

## **II. EVALUATION OF SIGNIFICANT FEATURES OF MICHIGAN FOREST LAND**

### **A. Aesthetic and Scenic Values**

The aesthetic and scenic characteristics of Michigan are, for many residents, the first thing that comes to mind when they think of their state. In fact, Michigan's official state motto is, "Si Quaeris Peninsulam Amoenam Circumspice" (if you seek a pleasant peninsula, look about you). The Upper and Lower Peninsulas of Michigan border four of the largest freshwater lakes in the world and consequently has more coastline than any other state in the United States. Michigan's two great freshwater peninsulas are thus a scenic mix of woods, water and coastline. One of the benefits of Michigan forests to citizens and visitors alike that should not be overlooked when considering the Forest Legacy Program is the aesthetic richness provided by Michigan forests.

Michigan's forests, strikingly beautiful when considered on their own, are also often found in spectacular natural settings. For example, the coastal sand dunes of western Michigan, many of which are forested, are especially scenic features. Similarly, coastlines along much of the Lower and Upper Peninsulas are known for their open vistas and forested scenery. Also, there are many other forested areas inland that provide no less aesthetic pleasure due to the dramatic character of the landscape, often reflective of their underlying geology or topography. There are, for example, more than 100 waterfalls in the Upper Peninsula, including the second largest waterfall east of the Mississippi. Statewide, Michigan's forests are completed by more than 35,000 inland lakes and 36,000 miles of river (Fridgen, 1995).

The scenic values of Michigan forests are evident in every season of the year, from summer camping and hiking opportunities in Michigan's national forests, to winter snowmobiling on State and federal lands, to fall color tours in each of the State's 83 counties.

In recognition of the scenic and aesthetic values of Michigan's forests, the Eligibility Criteria used for identifying Forest Legacy Areas in this Assessment of Need include whether forested lands are near Great Lakes coastline (i.e., within five miles); whether forested lands are part of one of Michigan's many publicized fall color tours; or are near a major hiking trail like the North Country Trail (**Map 4**).

### **B. Important Wildlife Habitat**

Forests are important for many, if not most, of the wildlife species in Michigan. Their importance can be thought of with respect to the common types of forested communities that provide habitat for many species and the rare or uncommon forest types or other rare communities that are nested within a forested landscape. Additionally, many rare, declining, and wide ranging species depend on forests as habitat for nesting, shelter, foraging, or resting during migration. And there are other, more common wildlife species for which forests play a critical role at one time or another in their lives.



Map 4. Scenic Areas in Michigan

## 1. Rare Natural Communities

Within the broad forest communities identified by MNFI (1986), *further distinctions* can be made based on more local variation in forest composition. In addition, there are some unique ecological conditions, such as cliffs or seepage areas, that support forest communities that may have very narrow ecological ranges. This is what is described in Table 2. Please note that for purposes of this document, the communities listed in Table 2 can be assigned to a given community listed in Table 1. At this time, MNFI does not have a publication illustrating how the forested communities in Table 2 relate to the set of forested communities listed in Table 1. Some of these narrowly defined forest communities are globally rare. These types of communities are considered *globally imperiled*, and have been assigned a rank of imperilment (G-rank<sup>1</sup>) of G1-G3 (G4 and G5 are not considered imperiled).

Rare natural communities occur throughout the State, but are concentrated on shorelines and in the few relatively intact areas of the southern Lower Peninsula. For example, the Jackson Interlobate (Sub-subsection VI.1.3) comprises relatively steep and gravelly land forms, which have restricted agricultural use and resulted in a relatively high percentage of forest cover in that landscape ecosystem.

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<sup>1</sup> G-rank refers to the degree of imperilment of a species or natural community. It is based on the number of individuals, populations, or occurrences and ranges from G1 (critically imperiled globally; 5 or fewer occurrences or very few individuals or acres) to G5 (demonstrably secure globally). Globally imperiled species and communities include G1, G2 (imperiled globally; 6 to 20 occurrences or few remaining individuals or acres), and G3 (either very rare and local throughout its range or found locally (even abundantly) in a restricted range or because of other factors making it vulnerable to extinction; 21 to 100 occurrences). G-ranks that are uncertain are indicated by a G?, a GQ, or by a range, such as G3G5.

**Table 2. Globally Imperiled Forest Communities of Michigan based on The Nature Conservancy Classification.**

<b>Community Name</b>	<b>Global Imperilment Ranking</b>
Basswood - Ash - Maple Woodland	G3G5
Beech - Maple Glaciated Forest	G3G4
Beech - Oak - Maple Mesic Floodplain Forest	G1Q
Bur Oak - Swamp White Oak Mixed Bottomland Forest	G2G3
Chinquapin Oak / Nodding Onion Alvar Woodland	G1?
Eastern Hemlock - Beech Hardwood Forest	G3?
Eastern White Cedar - Yellow Birch Forest	G2Q
Great Lakes Dune Pine Forest	G3Q
Great Lakes White Pine - Hemlock Forest	G3?
Hemlock - Yellow Birch Wet-Mesic Forest	G3
Hemlock Mesic Forest	G3G4
Jack Pine - Red Pine / Scrub Oak Woodland	G3G4
Lakeplain Mesic Oak Woodland	G2
Maple - Yellow Birch Northern Hardwoods Forest	G3G4
Mixed Conifer / Common Juniper Alvar Woodland	G2?
Northern Dry-Mesic Oak Woodland	G3G4
Northern Hardwood Forest	G3G5
Northern Maple - Basswood Forest	G3?
Pin Oak Mixed Hardwood Forest	G3G5
Red Pine / Blueberry Dry Forest	G3
Spruce-Cedar Wet Alvar Woodland	G1G2
Sugar Maple-Oak-Hickory Limestone Woodland	G3
Swamp White Oak Woodland	G1
Sycamore-silver Maple Floodplain Forest	G3G4
White Cedar - (Hemlock) Mesic Forest	G3?
White Cedar Bluff Woodland	G2Q
White Cedar Limestone Bedrock Woodland	G3
White Cedar Limestone Talus Woodland	G3G4
White Cedar Seepage Swamp	G3G4
White Pine - Oak Morainial Ridge Forest	G3Q
White Pine - Red Maple Swamp	G3G4
White Pine - Red Oak Forest	G3
White Pine - White Oak Forest	G3
White Pine - White Oak Sand Woodland	G1Q
White Pine / Blueberry Dry-Mesic Forest	G3G4
White Pine / Mountain Maple Mesic Forest	G3G4
White Pine Inland Dune Ridge Forest	G3?
Wooded Dune and Swale Complex	G3

## 2. Rare Species

Michigan forests are important habitat for many rare species, and maintaining forests with appropriate structure and composition and of sufficient size is critical for the survival of these species. For example, the Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) is a rare plant (G3G4) that prefers shaded, moist conditions in mature forests and is sensitive to disturbance (Penskar and Higman, 1996). Another example is the pine marten (*Martes americana*) that requires a mature or uneven-aged, well stocked stand of deciduous or coniferous forest as optimal habitat (Earle et al., 2001). Both of these rare species occur in forests of Michigan, as do many others (see Table 3 below). All of these species depend on forests for some portion of their life history, though they may differ in their habitat requirements. In contrast to the marten and the fern described above, some species may benefit from management for early successional forests. The Kirtland's warbler (G1), for example, requires young jack pine stands to provide suitable nesting habitat.

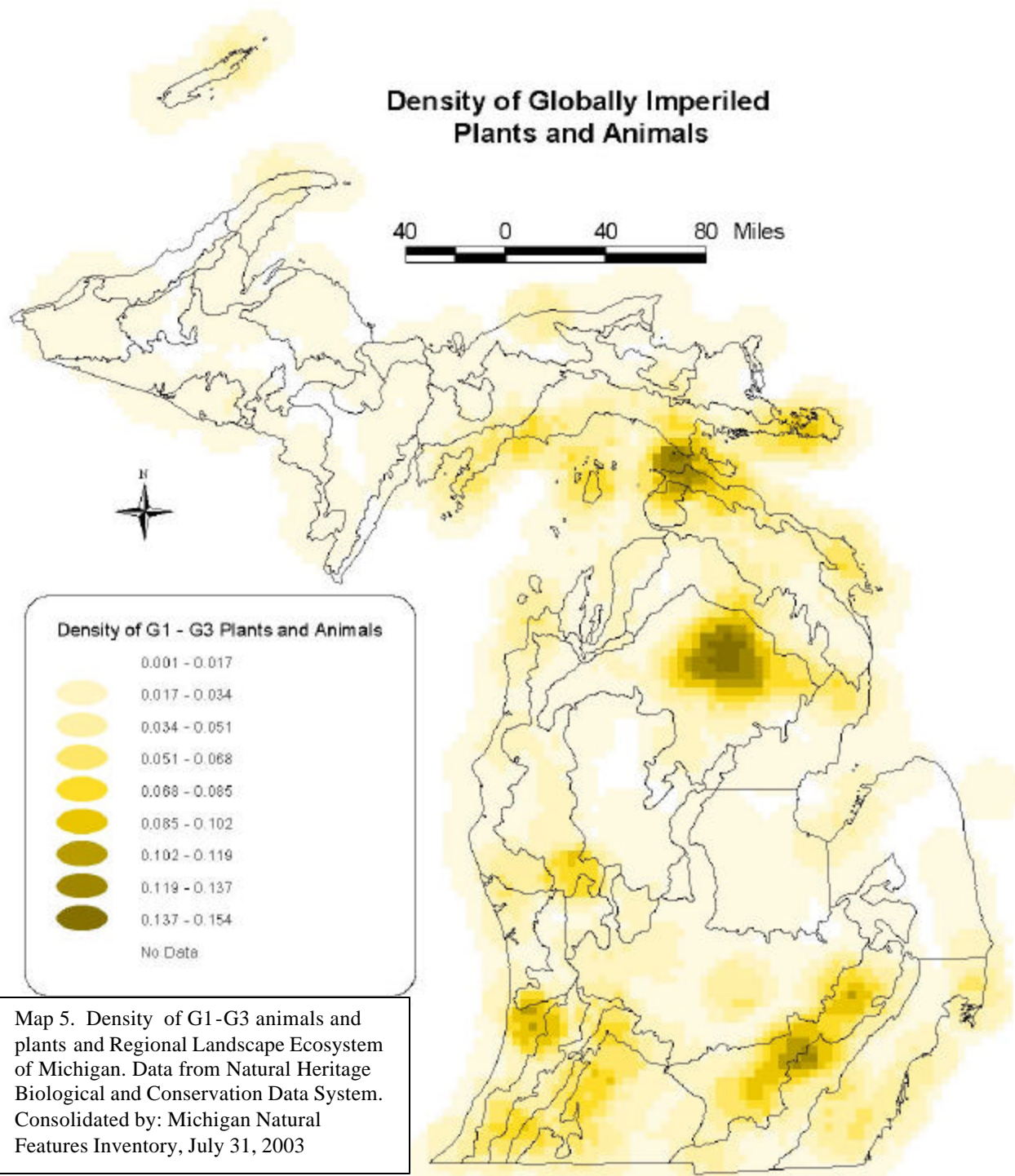
Rare species tend to be concentrated in many of the same areas of the State as rare communities (**Map 5**): near shorelines and in areas of remnant natural systems, especially forests.

## 3. Declining and Vulnerable Species and Migratory Songbirds

There are many species that are not yet considered rare or globally imperiled, but are declining, including many species of neotropical migratory birds and several reptiles and amphibians. In some cases, observed decreases in populations or disappearances of local populations are dramatic, as illustrated by the cerulean warbler. Numbers of this forest-dwelling species declined at a rate of 4.7 percent *per year* between 1966 and 2000 (Sauer et al. 2001). Similarly, the wood thrush declined at a rate of 0.9 percent over the same period. Most of these species depend on forests, either as habitat during some part of their life history or as buffer or recharge areas for their habitat. Because they depend directly on forests for their habitat and are relatively well understood, birds can serve as a surrogate for the broader group of declining and vulnerable species for the purposes of this Assessment of Need.

The Nature Conservancy, in partnership with other organizations, has identified declining species of birds for which the Great Lakes region provides critical forested habitat for breeding or stopover, and has taken the step to develop a map of those places most significant for conservation of those species (Ewert 1999). Much of this critical habitat may disappear due to increased conversion of forested land to urban and home development.

It is clear that large, contiguous forests, such as those in the Upper Peninsula and the northern Lower Peninsula, support large populations of many birds, including neotropical migratory species. Researchers have found that in early spring the first birds to reach the Upper Peninsula and other areas of Michigan



depend on insects hatching from near-shore areas in lakes. These insects mature from aquatic larvae and then breed and roost in the forests along lake shores, making shoreline forests particularly important for migratory birds that cannot find insect food in interior forests.

In summary, the large contiguous forests of the north are critical to declining and vulnerable birds because they support large populations and serve as a stronghold for many species. Of particular importance are those forests that support the earliest spring migrants, such as the shoreline forests of the northern lower peninsula, which are under strong pressure for use as property for secondary housing development.

#### **4. Wide-ranging Species**

In addition to rare and declining species, the forests of Michigan are important for several species that require large, intact areas to support viable populations. Wide ranging species, such as the gray wolf, the moose, the lynx, the fisher, and the black bear, though they may be able to tolerate close proximity to human activities under some circumstances, survive best when they have the ability to roam widely through undeveloped landscapes. In the upper Great Lakes, connectivity is provided by the mostly contiguous forests that stretch from the Upper Peninsula through northern Wisconsin and Minnesota and across Canada.

#### **5. Winter Deer Yards**

It is well established that the deer herd in Michigan makes a significant contribution to the economy and culture of Michigan (U.S. Fish and Wildlife Service and Bureau of the Census, 1998). In the Upper Peninsula, forests of northern white-cedar provide food and thermal cover for deer in winter. Areas where deer concentrate in winter, known as deer yards, are familiar to wildlife managers and hunters alike and have been studied for decades by the DNR. An important factor in determining these areas of winter deer concentration (depicted in **Map 6**) is the pattern of winter snow depth. In general, the northern half of the Upper Peninsula gets far more snow (many areas average 200 inches per winter) than the southern half and the Lower Peninsula. These extreme snowfalls force species, such as deer, that have a hard time traveling or finding food in deep snow, to move to areas of lesser snowfall. Other species that can move around more easily in deep snow (e.g., moose) or that hibernate (e.g., black bear) do not show similar patterns of winter distribution; their summer and winter ranges are the same.

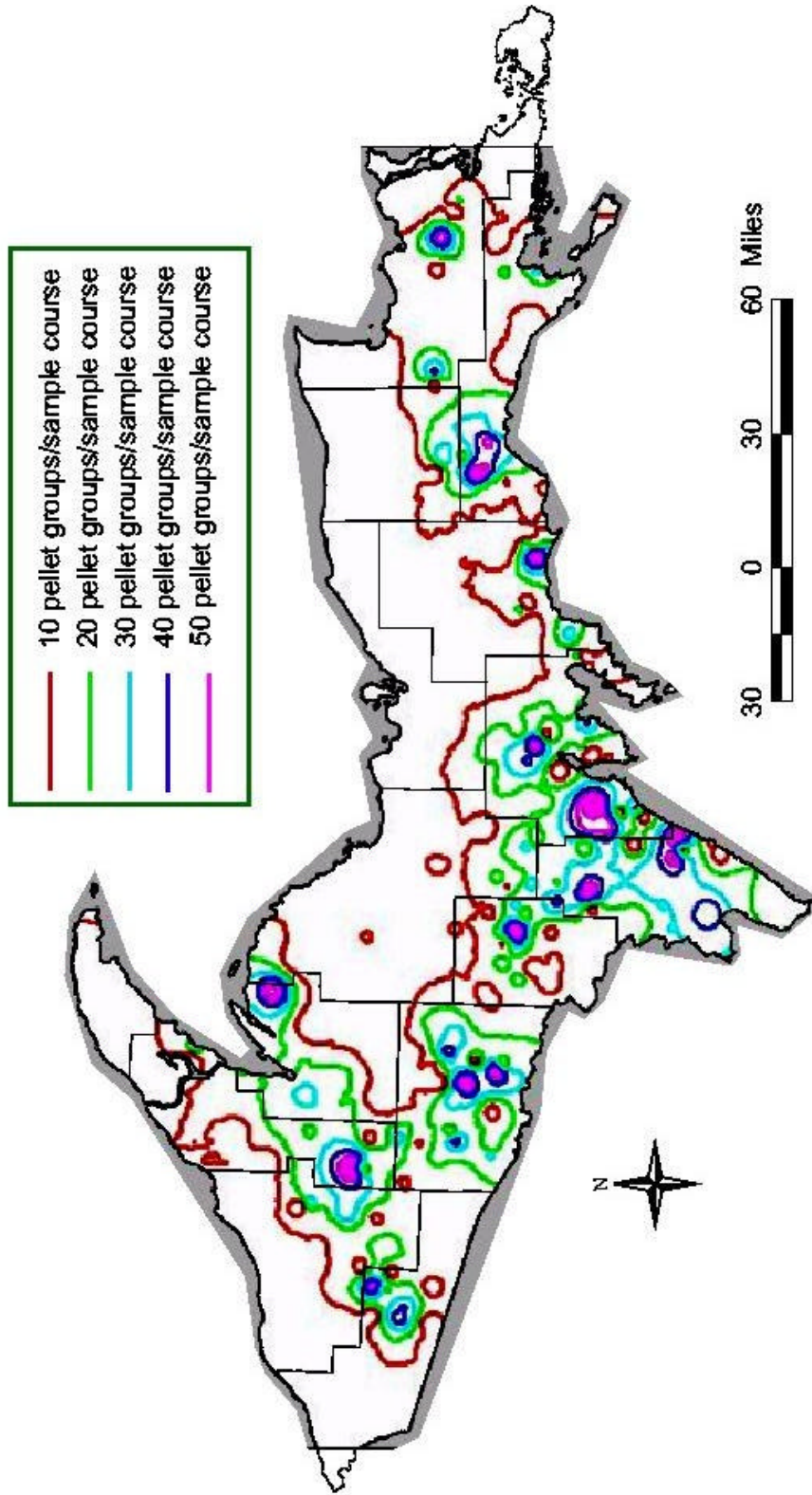
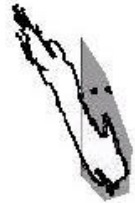
#### **6. Summary and Assessment**

Intact and relatively unfragmented forests are important for wildlife for a variety of reasons. The importance of forested areas for rare natural communities, rare species, declining and vulnerable species and migratory song birds, wide-ranging species, or as winter concentrations of white-tailed deer have thus been included in the Eligibility Criteria for Forest Legacy Areas.



# 1999 WINTER DEER CONCENTRATIONS IN MICHIGAN'S UPPER PENINSULA

\*Based on analysis of annual deer pellet counts (MDNR, unpublished data).



Map 6. Concentrations of deer in the Upper Peninsula of Michigan in the winter of 1999, based on analysis of annual deer pellet counts (MDNR, unpublished data)



### C. Geology and Outstanding Geologic Features

The geology of Michigan is complex, consisting not only of a variety of bedrock strata underlying the surface, but also layers of drift (material deposited through glacial processes) piled in various land forms through successive glacial advances and retreats (Dorr and Eschman 1970). Bedrock geology is most strongly expressed in the western Upper Peninsula, where formations dating to the Precambrian era (1.6 to 3.5 billion years ago) punctuate the landscape with dramatic ridges and steep ravines. Bedrock of more recent origin is exposed in the eastern Upper Peninsula and along the eastern shore of the northern Lower Peninsula, much of it being part of the Niagara Escarpment. This limestone and dolomite formation stretches from central New York through Ontario and Michigan and around the western side of Lake Michigan. The forests that grow on these bedrock surfaces are distinct in tree species composition and productivity, and they support very different associated plant and animal species.

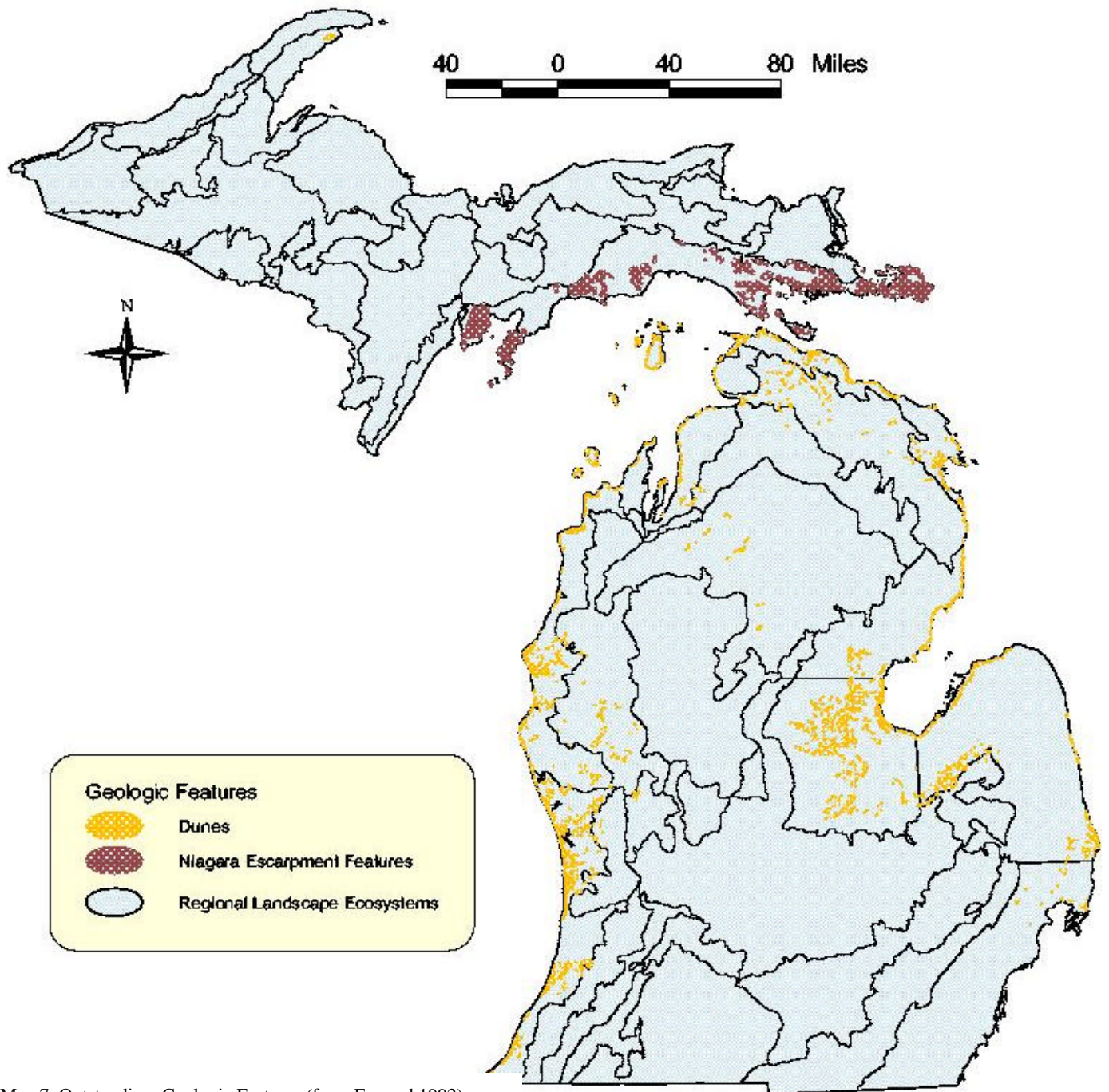
Much of the eastern Upper Peninsula and almost the entirety of the Lower Peninsula are covered in glacial drift, and different glacial land forms are characterized by distinct topography and soil types and provide the ecological setting for the development of ecosystems, forested and otherwise. For example, forests that develop on moraines (material deposited directly by glaciers and composed of mixed sands, clays, gravel and boulders) often are northern hardwoods or beech maple, and are typically more productive than those on outwash plains (typically level or pitted and composed of well sorted sands and gravels). The soils on outwash plains are typically less fertile, and often more excessively drained, commonly resulting in oak or oak-pine barrens or forests as the predominant plant community. The diversity of forests in Michigan is a direct result of the diversity of geology, coupled with broad climatic patterns and related differences in soils.

Among the variety of geological features in Michigan, some stand out as unique or unusual and deserve special consideration. Over the last several thousand years, as the land has rebounded from the weight of continental glaciers and the Great Lakes have filled and receded several times, several systems of freshwater dunes have formed. The most notable are those along the east coast of Lake Michigan, but also occur in many other places, including areas that are well inland from any lakes (**Map 7**). As the largest system of freshwater dunes in the world, the dunes (both open and forested) are a unique feature. They hold special cultural significance as some of the most picturesque landscapes in Michigan and host several rare natural communities and species, including the Federally Threatened Pitcher's thistle (*Cirsium pitcheri*). The dunes that are near the Great Lakes shorelines are of particular significance and will be included in the Eligibility Criteria for Forest Legacy Areas.

The Niagara Escarpment is another notable geologic feature. Formed of limestone and dolomite resulting from the deposition of calciferous marine organisms on an ancient ocean floor (400 – 500 million years ago), the Niagara Escarpment extends from the Door Peninsula in Wisconsin through the Garden Peninsula (near Manistique), arches around the northern shores of Lakes Michigan and Huron, and continues through Lake



# OUTSTANDING GEOLOGIC FEATURES OF MICHIGAN



Map 7. Outstanding Geologic Features (from Farrand 1992)

Huron then eastward to Niagara Falls and central New York (**Map 7**). In Ontario, the significance of the escarpment has been globally recognized; it has been a UNESCO World Biosphere Reserve since 1990 due to its biological and cultural importance. In Michigan, the Niagara Escarpment supports unusual natural communities (such as northern fens in low-lying areas; alvars on flat, droughty areas; and old growth northern white-cedar forests on bluffs), as well as rare species (such as the federally Endangered Hines Emerald dragonfly [*Somatochlora hineana*]), and is an important source of cedar for posts, poles, and other uses.

Because these geologic features are both largely near the shores of the Great Lakes, they are under relatively higher pressure for the development of second homes and roads. In addition to their geological, biological, and cultural significance, their susceptibility to development warrants consideration in the Eligibility Criteria. The Niagara Escarpment and the system of coastal freshwater sand dunes will make up one of the Eligibility Criteria for Forest Legacy Areas.

#### **D. Soils and Groundwater Recharge Areas**

The soils in Michigan reflect their geologic origin, whether being derived from bedrock or the result of glacial activity. There is tremendous diversity in soil texture, chemistry, and drainage class, and the age of Michigan soils spans several thousand years. Broad patterns of soil types are helpful in understanding differences among forests in Michigan. Differences in forest composition, structure, and productivity can be partly interpreted at this broad scale, though there is also much variation at the local scale.

Forest composition and structure is closely linked to soil characteristics, and intact forests also provide protection to supporting soils. Intensive forest management or conversion of forests to other land uses often results in compaction or erosion of the soil, which not only can dramatically change the ecology of an ecosystem, but can negatively affect aquatic and terrestrial ecosystems that are downstream. Conservation of forests and compatible forest management not only benefits forests, forest species, and soils, it also is critical to maintaining water quality in both surface and subsurface aquatic systems.

Forests capture a much greater proportion of water than land that has been converted to other uses, that is, they allow more water to infiltrate the soil where it can be used by resident plants or enter the groundwater. Formerly forested watersheds that are currently in agriculture or developed uses experience elevated runoff and erosion, resulting in changes to aquatic ecosystems and reduction of water quality (citation). Because of the predominance of glacial drift and its ability to soak up water, the cycle of infiltration, groundwater flow, and groundwater discharge is extremely important to ecosystems throughout Michigan. For example, the dry pine barrens of the Grayling Outwash Plain (landscape Sub-subsection VII.2.2, see **Map 3**) take in great amounts of precipitation and are considered an area of *groundwater recharge*. In contrast, the tamarack swamps of the Jackson Interlobate (landscape Sub-subsection VI.1.3, **Map 3**) and the coldwater lakes of the Traverse City Sub-subsection (VII.5.2, **Map 3**) depend on *groundwater discharge*. The role of forests in maintaining and benefiting from this cycle of recharge and discharge is central. Due to differences in geology, topography, and soil, some areas are more significant recharge areas than others; researchers at the Institute for

Fisheries Research (IFR) in Ann Arbor have mapped these patterns for the Lower Peninsula, and are soon to have the same information for the Upper Peninsula (**Map 8**). The areas that IFR has determined are significant will make up one of the Eligibility Criteria under Ecological Values for Legacy Areas.

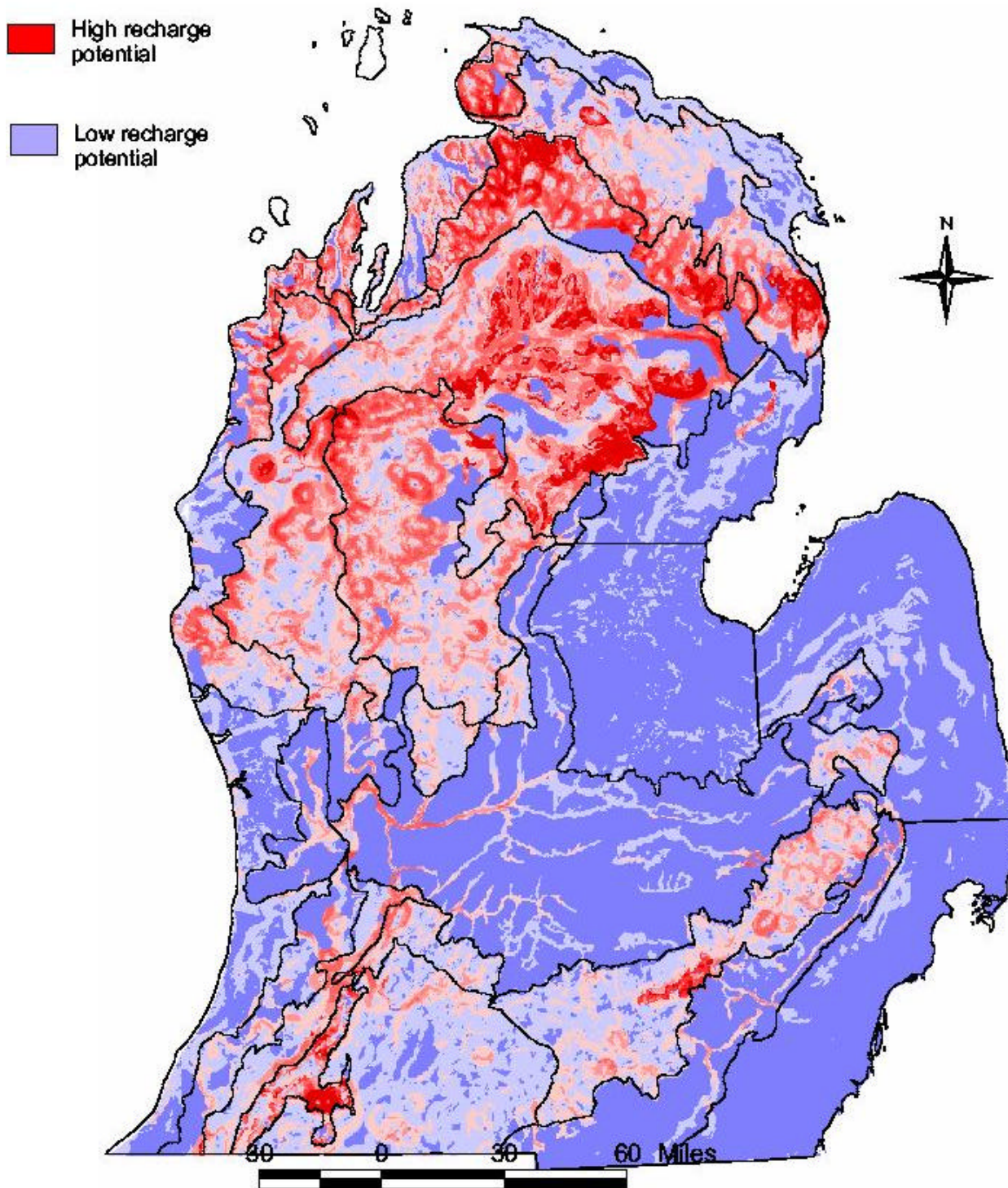
#### **E. Minerals Resource Potential**

In the Northern Lower Peninsula, much of the economic development related to mineral extraction is that coming from extraction of oil and gas in the Northern Lower Peninsula. Wells created to extract oil and gas do little to impair traditional uses and benefits of the surrounding forests in which these wells reside. Michigan's Forest Legacy Program (FLP) will consider those forested lands containing oil and gas well for participation in the FLP.

In certain areas where extraction would result in extensive surface disturbance, such as open pit mining, mineral extraction is at complete odds with the goals of the FLP. Michigan's FLP will exclude these lands from consideration. An exception will be made only if the mineral rights have been or can be reasonably purchased, with the intent of excluding any mining development.



# GROUNDWATER RECHARGE POTENTIAL IN THE LOWER PENINSULA OF MICHIGAN.



Map 12. Groundwater Recharge Potential in the Lower Peninsula of Michigan.