thelypteris phegopteris	NORTHERN BEECH FERN	x	x		x	x	x
Thuja occidentalis	ARBOR VITAE		x		x		
Tilia americana	BASSWOOD	x	x	x	x		x
Toxicodendron radicans	POISON IVY	x					
Trientalis borealis	STARFLOWER	x	x	x	x	x	x
Trillium cernuum	NODDING TRILLIUM		x				
Tsuga canadensis	HEMLOCK	x	x		x	x	x
Ulmus americana	AMERICAN ELM			x	x		
Uvularia grandiflora	BELLWORT		x				
Vaccinium angustifolium	BLUEBERRY	x	x				
Vaccinium myrtilloides	CANADA BLUEBERRY	x			x		
VERBASCUM THAPSUS	COMMON MULLEIN			x			x
VERONICA OFFICINALIS	COMMON SPEEDWELL		x		x		
Viola blanda	SWEET WHITE VIOLET		x		x		
Viola pubescens	YELLOW VIOLET	x	x	x	x	x	
Viola renifolia	KIDNEY LEAVED VIOLET	x		x			x
Viola selkirkii	GREAT SPURRED VIOLET	x	x	x	x	x	x
Viola sp.	VIOLET					x	x
Woodsia ilvensis	RUSTY WOODSIA	x	x				
Woodsia oregana	OREGON WOODSIA			x			x

Appendix 3a. Floristic Quality Assessment of Parcel 1.

```
Site:     Forestland Group - Parcel 1
Locale:   Marquette Co., MI
Date:     July 16, 2009   - hours
          June 17, 2009   - hours
By:       Brad Slaughter
File:     c:\Documents and Settings\Brad\Desktop\attachments_2009_07_23\Forestland Group Parcel 1.inv
Notes:    Also:
          Actaea sp.
          Crataegus sp.
          Fragaria sp.
```

FLORISTIC QUALITY DATA		Native			Adventive		
75	NATIVE SPECIES	Tree	14	17.9%	Tree	0	0.0%
78	Total Species	Shrub	15	19.2%	Shrub	0	0.0%
5.1	NATIVE MEAN C	W-Vine	1	1.3%	W-Vine	0	0.0%
4.9	W/Adventives	H-Vine	0	0.0%	H-Vine	0	0.0%
43.8	NATIVE FQI	P-Forb	20	25.6%	P-Forb	2	2.6%
42.9	W/Adventives	B-Forb	0	0.0%	B-Forb	0	0.0%
2.6	NATIVE MEAN W	A-Forb	2	2.6%	A-Forb	0	0.0%
2.6	W/Adventives	P-Grass	9	11.5%	P-Grass	1	1.3%
AVG:	Fac. Upland	A-Grass	0	0.0%	A-Grass	0	0.0%
		P-Sedge	3	3.8%	P-Sedge	0	0.0%
		A-Sedge	0	0.0%	A-Sedge	0	0.0%
		Fern	11	14.1%			

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ABIBAL	3	Abies balsamea	-3	FACW	Nt Tree	BALSAM FIR
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
AMEINT	4	Amelanchier interior	5	UPL	Nt Tree	SERVICEBERRY
AMESAN	5	Amelanchier sanguinea	5	UPL	Nt Shrub	ROUND LEAVED SERVICEBERRY
ANTHOW	2	Antennaria howellii	5	UPL	Nt P-Forb	SMALL PUSSYTOES
AQUCAN	5	Aquilegia canadensis	1	FAC-	Nt P-Forb	WILD COLUMBINE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ASPTRT	10	Asplenium trichomanes	5	UPL	Nt Fern	MAIDENHAIR SPLEENWORT
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
BETPAP	2	Betula papyrifera	2	FACU+	Nt Tree	PAPER BIRCH
BOTVIR	5	Botrychium virginianum	3	FACU	Nt Fern	RATTLESNAKE FERN
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS
CARPAR	10	Cardamine parviflora	0	FAC	Nt A-Forb	DRYLAND BITTER CRESS
CXARTT	3	Carex arctata	5	UPL	Nt P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt P-Sedge	SEDGE
CXLEPO	3	Carex leptonervia	0	FAC	Nt P-Sedge	SEDGE
CINLAT	5	Cinna latifolia	-4	FACW+	Nt P-Grass	WOOD REEDGRASS
CONAME	10	Conopholis americana	5	UPL	Nt P-Forb	SQUAWROOT
CORMAC	5	Corallorhiza maculata	4	FACU-	Nt P-Forb	SPOTTED CORAL ROOT
DANSPI	4	Danthonia spicata	5	UPL	Nt P-Grass	POVERTY GRASS; OATGRASS

DESFLE	6	Deschampsia flexuosa	5	UPL	Nt P-Grass	HAIR GRASS
DIELON	4	Diervilla lonicera	5	UPL	Nt Shrub	BUSH HONEYSUCKLE
DIRPAL	8	Dirca palustris	0	FAC	Nt Shrub	LEATHERWOOD
DRYINT	5	Dryopteris intermedia	0	FAC	Nt Fern	EVERGREEN WOODFERN
DRYMAR	5	Dryopteris marginalis	3	FACU	Nt Fern	MARGINAL WOODFERN
FESOCC	6	Festuca occidentalis	5	UPL	Nt P-Grass	WESTERN FESCUE
GALTRR	4	Galium triflorum	2	FACU+	Nt P-Forb	FRAGRANT BEDSTRAW
GAYBAC	7	Gaylussacia baccata	3	FACU	Nt Shrub	HUCKLEBERRY
GOOOBL	6	Goodyera oblongifolia	5	UPL	Nt P-Forb	MENZIES' RATTLESNAKE PLANTAIN
GYMDRY	5	Gymnocarpium dryopteris	0	FAC	Nt Fern	OAK FERN
HEPAME	6	Hepatica americana	5	UPL	Nt P-Forb	ROUND LOBED HEPATICA
HIEPIS	0	HIERACIUM PILOSELLOIDES	5	UPL	Ad P-Forb	GLAUCOUS KING DEVIL
HUPLUC	5	Huperzia lucidula	-1	FAC+	Nt F...Ally	SHINING CLUBMOSS
LINBOR	6	Linnaea borealis	0	FAC	Nt P-Forb	TWINFLOWER
LONCAN	5	Lonicera canadensis	3	FACU	Nt Shrub	AMERICAN FLY HONEYSUCKLE
LONHIR	6	Lonicera hirsuta	0	FAC	Nt Shrub	HAIRY HONEYSUCKLE
MAICAC	4	Maianthemum canadense	0	FAC	Nt P-Forb	CANADA MAYFLOWER
MELLIN	6	Melampyrum lineare	1	FAC-	Nt A-Forb	COW WHEAT
MILEFF	8	Milium effusum	4	FACU-	Nt P-Grass	WOOD MILLET
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt P-Grass	ROUGH LEAVED RICE GRASS
ORYPUN	9	Oryzopsis pungens	5	UPL	Nt P-Grass	RICE GRASS
OSMCLI	4	Osmorhiza claytonii	4	FACU-	Nt P-Forb	HAIRY SWEET CICELY
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt Tree	IRONWOOD; HOP HORNBEAM
PICGLA	3	Picea glauca	3	FACU	Nt Tree	WHITE SPRUCE
PINRES	6	Pinus resinosa	3	FACU	Nt Tree	RED PINE
PINSTR	3	Pinus strobus	3	FACU	Nt Tree	WHITE PINE
POAPRA	0	POA PRATENSIS	1	FAC-	Ad P-Grass	KENTUCKY BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt P-Forb	DOWNY SOLOMON SEAL
POLCIL	3	Polygonum cilinode	5	UPL	Nt P-Forb	FRINGED FALSE BUCKWHEAT
POLVIG	8	Polypodium virginianum	5	UPL	Nt Fern	COMMON POLYPODY
POLLON	10	Polystichum lonchitis	5	UPL	Nt Fern	NORTHERN HOLLY FERN
POPTRE	1	Populus tremuloides	0	FAC	Nt Tree	QUAKING ASPEN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt Fern	BRACKEN FERN
QUERUB	5	Quercus rubra	3	FACU	Nt Tree	RED OAK
RIBCYN	4	Ribes cynosbati	5	UPL	Nt Shrub	PRICKLY or WILD GOOSEBERRY
ROSACI	4	Rosa acicularis	3	FACU	Nt Shrub	WILD ROSE
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt Shrub	THIMBLEBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt Shrub	WILD RED RASPBERRY
SAMRAC	3	Sambucus racemosa	2	FACU+	Nt Shrub	RED BERRIED ELDER
SAXVIR	10	Saxifraga virginiensis	1	FAC-	Nt P-Forb	EARLY SAXIFRAGE
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt P-Grass	FALSE MELIC
STRROS	5	Streptopus roseus	0	FAC	Nt P-Forb	ROSE TWISTED STALK
SYMALB	5	Symphoricarpos albus	4	FACU-	Nt Shrub	SNOWBERRY
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad P-Forb	COMMON DANDELION
THEPHE	5	Thelypteris phegopteris	5	UPL	Nt Fern	NORTHERN BEECH FERN
TILAME	5	Tilia americana	3	FACU	Nt Tree	BASSWOOD
TOXRAR	2	Toxicodendron radicans	-1	FAC+	Nt W-Vine	POISON IVY
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt P-Forb	STARFLOWER
TSUCAN	5	Tsuga canadensis	3	FACU	Nt Tree	HEMLOCK
VACANG	4	Vaccinium angustifolium	3	FACU	Nt Shrub	BLUEBERRY

VACMYR	4	Vaccinium myrtilloides	-2	FACW-	Nt Shrub	CANADA BLUEBERRY
VIOPUB	4	Viola pubescens	4	FACU-	Nt P-Forb	YELLOW VIOLET
VIOREN	6	Viola renifolia	-3	FACW	Nt P-Forb	KIDNEY LEAVED VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt P-Forb	GREAT SPURRED VIOLET
WOOILV	10	Woodsia ilvensis	5	UPL	Nt Fern	RUSTY WOODSIA

Appendix 3b. Floristic Quality Assessment of Parcel 2.

```
Site:     Forestland Group - Parcel 2
Locale:   Marquette Co., MI
Date:     July 14, 2009   - hours
          June 15, 2009   - hours
By:       Brad Slaughter
File:     s:\NFI\BOTANY\FORESTLAND GROUP\FQAs\Parcel 2\Forestland Group Parcel 2.inv
Notes:    Also:
          Actaea sp.
          Chenopodium sp.
```

FLORISTIC QUALITY DATA		Native			Adventive		
103	NATIVE SPECIES	Tree	17	15.9%	Tree	0	0.0%
107	Total Species	Shrub	12	11.2%	Shrub	0	0.0%
4.8	NATIVE MEAN C	W-Vine	0	0.0%	W-Vine	0	0.0%
4.6	W/Adventives	H-Vine	0	0.0%	H-Vine	0	0.0%
48.6	NATIVE FQI	P-Forb	37	34.6%	P-Forb	3	2.8%
47.7	W/Adventives	B-Forb	1	0.9%	B-Forb	0	0.0%
1.6	NATIVE MEAN W	A-Forb	3	2.8%	A-Forb	0	0.0%
1.7	W/Adventives	P-Grass	11	10.3%	P-Grass	1	0.9%
AVG:	Fac. Upland (+)	A-Grass	0	0.0%	A-Grass	0	0.0%
		P-Sedge	6	5.6%	P-Sedge	0	0.0%
		A-Sedge	0	0.0%	A-Sedge	0	0.0%
		Fern	16	15.0%			

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ABIBAL	3	Abies balsamea	-3	FACW	Nt Tree	BALSAM FIR
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
AGRTRA	8	Agropyron trachycaulum	0	FAC	Nt P-Grass	SLENDER WHEAT GRASS
AGRHYE	4	Agrostis hyemalis	1	FAC-	Nt P-Grass	TICKLEGRASS
ALNRUG	5	Alnus rugosa	-5	OBL	Nt Shrub	TAG ALDER
AMEARB	4	Amelanchier arborea	3	FACU	Nt Tree	JUNEBERRY
AMEINT	4	Amelanchier interior	5	UPL	Nt Tree	SERVICEBERRY
AMESAN	5	Amelanchier sanguinea	5	UPL	Nt Shrub	ROUND LEAVED SERVICEBERRY
ANTHOW	2	Antennaria howellii	5	UPL	Nt P-Forb	SMALL PUSSYTOES
APOAND	3	Apocynum androsaemifolium	5	UPL	Nt P-Forb	SPREADING DOGBANE
AQUCAN	5	Aquilegia canadensis	1	FAC-	Nt P-Forb	WILD COLUMBINE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ARARAC	8	Aralia racemosa	5	UPL	Nt P-Forb	SPIKENARD
ARITRI	5	Arisaema triphyllum	-2	FACW-	Nt P-Forb	JACK IN THE PULPIT
ASPTRT	10	Asplenium trichomanes	5	UPL	Nt Fern	MAIDENHAIR SPLEENWORT
ASTLAT	2	Aster lateriflorus	-2	FACW-	Nt P-Forb	SIDE FLOWERING ASTER
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
ATHFIL	4	Athyrium filix-femina	0	FAC	Nt Fern	LADY FERN
BETALL	7	Betula alleghaniensis	0	FAC	Nt Tree	YELLOW BIRCH
BOTVIR	5	Botrychium virginianum	3	FACU	Nt Fern	RATTLESNAKE FERN
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS

CALTPA	6	Caltha palustris	-5	OBL	Nt	P-Forb	MARSH MARIGOLD
CARPAR	10	Cardamine parviflora	0	FAC	Nt	A-Forb	DRYLAND BITTER CRESS
CXARTT	3	Carex arctata	5	UPL	Nt	P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt	P-Sedge	SEDGE
CXINTU	3	Carex intumescens	-4	FACW+	Nt	P-Sedge	SEDGE
CXLEPA	5	Carex leptalea	-5	OBL	Nt	P-Sedge	SEDGE
CXLEPO	3	Carex leptonervia	0	FAC	Nt	P-Sedge	SEDGE
CXPEDU	5	Carex pedunculata	5	UPL	Nt	P-Sedge	SEDGE
CHEGLB	7	Chelone glabra	-5	OBL	Nt	P-Forb	TURTLEHEAD
CHRAME	6	Chrysosplenium americanum	-5	OBL	Nt	P-Forb	GOLDEN SAXIFRAGE
CLIVUL	3	Clinopodium vulgare	5	UPL	Nt	P-Forb	WILD BASIL
CLIBOR	5	Clintonia borealis	-1	FAC+	Nt	P-Forb	BLUEBEAD LILY; CORN LILY
CORMAC	5	Corallorhiza maculata	4	FACU-	Nt	P-Forb	SPOTTED CORAL ROOT
CORSEM	5	Corydalis sempervirens	5	UPL	Nt	B-Forb	PINK or PALE CORYDALIS
CORCOR	5	Corylus cornuta	5	UPL	Nt	Shrub	BEAKED HAZELNUT
CYPACA	5	Cypripedium acaule	-3	FACW	Nt	P-Forb	PINK LADY'S SL...CCASIN FLOWER
CYSTEN	5	Cystopteris tenuis	5	UPL	Nt	Fern	FRAGILE FERN
DANSPI	4	Danthonia spicata	5	UPL	Nt	P-Grass	POVERTY GRASS; OATGRASS
DESFLE	6	Deschampsia flexuosa	5	UPL	Nt	P-Grass	HAIR GRASS
DICCUC	7	Dicentra cucullaria	5	UPL	Nt	P-Forb	DUTCHMAN'S BREECHES
DIELON	4	Diervilla lonicera	5	UPL	Nt	Shrub	BUSH HONEYSUCKLE
DRYCRI	6	Dryopteris cristata	-5	OBL	Nt	Fern	CRESTED SHIELD FERN
DRYFIL	10	Dryopteris filix-mas	5	UPL	Nt	Fern	MALE FERN
DRYINT	5	Dryopteris intermedia	0	FAC	Nt	Fern	EVERGREEN WOODFERN
EQUARV	0	Equisetum arvense	0	FAC	Nt	F...Ally	COMMON HORSETAIL
FRANIG	6	Fraxinus nigra	-4	FACW+	Nt	Tree	BLACK ASH
GALTRR	4	Galium triflorum	2	FACU+	Nt	P-Forb	FRAGRANT BEDSTRAW
GLYSTR	4	Glyceria striata	-5	OBL	Nt	P-Grass	FOWL MANNA GRASS
GOOOBL	6	Goodyera oblongifolia	5	UPL	Nt	P-Forb	MENZIES' RATTLESNAKE PLANTAIN
GYMDRY	5	Gymnocarpium dryopteris	0	FAC	Nt	Fern	OAK FERN
HEPAME	6	Hepatica americana	5	UPL	Nt	P-Forb	ROUND LOBED HEPATICA
HIEKAL	3	Hieracium kalmii	5	UPL	Nt	P-Forb	KALM'S HAWKWEED
HIEPIS	0	HIERACIUM PILOSELLOIDES	5	UPL	Ad	P-Forb	GLAUCOUS KING DEVIL
HUPLUC	5	Huperzia lucidula	-1	FAC+	Nt	F...Ally	SHINING CLUBMOSS
IMPCAP	2	Impatiens capensis	-3	FACW	Nt	A-Forb	SPOTTED TOUCH ME NOT
LONCAN	5	Lonicera canadensis	3	FACU	Nt	Shrub	AMERICAN FLY HONEYSUCKLE
LYCUNI	2	Lycopus uniflorus	-5	OBL	Nt	P-Forb	NORTHERN BUGLE WEED
MAICAC	4	Maianthemum canadense	0	FAC	Nt	P-Forb	CANADA MAYFLOWER
MILEFF	8	Milium effusum	4	FACU-	Nt	P-Grass	WOOD MILLET
MITREP	5	Mitchella repens	2	FACU+	Nt	P-Forb	PARTRIDGE BERRY
MITNUD	8	Mitella nuda	-3	FACW	Nt	P-Forb	NAKED MITERWORT
ONOSEN	2	Onoclea sensibilis	-3	FACW	Nt	Fern	SENSITIVE FERN
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt	P-Grass	ROUGH LEAVED RICE GRASS
ORYPUN	9	Oryzopsis pungens	5	UPL	Nt	P-Grass	RICE GRASS
OSMCLI	4	Osmorhiza claytonii	4	FACU-	Nt	P-Forb	HAIRY SWEET CICELY
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt	Tree	IRONWOOD; HOP HORNBEAM
PICGLA	3	Picea glauca	3	FACU	Nt	Tree	WHITE SPRUCE
PINSTR	3	Pinus strobus	3	FACU	Nt	Tree	WHITE PINE
POAPRA	0	POA PRATENSIS	1	FAC-	Ad	P-Grass	KENTUCKY BLUEGRASS
POASAL	5	Poa saltuensis	5	UPL	Nt	P-Grass	BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt	P-Forb	DOWNY SOLOMON SEAL

POLCIL	3	Polygonum cilinode	5	UPL	Nt	P-Forb	FRINGED FALSE BUCKWHEAT
POLVIG	8	Polypodium virginianum	5	UPL	Nt	Fern	COMMON POLYPODY
POLLON	10	Polystichum lonchitis	5	UPL	Nt	Fern	NORTHERN HOLLY FERN
POPGRA	4	Populus grandidentata	3	FACU	Nt	Tree	BIG TOOTHED ASPEN
POPTRE	1	Populus tremuloides	0	FAC	Nt	Tree	QUAKING ASPEN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt	Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt	Fern	BRACKEN FERN
QUERUB	5	Quercus rubra	3	FACU	Nt	Tree	RED OAK
RANABO	0	Ranunculus abortivus	-2	FACW-	Nt	A-Forb	SMALL FLOWERED BUTTERCUP
RIBCYN	4	Ribes cynosbati	5	UPL	Nt	Shrub	PRICKLY or WILD GOOSEBERRY
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt	Shrub	THIMBLEBERRY
RUBPUB	4	Rubus pubescens	-4	FACW+	Nt	P-Forb	DWARF RASPBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt	Shrub	WILD RED RASPBERRY
SAMRAC	3	Sambucus racemosa	2	FACU+	Nt	Shrub	RED BERRIED ELDER
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt	P-Grass	FALSE MELIC
SCULAT	5	Scutellaria lateriflora	-5	OBL	Nt	P-Forb	MAD DOG SKULLCAP
SMIRAC	5	Smilacina racemosa	3	FACU	Nt	P-Forb	FALSE SPIKENARD
STRROS	5	Streptopus roseus	0	FAC	Nt	P-Forb	ROSE TWISTED STALK
SYMALB	5	Symphoricarpos albus	4	FACU-	Nt	Shrub	SNOWBERRY
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad	P-Forb	COMMON DANDELION
THEPHE	5	Thelypteris phegopteris	5	UPL	Nt	Fern	NORTHERN BEECH FERN
THUOCC	4	Thuja occidentalis	-3	FACW	Nt	Tree	ARBOR VITAE
TILAME	5	Tilia americana	3	FACU	Nt	Tree	BASSWOOD
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt	P-Forb	STARFLOWER
TRICER	5	Trillium cernuum	0	FAC	Nt	P-Forb	NODDING TRILLIUM
TSUCAN	5	Tsuga canadensis	3	FACU	Nt	Tree	HEMLOCK
UVUGRA	5	Uvularia grandiflora	5	UPL	Nt	P-Forb	BELLWORT
VACANG	4	Vaccinium angustifolium	3	FACU	Nt	Shrub	BLUEBERRY
VEROFF	0	VERONICA OFFICINALIS	5	UPL	Ad	P-Forb	COMMON SPEEDWELL
VIOBLA	5	Viola blanda	-2	FACW-	Nt	P-Forb	SWEET WHITE VIOLET
VIOPUB	4	Viola pubescens	4	FACU-	Nt	P-Forb	YELLOW VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt	P-Forb	GREAT SPURRED VIOLET
WOOILV	10	Woodsia ilvensis	5	UPL	Nt	Fern	RUSTY WOODSIA

Appendix 3c. Floristic Quality Assessment of Parcel 3.

```
Site:     Forestland Group - Parcel 3
Locale:   Marquette Co., MI
Date:     July 13, 2009   - hours
          June 15, 2009   - hours
By:       Brad Slaughter
File:     s:\NFI\BOTANY\FORESTLAND GROUP\FQAs\Parcel 3\Forestland Group Parcel 3.inv
Notes:    Also:
          Crataegus sp.
```

FLORISTIC QUALITY DATA						
80 NATIVE SPECIES	Native	80	93.0%	Adventive	6	7.0%
86 Total Species	Tree	12	14.0%	Tree	0	0.0%
5.0 NATIVE MEAN C	Shrub	11	12.8%	Shrub	0	0.0%
4.6 W/Adventives	W-Vine	0	0.0%	W-Vine	0	0.0%
44.6 NATIVE FQI	H-Vine	0	0.0%	H-Vine	0	0.0%
43.0 W/Adventives	P-Forb	23	26.7%	P-Forb	3	3.5%
2.8 NATIVE MEAN W	B-Forb	2	2.3%	B-Forb	1	1.2%
2.9 W/Adventives	A-Forb	3	3.5%	A-Forb	0	0.0%
AVG: Fac. Upland	P-Grass	11	12.8%	P-Grass	2	2.3%
	A-Grass	0	0.0%	A-Grass	0	0.0%
	P-Sedge	6	7.0%	P-Sedge	0	0.0%
	A-Sedge	0	0.0%	A-Sedge	0	0.0%
	Fern	12	14.0%			

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
ACESPI	5	Acer spicatum	3	FACU	Nt Tree	MOUNTAIN MAPLE
ACHMIL	1	Achillea millefolium	3	FACU	Nt P-Forb	YARROW
AGRTRA	8	Agropyron trachycaulum	0	FAC	Nt P-Grass	SLENDER WHEAT GRASS
AMEARB	4	Amelanchier arborea	3	FACU	Nt Tree	JUNEBERRY
AMEINT	4	Amelanchier interior	5	UPL	Nt Tree	SERVICEBERRY
APOAND	3	Apocynum androsaemifolium	5	UPL	Nt P-Forb	SPREADING DOGBANE
AQUCAN	5	Aquilegia canadensis	1	FAC-	Nt P-Forb	WILD COLUMBINE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ASPTRT	10	Asplenium trichomanes	5	UPL	Nt Fern	MAIDENHAIR SPLEENWORT
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
ASTSAG	2	Aster sagittifolius	5	UPL	Nt P-Forb	ARROW LEAVED ASTER
ATHFIL	4	Athyrium filix-femina	0	FAC	Nt Fern	LADY FERN
BETALL	7	Betula alleghaniensis	0	FAC	Nt Tree	YELLOW BIRCH
BOTVIR	5	Botrychium virginianum	3	FACU	Nt Fern	RATTLESNAKE FERN
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS
CARPAR	10	Cardamine parviflora	0	FAC	Nt A-Forb	DRYLAND BITTER CRESS
CXARTT	3	Carex arctata	5	UPL	Nt P-Sedge	SEDGE
CXBACK	8	Carex backii	5	UPL	Nt P-Sedge	SEDGE
CXBRUN	5	Carex brunnescens	-3	FACW	Nt P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt P-Sedge	SEDGE
CXINTU	3	Carex intumescens	-4	FACW+	Nt P-Sedge	SEDGE

CXPEDU	5	Carex pedunculata	5	UPL	Nt P-Sedge	SEDGE
CINLAT	5	Cinna latifolia	-4	FACW+	Nt P-Grass	WOOD REEDGRASS
CLACAR	6	Claytonia caroliniana	3	FACU	Nt P-Forb	CAROLINA SPRING BEAUTY
CLIVUL	3	Clinopodium vulgare	5	UPL	Nt P-Forb	WILD BASIL
CONAME	10	Conopholis americana	5	UPL	Nt P-Forb	SQUAWROOT
CORSEM	5	Corydalis sempervirens	5	UPL	Nt B-Forb	PINK or PALE CORYDALIS
CORCOR	5	Corylus cornuta	5	UPL	Nt Shrub	BEAKED HAZELNUT
CYSTEN	5	Cystopteris tenuis	5	UPL	Nt Fern	FRAGILE FERN
DANSPI	4	Danthonia spicata	5	UPL	Nt P-Grass	POVERTY GRASS; OATGRASS
DENLAC	5	Dentaria laciniata	3	FACU	Nt P-Forb	CUT LEAVED TOOTHWORT
DESFLE	6	Deschampsia flexuosa	5	UPL	Nt P-Grass	HAIR GRASS
DICCUC	7	Dicentra cucullaria	5	UPL	Nt P-Forb	DUTCHMAN'S BREECHES
DIELON	4	Diervilla lonicera	5	UPL	Nt Shrub	BUSH HONEYSUCKLE
DRYFIL	10	Dryopteris filix-mas	5	UPL	Nt Fern	MALE FERN
DRYINT	5	Dryopteris intermedia	0	FAC	Nt Fern	EVERGREEN WOODFERN
DRYMAR	5	Dryopteris marginalis	3	FACU	Nt Fern	MARGINAL WOODFERN
FRAAME	5	Fraxinus americana	3	FACU	Nt Tree	WHITE ASH
GALTRR	4	Galium triflorum	2	FACU+	Nt P-Forb	FRAGRANT BEDSTRAW
GERROB	3	Geranium robertianum	5	UPL	Nt A-Forb	HERB ROBERT
GYMDRY	5	Gymnocarpium dryopteris	0	FAC	Nt Fern	OAK FERN
HEPAME	6	Hepatica americana	5	UPL	Nt P-Forb	ROUND LOBED HEPATICA
HIEAUR	0	HIERACIUM AURANTIACUM	5	UPL	Ad P-Forb	ORANGE HAWKWEED
HIEPIS	0	HIERACIUM PILOSELLOIDES	5	UPL	Ad P-Forb	GLAUCOUS KING DEVIL
HYSPAT	5	Hystrix patula	5	UPL	Nt P-Grass	BOTTLEBRUSH GRASS
LACCAN	2	Lactuca canadensis	2	FACU+	Nt B-Forb	TALL LETTUCE
LONCAN	5	Lonicera canadensis	3	FACU	Nt Shrub	AMERICAN FLY HONEYSUCKLE
LONHIR	6	Lonicera hirsuta	0	FAC	Nt Shrub	HAIRY HONEYSUCKLE
MAICAC	4	Maianthemum canadense	0	FAC	Nt P-Forb	CANADA MAYFLOWER
MILEFF	8	Milium effusum	4	FACU-	Nt P-Grass	WOOD MILLET
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt P-Grass	ROUGH LEAVED RICE GRASS
ORYPUN	9	Oryzopsis pungens	5	UPL	Nt P-Grass	RICE GRASS
OSMCLI	4	Osmorhiza claytonii	4	FACU-	Nt P-Forb	HAIRY SWEET CICELY
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt Tree	IRONWOOD; HOP HORNBEAM
POACOM	0	POA COMPRESSA	2	FACU+	Ad P-Grass	CANADA BLUEGRASS
POAPRA	0	POA PRATENSIS	1	FAC-	Ad P-Grass	KENTUCKY BLUEGRASS
POASAL	5	Poa saltuensis	5	UPL	Nt P-Grass	BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt P-Forb	DOWNY SOLOMON SEAL
POLCIL	3	Polygonum cilinode	5	UPL	Nt P-Forb	FRINGED FALSE BUCKWHEAT
POLVIG	8	Polypodium virginianum	5	UPL	Nt Fern	COMMON POLYPODY
POLLON	10	Polystichum lonchitis	5	UPL	Nt Fern	NORTHERN HOLLY FERN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt Fern	BRACKEN FERN
QUERUB	5	Quercus rubra	3	FACU	Nt Tree	RED OAK
RANABO	0	Ranunculus abortivus	-2	FACW-	Nt A-Forb	SMALL FLOWERED BUTTERCUP
RIBCYN	4	Ribes cynosbati	5	UPL	Nt Shrub	PRICKLY or WILD GOOSEBERRY
ROSACI	4	Rosa acicularis	3	FACU	Nt Shrub	WILD ROSE
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt Shrub	THIMBLEBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt Shrub	WILD RED RASPBERRY
SAMRAC	3	Sambucus racemosa	2	FACU+	Nt Shrub	RED BERRIED ELDER
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt P-Grass	FALSE MELIC
SMIRAC	5	Smilacina racemosa	3	FACU	Nt P-Forb	FALSE SPIKENARD

STRROS	5	Streptopus roseus	0	FAC	Nt P-Forb	ROSE TWISTED STALK
SYMALB	5	Symphoricarpos albus	4	FACU-	Nt Shrub	SNOWBERRY
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad P-Forb	COMMON DANDELION
TILAME	5	Tilia americana	3	FACU	Nt Tree	BASSWOOD
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt P-Forb	STARFLOWER
ULMAME	1	Ulmus americana	-2	FACW-	Nt Tree	AMERICAN ELM
VERTHA	0	VERBASCUM THAPSUS	5	UPL	Ad B-Forb	COMMON MULLEIN
VIOPUB	4	Viola pubescens	4	FACU-	Nt P-Forb	YELLOW VIOLET
VIOREN	6	Viola renifolia	-3	FACW	Nt P-Forb	KIDNEY LEAVED VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt P-Forb	GREAT SPURRED VIOLET
WOOORE	10	Woodsia oregana	5	UPL	Nt Fern	OREGON WOODSIA

Appendix 3d. Floristic Quality Assessment of Parcel 4.

```
Site:     Forestland Group - Parcel 4
Locale:   Marquette Co., MI
Date:     July 14, 2009   - hours
          June 15, 2009   - hours
By:       Brad Slaughter
File:     c:\Documents and Settings\Brad\Desktop\attachments_2009_07_23\Forestland Group Parcel 4.inv
Notes:    Also:
          Actaea sp.
```

FLORISTIC QUALITY DATA		Native			Adventive		
80	NATIVE SPECIES	Tree	15	17.6%	Tree	0	0.0%
85	Total Species	Shrub	8	9.4%	Shrub	0	0.0%
4.8	NATIVE MEAN C	W-Vine	0	0.0%	W-Vine	0	0.0%
4.5	W/Adventives	H-Vine	0	0.0%	H-Vine	0	0.0%
42.9	NATIVE FQI	P-Forb	24	28.2%	P-Forb	5	5.9%
41.7	W/Adventives	B-Forb	2	2.4%	B-Forb	0	0.0%
2.5	NATIVE MEAN W	A-Forb	2	2.4%	A-Forb	0	0.0%
2.6	W/Adventives	P-Grass	10	11.8%	P-Grass	0	0.0%
AVG:	Fac. Upland	A-Grass	0	0.0%	A-Grass	0	0.0%
		P-Sedge	5	5.9%	P-Sedge	0	0.0%
		A-Sedge	0	0.0%	A-Sedge	0	0.0%
		Fern	14	16.5%			

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ABIBAL	3	Abies balsamea	-3	FACW	Nt Tree	BALSAM FIR
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
AMEINT	4	Amelanchier interior	5	UPL	Nt Tree	SERVICEBERRY
APOAND	3	Apocynum androsaemifolium	5	UPL	Nt P-Forb	SPREADING DOGBANE
AQUCAN	5	Aquilegia canadensis	1	FAC-	Nt P-Forb	WILD COLUMBINE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ASPTRT	10	Asplenium trichomanes	5	UPL	Nt Fern	MAIDENHAIR SPLEENWORT
ASTCIL	4	Aster ciliolatus	4	FACU-	Nt P-Forb	NORTHERN HEART LEAVED ASTER
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
ATHFIL	4	Athyrium filix-femina	0	FAC	Nt Fern	LADY FERN
BETALL	7	Betula alleghaniensis	0	FAC	Nt Tree	YELLOW BIRCH
BETPAP	2	Betula papyrifera	2	FACU+	Nt Tree	PAPER BIRCH
BOTVIR	5	Botrychium virginianum	3	FACU	Nt Fern	RATTLESNAKE FERN
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS
CARPAR	10	Cardamine parviflora	0	FAC	Nt A-Forb	DRYLAND BITTER CRESS
CXARTT	3	Carex arctata	5	UPL	Nt P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt P-Sedge	SEDGE
CXINTU	3	Carex intumescens	-4	FACW+	Nt P-Sedge	SEDGE
CXLEPO	3	Carex leptonervia	0	FAC	Nt P-Sedge	SEDGE
CXPEDU	5	Carex pedunculata	5	UPL	Nt P-Sedge	SEDGE
CINLAT	5	Cinna latifolia	-4	FACW+	Nt P-Grass	WOOD REEDGRASS
CLACAR	6	Claytonia caroliniana	3	FACU	Nt P-Forb	CAROLINA SPRING BEAUTY

CLIVUL	3	Clinopodium vulgare	5	UPL	Nt P-Forb	WILD BASIL
CLIBOR	5	Clintonia borealis	-1	FAC+	Nt P-Forb	BLUEBEAD LILY; CORN LILY
COPTRI	5	Coptis trifolia	-3	FACW	Nt P-Forb	GOLDTHREAD
CORSEM	5	Corydalis sempervirens	5	UPL	Nt B-Forb	PINK or PALE CORYDALIS
CYSTEN	5	Cystopteris tenuis	5	UPL	Nt Fern	FRAGILE FERN
DENLAC	5	Dentaria laciniata	3	FACU	Nt P-Forb	CUT LEAVED TOOTHWORT
DESFLE	6	Deschampsia flexuosa	5	UPL	Nt P-Grass	HAIR GRASS
DIELON	4	Diervilla lonicera	5	UPL	Nt Shrub	BUSH HONEYSUCKLE
DIPDIG	3	Diphasiastrum digitatum	5	UPL	Nt F...Ally	GROUND CEDAR
DRYFIL	10	Dryopteris filix-mas	5	UPL	Nt Fern	MALE FERN
DRYINT	5	Dryopteris intermedia	0	FAC	Nt Fern	EVERGREEN WOODFERN
FESOCC	6	Festuca occidentalis	5	UPL	Nt P-Grass	WESTERN FESCUE
FRAAME	5	Fraxinus americana	3	FACU	Nt Tree	WHITE ASH
GALTRR	4	Galium triflorum	2	FACU+	Nt P-Forb	FRAGRANT BEDSTRAW
GOOOBL	6	Goodyera oblongifolia	5	UPL	Nt P-Forb	MENZIES' RATTLESNAKE PLANTAIN
HEPAME	6	Hepatica americana	5	UPL	Nt P-Forb	ROUND LOBED HEPATICA
HIEAUR	0	HIERACIUM AURANTIACUM	5	UPL	Ad P-Forb	ORANGE HAWKWEED
HIEPIS	0	HIERACIUM PILOSELLOIDES	5	UPL	Ad P-Forb	GLAUCOUS KING DEVIL
HUPLUC	5	Huperzia lucidula	-1	FAC+	Nt F...Ally	SHINING CLUBMOSS
HYSPAT	5	Hystrix patula	5	UPL	Nt P-Grass	BOTTLEBRUSH GRASS
LACCAN	2	Lactuca canadensis	2	FACU+	Nt B-Forb	TALL LETTUCE
LONCAN	5	Lonicera canadensis	3	FACU	Nt Shrub	AMERICAN FLY HONEYSUCKLE
LYCCLA	4	Lycopodium clavatum	0	FAC	Nt F...Ally	RUNNING GROUND PINE
MAICAC	4	Maianthemum canadense	0	FAC	Nt P-Forb	CANADA MAYFLOWER
MILEFF	8	Milium effusum	4	FACU-	Nt P-Grass	WOOD MILLET
MITREP	5	Mitchella repens	2	FACU+	Nt P-Forb	PARTRIDGE BERRY
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt P-Grass	ROUGH LEAVED RICE GRASS
ORYPUN	9	Oryzopsis pungens	5	UPL	Nt P-Grass	RICE GRASS
OSMCLI	4	Osmorhiza claytonii	4	FACU-	Nt P-Forb	HAIRY SWEET CICELY
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt Tree	IRONWOOD; HOP HORNBEAM
PICGLA	3	Picea glauca	3	FACU	Nt Tree	WHITE SPRUCE
POASAL	5	Poa saltuensis	5	UPL	Nt P-Grass	BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt P-Forb	DOWNY SOLOMON SEAL
POLCIL	3	Polygonum cilinode	5	UPL	Nt P-Forb	FRINGED FALSE BUCKWHEAT
POLVIG	8	Polypodium virginianum	5	UPL	Nt Fern	COMMON POLYPODY
POLBRA	8	Polystichum braunii	5	UPL	Nt Fern	BRAUN'S HOLLY FERN
POLLON	10	Polystichum lonchitis	5	UPL	Nt Fern	NORTHERN HOLLY FERN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt Fern	BRACKEN FERN
PYRELL	6	Pyrola elliptica	5	UPL	Nt P-Forb	LARGE LEAVED SHINLEAF
QUERUB	5	Quercus rubra	3	FACU	Nt Tree	RED OAK
RANABO	0	Ranunculus abortivus	-2	FACW-	Nt A-Forb	SMALL FLOWERED BUTTERCUP
RIBCYN	4	Ribes cynosbati	5	UPL	Nt Shrub	PRICKLY or WILD GOOSEBERRY
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt Shrub	THIMBLEBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt Shrub	WILD RED RASPBERRY
RUMACL	0	RUMEX ACETOSELLA	0	FAC	Ad P-Forb	SHEEP SORREL
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt P-Grass	FALSE MELIC
SMIRAC	5	Smilacina racemosa	3	FACU	Nt P-Forb	FALSE SPIKENARD
SYMALB	5	Symphoricarpos albus	4	FACU-	Nt Shrub	SNOWBERRY
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad P-Forb	COMMON DANDELION
THEPHE	5	Thelypteris phegopteris	5	UPL	Nt Fern	NORTHERN BEECH FERN

THUOCC	4	Thuja occidentalis	-3	FACW	Nt Tree	ARBOR VITAE
TILAME	5	Tilia americana	3	FACU	Nt Tree	BASSWOOD
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt P-Forb	STARFLOWER
TSUCAN	5	Tsuga canadensis	3	FACU	Nt Tree	HEMLOCK
ULMAME	1	Ulmus americana	-2	FACW-	Nt Tree	AMERICAN ELM
VACMYR	4	Vaccinium myrtilloides	-2	FACW-	Nt Shrub	CANADA BLUEBERRY
VEROFF	0	VERONICA OFFICINALIS	5	UPL	Ad P-Forb	COMMON SPEEDWELL
VIOBLA	5	Viola blanda	-2	FACW-	Nt P-Forb	SWEET WHITE VIOLET
VIOPUB	4	Viola pubescens	4	FACU-	Nt P-Forb	YELLOW VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt P-Forb	GREAT SPURRED VIOLET

Appendix 3e. Floristic Quality Assessment of Parcel 5.

```
Site:     Forestland Group - Parcel 5
Locale:   Marquette Co., MI
Date:     July 15, 2009   - hours
          June 16, 2009   - hours
By:       Brad Slaughter
File:     c:\Documents and Settings\Brad\Desktop\attachments_2009_07_23\Forestland Group Parcel 5.inv
Notes:    Also:
          Salix sp.
          Viola sp.
```

FLORISTIC QUALITY DATA		Native		Adventive	
67 NATIVE SPECIES	Native	67	93.1%	5	6.9%
72 Total Species	Tree	11	15.3%	0	0.0%
4.5 NATIVE MEAN C	Shrub	5	6.9%	0	0.0%
4.2 W/Adventives	W-Vine	0	0.0%	0	0.0%
37.0 NATIVE FQI	H-Vine	0	0.0%	0	0.0%
35.7 W/Adventives	P-Forb	19	26.4%	3	4.2%
1.4 NATIVE MEAN W	B-Forb	1	1.4%	1	1.4%
1.5 W/Adventives	A-Forb	1	1.4%	1	1.4%
AVG: Faculative (-)	P-Grass	8	11.1%	0	0.0%
	A-Grass	0	0.0%	0	0.0%
	P-Sedge	10	13.9%	0	0.0%
	A-Sedge	0	0.0%	0	0.0%
	Fern	12	16.7%		

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ABIBAL	3	Abies balsamea	-3	FACW	Nt Tree	BALSAM FIR
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
AMEARB	4	Amelanchier arborea	3	FACU	Nt Tree	JUNEBERRY
AMEINT	4	Amelanchier interior	5	UPL	Nt Tree	SERVICEBERRY
APOAND	3	Apocynum androsaemifolium	5	UPL	Nt P-Forb	SPREADING DOGBANE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
ATHFIL	4	Athyrium filix-femina	0	FAC	Nt Fern	LADY FERN
BETALL	7	Betula alleghaniensis	0	FAC	Nt Tree	YELLOW BIRCH
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS
CALCAN	3	Calamagrostis canadensis	-5	OBL	Nt P-Grass	BLUE JOINT GRASS
CXARTT	3	Carex arctata	5	UPL	Nt P-Sedge	SEDGE
CXBRUN	5	Carex brunnescens	-3	FACW	Nt P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt P-Sedge	SEDGE
CXDISP	10	Carex disperma	-5	OBL	Nt P-Sedge	SEDGE
CXGYNA	3	Carex gynandra	-4	FACW+	Nt P-Sedge	SEDGE
CXINTU	3	Carex intumescens	-4	FACW+	Nt P-Sedge	SEDGE
CXLEPO	3	Carex leptonervia	0	FAC	Nt P-Sedge	SEDGE
CXPEDU	5	Carex pedunculata	5	UPL	Nt P-Sedge	SEDGE
CINLAT	5	Cinna latifolia	-4	FACW+	Nt P-Grass	WOOD REEDGRASS
CIRPAL	0	CIRSIUM PALUSTRE	-4	FACW+	Ad B-Forb	MARSH THISTLE

CLIVUL	3	Clinopodium vulgare	5	UPL	Nt P-Forb	WILD BASIL
COPTRI	5	Coptis trifolia	-3	FACW	Nt P-Forb	GOLDTHREAD
CORSEM	5	Corydalis sempervirens	5	UPL	Nt B-Forb	PINK or PALE CORYDALIS
CYSTEN	5	Cystopteris tenuis	5	UPL	Nt Fern	FRAGILE FERN
DESFLE	6	Deschampsia flexuosa	5	UPL	Nt P-Grass	HAIR GRASS
DIPDIG	3	Diphasiastrum digitatum	5	UPL	Nt F...Ally	GROUND CEDAR
DRYCAR	5	Dryopteris carthusiana	-2	FACW-	Nt Fern	SPINULOSE WOODFERN
DRYCRI	6	Dryopteris cristata	-5	OBL	Nt Fern	CRESTED SHIELD FERN
DRYINT	5	Dryopteris intermedia	0	FAC	Nt Fern	EVERGREEN WOODFERN
EPICOL	3	Epilobium coloratum	-5	OBL	Nt P-Forb	CINNAMON WILLOW HERB
EQUSYL	5	Equisetum sylvaticum	-3	FACW	Nt F...Ally	WOODLAND HORSETAIL
GALTET	0	GALEOPSIS TETRAHIT	5	UPL	Ad A-Forb	COMMON HEMP NETTLE
GALTRR	4	Galium triflorum	2	FACU+	Nt P-Forb	FRAGRANT BEDSTRAW
GNAOBT	2	Gnaphalium obtusifolium	5	UPL	Nt A-Forb	OLD FIELD BALSAM
HIEAUR	0	HIERACIUM AURANTIACUM	5	UPL	Ad P-Forb	ORANGE HAWKWEED
HIEPIS	0	HIERACIUM PILOSELLOIDES	5	UPL	Ad P-Forb	GLAUCOUS KING DEVIL
HUPLUC	5	Huperzia lucidula	-1	FAC+	Nt F...Ally	SHINING CLUBMOSS
JUNEFF	3	Juncus effusus	-5	OBL	Nt P-Forb	SOFT STEMMED RUSH
LONCAN	5	Lonicera canadensis	3	FACU	Nt Shrub	AMERICAN FLY HONEYSUCKLE
LYCUNI	2	Lycopus uniflorus	-5	OBL	Nt P-Forb	NORTHERN BUGLE WEED
MAICAC	4	Maianthemum canadense	0	FAC	Nt P-Forb	CANADA MAYFLOWER
MILEFF	8	Milium effusum	4	FACU-	Nt P-Grass	WOOD MILLET
MITREP	5	Mitchella repens	2	FACU+	Nt P-Forb	PARTRIDGE BERRY
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt P-Grass	ROUGH LEAVED RICE GRASS
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt Tree	IRONWOOD; HOP HORNBEAM
PICGLA	3	Picea glauca	3	FACU	Nt Tree	WHITE SPRUCE
POASAL	5	Poa saltuensis	5	UPL	Nt P-Grass	BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt P-Forb	DOWNY SOLOMON SEAL
POLCIL	3	Polygonum cilinode	5	UPL	Nt P-Forb	FRINGED FALSE BUCKWHEAT
POLBRA	8	Polystichum braunii	5	UPL	Nt Fern	BRAUN'S HOLLY FERN
POLLON	10	Polystichum lonchitis	5	UPL	Nt Fern	NORTHERN HOLLY FERN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt Fern	BRACKEN FERN
PYRELL	6	Pyrola elliptica	5	UPL	Nt P-Forb	LARGE LEAVED SHINLEAF
QUERUB	5	Quercus rubra	3	FACU	Nt Tree	RED OAK
RIBCYN	4	Ribes cynosbati	5	UPL	Nt Shrub	PRICKLY or WILD GOOSEBERRY
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt Shrub	THIMBLEBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt Shrub	WILD RED RASPBERRY
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt P-Grass	FALSE MELIC
SCIATR	3	Scirpus atrovirens	-5	OBL	Nt P-Sedge	BULRUSH
SCICYP	5	Scirpus cyperinus	-5	OBL	Nt P-Sedge	WOOL GRASS
SMIRAC	5	Smilacina racemosa	3	FACU	Nt P-Forb	FALSE SPIKENARD
STRROS	5	Streptopus roseus	0	FAC	Nt P-Forb	ROSE TWISTED STALK
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad P-Forb	COMMON DANDELION
THEPHE	5	Thelypteris phegopteris	5	UPL	Nt Fern	NORTHERN BEECH FERN
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt P-Forb	STARFLOWER
TSUCAN	5	Tsuga canadensis	3	FACU	Nt Tree	HEMLOCK
VIOPUB	4	Viola pubescens	4	FACU-	Nt P-Forb	YELLOW VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt P-Forb	GREAT SPURRED VIOLET

Appendix 3f. Floristic Quality Assessment of Parcel 6.

```
Site:     Forestland Group - Parcel 6
Locale:   Marquette Co., MI
Date:     July 15, 2009   - hours
          June 16, 2009   - hours
By:       Brad Slaughter
File:     s:\NFI\BOTANY\FORESTLAND GROUP\FQAs\Parcel 6\Forestland Group Parcel 6.inv
Notes:    Also:
          Carex sp.
          Viola sp.
```

FLORISTIC QUALITY DATA		Native		Adventive	
78 NATIVE SPECIES	Tree	13	16.0%	Tree	0 0.0%
81 Total Species	Shrub	6	7.4%	Shrub	0 0.0%
4.6 NATIVE MEAN C	W-Vine	0	0.0%	W-Vine	0 0.0%
4.5 W/Adventives	H-Vine	0	0.0%	H-Vine	0 0.0%
40.9 NATIVE FQI	P-Forb	21	25.9%	P-Forb	1 1.2%
40.1 W/Adventives	B-Forb	2	2.5%	B-Forb	2 2.5%
1.4 NATIVE MEAN W	A-Forb	2	2.5%	A-Forb	0 0.0%
1.4 W/Adventives	P-Grass	9	11.1%	P-Grass	0 0.0%
AVG: Faculative (-)	A-Grass	0	0.0%	A-Grass	0 0.0%
	P-Sedge	8	9.9%	P-Sedge	0 0.0%
	A-Sedge	0	0.0%	A-Sedge	0 0.0%
	Fern	17	21.0%		

ACRONYM	C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
ABIBAL	3	Abies balsamea	-3	FACW	Nt Tree	BALSAM FIR
ACEPEN	5	Acer pensylvanicum	3	FACU	Nt Tree	STRIPED MAPLE
ACERUB	1	Acer rubrum	0	FAC	Nt Tree	RED MAPLE
ACESAU	5	Acer saccharum	3	FACU	Nt Tree	SUGAR MAPLE
ACTPAC	7	Actaea pachypoda	5	UPL	Nt P-Forb	DOLL'S EYES
AMEARB	4	Amelanchier arborea	3	FACU	Nt Tree	JUNEBERRY
AQUCAN	5	Aquilegia canadensis	1	FAC-	Nt P-Forb	WILD COLUMBINE
ARANUD	5	Aralia nudicaulis	3	FACU	Nt P-Forb	WILD SARSAPARILLA
ARARAC	8	Aralia racemosa	5	UPL	Nt P-Forb	SPIKENARD
ARITRI	5	Arisaema triphyllum	-2	FACW-	Nt P-Forb	JACK IN THE PULPIT
ASPTRT	10	Asplenium trichomanes	5	UPL	Nt Fern	MAIDENHAIR SPLEENWORT
ASTCIL	4	Aster ciliolatus	4	FACU-	Nt P-Forb	NORTHERN HEART LEAVED ASTER
ASTMAC	4	Aster macrophyllus	5	UPL	Nt P-Forb	BIG LEAVED ASTER
ASTUMB	5	Aster umbellatus	-3	FACW	Nt P-Forb	TALL FLAT TOP WHITE ASTER
ATHFIL	4	Athyrium filix-femina	0	FAC	Nt Fern	LADY FERN
BETALL	7	Betula alleghaniensis	0	FAC	Nt Tree	YELLOW BIRCH
BETPAP	2	Betula papyrifera	2	FACU+	Nt Tree	PAPER BIRCH
BOTVIR	5	Botrychium virginianum	3	FACU	Nt Fern	RATTLESNAKE FERN
BRAERE	7	Brachyelytrum erectum	5	UPL	Nt P-Grass	LONG AWNED WOOD GRASS
CALCAN	3	Calamagrostis canadensis	-5	OBL	Nt P-Grass	BLUE JOINT GRASS
CXARTT	3	Carex arctata	5	UPL	Nt P-Sedge	SEDGE
CXDEWE	3	Carex deweyana	4	FACU-	Nt P-Sedge	SEDGE
CXGYNA	3	Carex gynandra	-4	FACW+	Nt P-Sedge	SEDGE

CXINTU	3	Carex intumescens	-4	FACW+	Nt	P-Sedge	SEDGE
CXLEPO	3	Carex leptonervia	0	FAC	Nt	P-Sedge	SEDGE
CXPEDU	5	Carex pedunculata	5	UPL	Nt	P-Sedge	SEDGE
CINLAT	5	Cinna latifolia	-4	FACW+	Nt	P-Grass	WOOD REEDGRASS
CIRPAL	0	CIRSIUM PALUSTRE	-4	FACW+	Ad	B-Forb	MARSH THISTLE
CORSEM	5	Corydalis sempervirens	5	UPL	Nt	B-Forb	PINK or PALE CORYDALIS
CYSTEN	5	Cystopteris tenuis	5	UPL	Nt	Fern	FRAGILE FERN
DESFLE	6	Deschampsia flexuosa	5	UPL	Nt	P-Grass	HAIR GRASS
DRYINT	5	Dryopteris intermedia	0	FAC	Nt	Fern	EVERGREEN WOODFERN
EQUARV	0	Equisetum arvense	0	FAC	Nt	F...Ally	COMMON HORSETAIL
FESOCC	6	Festuca occidentalis	5	UPL	Nt	P-Grass	WESTERN FESCUE
GALTRR	4	Galium triflorum	2	FACU+	Nt	P-Forb	FRAGRANT BEDSTRAW
GLYSTR	4	Glyceria striata	-5	OBL	Nt	P-Grass	FOWL MANNA GRASS
GNAOBT	2	Gnaphalium obtusifolium	5	UPL	Nt	A-Forb	OLD FIELD BALSAM
GYMDRY	5	Gymnocarpium dryopteris	0	FAC	Nt	Fern	OAK FERN
HUPLUC	5	Huperzia lucidula	-1	FAC+	Nt	F...Ally	SHINING CLUBMOSS
IRIVER	5	Iris versicolor	-5	OBL	Nt	P-Forb	WILD BLUE FLAG
LACCAN	2	Lactuca canadensis	2	FACU+	Nt	B-Forb	TALL LETTUCE
LONCAN	5	Lonicera canadensis	3	FACU	Nt	Shrub	AMERICAN FLY HONEYSUCKLE
MAICAC	4	Maianthemum canadense	0	FAC	Nt	P-Forb	CANADA MAYFLOWER
MATSTR	3	Matteuccia struthiopteris	-3	FACW	Nt	Fern	OSTRICH FERN
MITREP	5	Mitchella repens	2	FACU+	Nt	P-Forb	PARTRIDGE BERRY
ONOSEN	2	Onoclea sensibilis	-3	FACW	Nt	Fern	SENSITIVE FERN
ORYASP	6	Oryzopsis asperifolia	5	UPL	Nt	P-Grass	ROUGH LEAVED RICE GRASS
OSMCLI	4	Osmorhiza claytonii	4	FACU-	Nt	P-Forb	HAIRY SWEET CICELY
OSMCLN	6	Osmunda claytoniana	-1	FAC+	Nt	Fern	INTERRUPTED FERN
OSMREG	5	Osmunda regalis	-5	OBL	Nt	Fern	ROYAL FERN
OSTVIR	5	Ostrya virginiana	4	FACU-	Nt	Tree	IRONWOOD; HOP HORNBEAM
PICGLA	3	Picea glauca	3	FACU	Nt	Tree	WHITE SPRUCE
PLAORB	10	Platanthera orbiculata	0	FAC	Nt	P-Forb	LARGE ROUND LEAVED ORCHID
POASAL	5	Poa saltuensis	5	UPL	Nt	P-Grass	BLUEGRASS
POLPUB	5	Polygonatum pubescens	5	UPL	Nt	P-Forb	DOWNY SOLOMON SEAL
POLCIL	3	Polygonum cilinode	5	UPL	Nt	P-Forb	FRINGED FALSE BUCKWHEAT
POLVIG	8	Polypodium virginianum	5	UPL	Nt	Fern	COMMON POLYPODY
POLLON	10	Polystichum lonchitis	5	UPL	Nt	Fern	NORTHERN HOLLY FERN
POPTRE	1	Populus tremuloides	0	FAC	Nt	Tree	QUAKING ASPEN
PRUVIR	2	Prunus virginiana	1	FAC-	Nt	Shrub	CHOKE CHERRY
PTEAQU	0	Pteridium aquilinum	3	FACU	Nt	Fern	BRACKEN FERN
QUERUB	5	Quercus rubra	3	FACU	Nt	Tree	RED OAK
RANREC	5	Ranunculus recurvatus	-3	FACW	Nt	A-Forb	HOOKED CROWFOOT
RIBCYN	4	Ribes cynosbati	5	UPL	Nt	Shrub	PRICKLY or WILD GOOSEBERRY
RUBPAR	6	Rubus parviflorus	2	FACU+	Nt	Shrub	THIMBLEBERRY
RUBSTR	2	Rubus strigosus	-2	FACW-	Nt	Shrub	WILD RED RASPBERRY
SAMRAC	3	Sambucus racemosa	2	FACU+	Nt	Shrub	RED BERRIED ELDER
SCHPUP	5	Schizachne purpurascens	2	FACU+	Nt	P-Grass	FALSE MELIC
SCIATR	3	Scirpus atrovirens	-5	OBL	Nt	P-Sedge	BULRUSH
SCICYP	5	Scirpus cyperinus	-5	OBL	Nt	P-Sedge	WOOL GRASS
SMIRAC	5	Smilacina racemosa	3	FACU	Nt	P-Forb	FALSE SPIKENARD
STRROS	5	Streptopus roseus	0	FAC	Nt	P-Forb	ROSE TWISTED STALK
TAROFF	0	TARAXACUM OFFICINALE	3	FACU	Ad	P-Forb	COMMON DANDELION
THEPHE	5	Thelypteris phegopteris	5	UPL	Nt	Fern	NORTHERN BEECH FERN

TILAME	5	Tilia americana	3	FACU	Nt Tree	BASSWOOD
TRIBOR	5	Trientalis borealis	-1	FAC+	Nt P-Forb	STARFLOWER
TSUCAN	5	Tsuga canadensis	3	FACU	Nt Tree	HEMLOCK
VERTHA	0	VERBASCUM THAPSUS	5	UPL	Ad B-Forb	COMMON MULLEIN
VIOREN	6	Viola renifolia	-3	FACW	Nt P-Forb	KIDNEY LEAVED VIOLET
VIOSEL	7	Viola selkirkii	5	UPL	Nt P-Forb	GREAT SPURRED VIOLET
WOOORE	10	Woodsia oregana	5	UPL	Nt Fern	OREGON WOODSIA