Significant Ecological Features of Wisconsin

The ecological features described here are those for which Wisconsin has an opportunity and responsibility in helping maintain regionally, continentally, and globally significant populations and/or natural communities. This information, along with maps identifying locations in Wisconsin where these features occur, was used to help set priorities for the Wisconsin Wildlife Action Plan.

Global Features	Upper Midwest-Regional Features
Great Lakes and their Shorelines	Glacial Lake Wisconsin
No. Highland Kettle Lakes/Pine Forest	Large Blocks of Predominantly Older Northern Forest
Pine-Oak Barrens	Large Sedge Meadows, Fens, and Prairies
Bur Oak Openings	Caves & Abandoned Mines
Niagara Escarpment	Medium-sized Rivers and Streams
Continental Features	**State Features**
Driftless Area Features	Extensive Grassland Communities
Large Blocks-Old Deciduous-Coniferous Forest	Working Northern Forests Communities
Boreal Transition Forest	Floodplain Forest Communities
Kettle Moraine Features	High Quality Wetland Communities
Large River Corridors	Diverse Aquatic Communities
	Bedrock Communities

Globally Important Resources in Wisconsin

Great Lakes and their Shorelines. The Great Lakes are the largest freshwater lakes in the world. Great Lakes shorelines support a diverse and distinct mosaic of natural communities and many regional endemic species. Lake Superior has important fisheries and bird habitat (e.g. lake trout and whitefish spawning and nesting piping plovers). Lakes Superior and Michigan and their shorelines are important migratory bird corridors and provide habitat for wintering waterfowl. The Apostle Islands have exceptional examples of old growth forests, beach and dune complexes, coastal wetlands, and bedrock features. There is a tremendous regional repository of rare biota and intact natural communities here. The freshwater estuaries on the southwest shore of Lake Superior are in relatively good condition (some are "pristine") and unique. Many other Great Lakes estuaries, especially to the east of Wisconsin on the "lower" lakes, are degraded due to poor water quality, development, and serious infestations of invasive species. Ridge and swale complexes are unique features of the Great Lakes shorelines, contain diverse assemblages of natural communities, and are especially prominent along Lake Michigan. The lakeplain prairie complex on southwestern Lake Michigan is

the only non-forested ridge and swale system in the state and includes Chiwaukee Prairie. “Sandscapes” (these include sandspits, coastal barrier spits, cuspate forelands, and tombolos) protect a diverse array of important natural communities and provide critical habitat for rare species (e.g., Piping Plover). Major concentrations of migratory birds occur on some of these sandscapes, especially the coastal barrier spits such as Long Island and Wisconsin Point. The Door Peninsula and Grand Traverse Islands have high concentrations of rare species associated with the calcareous soils and exposures of dolomite that characterize shoreline environments. Some “maritime” forests on the mainland and on offshore islands are of high quality.

Northern Highland Kettle Lakes and Pine Forest. This sandy outwash plain has one of the highest densities of glacial kettle lakes in the world. It is a complex heterogeneous landscape of forested uplands, diverse wetlands, and many lake types. Some lake types, unmanipulated spring ponds, and undeveloped connecting streams, are now quite rare. Some rare lake types feature clear circumneutral water, hard bottoms, exceptionally low nutrient levels, and support rare invertebrates and fish species that are far better represented in this Landscape than anywhere else in the state. Some lakes and low gradient streams support wild rice beds, which are important both ecologically and culturally.

The pine-dominated dry-mesic forests that occur here are different than the matrix of hemlock-hardwood forest that historically vegetated most of northern Wisconsin and surrounds the Landscape. This is the best place in Wisconsin to practice large-scale white pine/red pine forest management, with opportunities to represent all age classes and patch sizes, including those which are currently scarce or absent. Natural red pine forest is at the center of its continental range here, (which is limited to the northern Lake States, Ontario, and the Appalachian Mountains). Wildlife species associated with coniferous forests are especially well-represented here.

Pine-Oak Barrens. Pine barrens found in Wisconsin are globally significant due to their distinctive ecological characteristics, restricted range, and range wide rarity. Their species composition differs from the New Jersey pine barrens (which are pitch pine-dominated and well east of the range of many of the prairie species that are so important in the Upper Midwestern barrens). Elsewhere in the upper Midwest, pine barrens are degraded or the remnants small, offering limited opportunities for restoration or management. Wisconsin pine barrens support a high number of rare species, including some that are globally rare (such as the federally endangered Karner blue butterfly and the Kirtland’s Warbler), and many on the state list of Species of Greatest Conservation Need. Pine barrens in Wisconsin are dynamic and highly variable fire-driven ecosystems, and can be managed for a continuum of natural structurally distinct community types from semi-open brush prairie, to savannas with scattered trees, to closed canopy dry forest.

Bur Oak Openings. The Great Plains has savanna communities all along its eastern edge, but those farther south and west are much different than those in Wisconsin. The

Nature Conservancy called the savanna found in southern Wisconsin the "northern bur oak opening". This savanna type occurs from central Illinois in a thin strip into Minnesota. The type has a limited range, and Wisconsin is the center of the feature and has the best opportunity for restoration, especially at larger scales. The Southern Unit of the Kettle Moraine State Forest, portions of the Central Sand Hills and Central Sand Plains, and some places in the Western Coulees and Ridges Ecological Landscape, are areas where significant management opportunities exist for this globally rare community. Some of today's scrub oak barrens, or brush prairie communities, were historically Pine Barrens that lost their coniferous component and have been partially restored through mechanical and chemical reduction of woody cover and frequent prescribed burning. "Scrub" oak savannas with short, brushy structure, composed primarily of black and northern pin oaks, could be restored in the Central Sand Plains, Northwest Sands, and Northeast Sands Ecological Landscapes.

Niagara Escarpment. The Niagara Escarpment is a bedrock feature composed mostly of Silurian dolomite (strictly speaking, it's the steep, exposed side of a gently sloping bedrock ridge or "cuesta") that stretches from Lake Champlain in the northeastern United States westward across the Great Lakes to Wisconsin. Here the Escarpment is exposed from the islands off of the northern tip of the Door Peninsula southwest for over 150 miles into southeastern Wisconsin where it disappears beneath glacial deposits. The Escarpment supports many rare species, most notably a group of globally rare snails, the oldest trees known in Wisconsin, karst topography, and contains important hibernacula for bats. It has value for migratory birds and bats by providing updrafts and generally north-south 'leading line'. Rare or otherwise important natural communities and habitats associated with the Escarpment include dripping cliffs, dry cliffs, talus slopes, unusual conifer forests that contain the state's oldest trees, and, at one site on the Door Peninsula, the globally-rare alvar community.

Continentally Important Resources in Wisconsin

Driftless Area Features. The Driftless area occurs in southeast Minnesota, northeast Iowa, and northwest Illinois, however approximately 75% of the Driftless Area is in Wisconsin. Unlike most of Wisconsin and the Upper Midwest, the topography here formed over millions of years without glaciation, and is characterized by deep erosional valleys, exposed bedrock-controlled ridges, steep forested side slopes with strong aspect differences that support high species and community diversity, and landscape heterogeneity. The rugged topography led to greater abundance and persistence of remnant community types that have been destroyed or more greatly diminished elsewhere. Forest cover is relatively extensive compared to other parts of southern Wisconsin. Natural community types and habitats that are especially well-represented here are oak forests, mesic maple-basswood forests, floodplain forests, hemlock and pine "relicts", algific talus slopes, dry (goat) prairie, caves (and abandoned mines) with bat and herptile hibernacula, cliffs and associated rare plants and snails, and spring-fed cold-water streams. The lower reaches

of several of Wisconsin's largest rivers occur here including the Wisconsin, Black, and Chippewa Rivers which all flow into the Mississippi River. These river systems are associated with broad floodplains, containing extensive floodplain forests, marshes, and oxbow lakes. Where these are associated with large blocks of upland forest, the diversity of forest dependent wildlife is especially high and many rare species are present. The largest stand of southern bottomland hardwoods in the upper Midwest is located along the Lower Chippewa River.

Large Blocks – Old Deciduous-Coniferous Forest (climate change resistant forest systems). Large contiguous blocks of this forest type are embedded in a relatively unbroken forested matrix. These deciduous-coniferous forests have some of the most diverse assemblages of breeding birds on the continent. This strip of habitat stretches from Algonquin Park in Ontario to central Minnesota but does not extend very far north or south. Wisconsin is in the heart of this high diversity bird area. These forests are centers of abundance for many species, and are believed to be a source area for broadly distributed species. Distribution maps of many warbler species follow the same boundary and are associated with this forest. Locations in Wisconsin where these forests are extensive and offer good opportunities for large-block management are the

Winegar Moraine and Penokee Range. The Baraboo Hills occur on an outcrop of a unique quartzite formation, and also represent a part of the largest remaining block of dry-mesic and mesic forest in southern Wisconsin. The area has a high diversity of species and is considered one of the state's most important breeding sites for area-sensitive birds, especially those associated strongly with "southern" hardwood forests and Driftless Area conifer "relicts". The best of the conifer stands are imbedded within a matrix of extensive hardwood forest, and are often associated with deep gorges cut through the bedrock by intact and ecologically important headwaters streams. The Baraboo Hills support a wealth of rare species and natural communities, and have been a major focus of conservation efforts for many decades. The unique geological features have attracted worldwide attention.

Boreal Transition Forest. This forest type is only seen in parts of the coastal strip of Michigan and Wisconsin along the Lake Superior clay plain. It is not found in Minnesota. It is an edaphic feature associated with the local climate and has very different properties from the boreal forests in Canada. Wisconsin historically had white pine and white cedar abundantly represented in this community type, but virtually no primary forest is left. It was heavily converted and much of the area is still managed for aspen. The Lake Superior Clay Plain forest differs from boreal transition forests in Door County. In Door County, the overstory is similar, but the substrate consists of shallow soils over dolomite bedrock, and the ground flora includes Great Lakes shoreline specialists and calciphiles. In the Lake Superior Clay Plain the substrate is mostly deep lacustrine clay soils. Clay soils also have a high calcium status but are relatively impermeable to moisture infiltration, resulting in more wetland-like conditions. The Lake Superior forest has some boreal species not found on Door Peninsula. This area is important to boreal birds in Wisconsin. Climate change modeling suggests that areas next to the Great

Lakes may retain the current climate the longest and might be places to concentrate efforts for protecting examples of temperate community types. The "snowbelt" along the Great Lakes may be the best place to manage for hemlock and other species requiring cool climates and constant, relatively high moisture levels.

Kettle Moraine Features. This is a large glacial interlobate moraine starting east of Lake Winnebago and running southwest for almost 90 miles into southern Wisconsin. It features rugged topography and contains many glacial features such as kames, drumlins and eskers. The vegetation is a complex mosaic of savanna, prairie, sedge meadow, marsh, calcareous fen, and southern forest communities. Presently it is a large forested block in the midst of agricultural lands. Michigan has some similar topography but the interlobate moraine in Wisconsin was less suitable for conversion to agriculture than other regions and many of the natural features that have persisted here have all but disappeared elsewhere. Interlobate moraines with this combination of natural features at this scale are very rare, and possibly restricted to just a few locations in the Upper Midwest.

Large River Corridors. Wisconsin has a large number of lakes, rivers, and streams. Large rivers such as the Upper Mississippi, Wisconsin, Chippewa, Black, St. Croix, Brule, Wolf and Namekagon, Rivers are significant. An abundance of smaller coldwater streams emanating from glacial moraines and sedimentary bedrock in the unglaciated Driftless Area also occur here. The lower Wolf River is considered to be one of the few remaining rivers with a high degree of natural meandering which is needed by some aquatic species. The Winnebago pool lakes have a very significant population of the lake sturgeon. These waters contain significant populations of fish and rare invertebrates such as mussels and dragonflies, and the larger waterbodies also serve as major migratory bird stopover areas.

Upper Midwest Regionally Important Resources in Wisconsin

Glacial Lake Wisconsin. This area in central Wisconsin is in and around the bed of extinct Glacial Lake Wisconsin and is a biodiversity hotspot. The feature occurs in the Tension Zone and supports a unique mixture of southern and northern species. Many SGCN, especially habitat and area-sensitive species, thrive in the area. Wet-mesic white pine-red maple forests are found here, which support many sensitive species, and have few if any extant occurrences elsewhere in the Upper Midwest (those in Michigan were cut and have not been restored). Large expanses of dry forest and barrens occur here and the potential for barrens restoration is high. This is one of the two best places in the state and continent to manage for Midwestern barrens vegetation and its associated species. The state's largest area of contiguous wetland occurred here - 'The Great Swamp of Central Wisconsin' – and there are large expanses of wetlands remaining, though many have been altered hydrologically by ditches and dikes. Sandstone buttes, mesas, cliffs,

pinnacles, and gorges occur here; some with rare species. These features do not occur in other parts of the Upper Midwest.

Large Blocks of Predominately Older Northern Forest. The Blue Hills have quartzite bedrock and are similar in some ways to the Baraboo Hills. The area supports large blocks of relatively unfragmented forests. The high-gradient, softwater streams drain intact, forested watersheds, have significant diversity values, and look similar to mountain streams. The area contains unique geological features especially the Felsenmeers ("sea of rocks"), which consist of extensive slopes of open, shattered quartzite talus with unusual lichen communities and dramatic cold air drainages which are responsible for the presence of several notably disjunct northern species.

The Menominee Reservation has vast relatively unbroken hemlock-hardwood forests, scattered lakes, and ecologically important streams within forested watersheds. Large white cedar swamps are common in the eastern portion, where marl lakes supporting calciphilic plants occur. Prominent exposures of granitic bedrock occur along the Wolf River. Most of the forest is older than average for the state and supports significant populations of forest interior species that have become scarce in forests elsewhere. Other northeast Wisconsin Forest have rock outcrops, rivers, and extensive forests, some with bedrock close to the surface including cliffs, talus slopes, and glade communities. It needs more study as to its regional importance.

Large Sedge Meadows, Fens and Prairies. Although most of the tallgrass prairie has been lost, Wisconsin has some significant prairie remnants. Avoca Prairie is the largest contiguous prairie east of the Mississippi River. Scuppernong Prairie and Military Ridge have significant numbers of remnants and have very good potential for restoration. Chiwaukee Prairie is the largest wet-mesic prairie in the state. These remnants have high prairie species diversity. Among the largest concentrations of bluff ("goat") prairies in the Upper Midwest occur in Wisconsin's portion of the Driftless Area. Many of these are associated with significant stands of oak forest and restorable oak savanna. The bracken grasslands occurring at Spread Eagle are part of this category.

Wisconsin has a large number of wetlands covered under the heading sedge meadow, especially floodplain forests, marshes, and peatlands (however, Minnesota and Michigan also have many peatlands; Michigan has patterned peatlands that are more diverse) and to a lesser degree, fens, and prairie wetland types. Wetland loss in neighboring states has been greater than Wisconsin's on a percentage basis. Cedar swamps are common in some parts of the state and harbor many rare plants.

Caves and Abandoned Mines. Wisconsin has several caves and abandoned mines that have become hibernacula for large populations of bats. Neda Mine is considered to contain the largest number of hibernating bats in the Midwest. Even though many parts of the mine were inaccessible for censusing, the population was estimated to include at least 300,000 little brown bats (*Myotis lucifugus*), and hundreds of northern long-eared bats (*Myotis septentrionalis*), eastern pipistrelles (*Pipistrellus subflavus*) and

big brown bats (*Eptesicus fuscus*) (Altenbach, unpublished data, 1995). Other abandoned mines known to harbor large numbers of hibernating bats occur along the Mississippi River and in the Penokee Range of far northern Wisconsin. Driftless Area caves also support bat hibernacula.

Medium-sized Rivers and Streams. These waters contain significant populations of fish and rare invertebrates such as mussels and dragonflies, but have fewer species than the larger waterbodies. River systems such as the Wolf, Jump, Bark and Namekagon fall into this category. They also serve as major migratory bird stopover areas and often times harbor significant streamside natural communities.

The combined relevance of the fore mentioned ecological role goes well beyond our borders. Global, continental and upper Midwest features of importance, for which Wisconsin has a major role to play in the continued existence of a natural communities or species, indicates they should be our foremost conservation priorities. If we don't do it here, then conservation probably will not get done elsewhere and species will suffer the consequences of our actions (or inaction).

State Important Resources in Wisconsin

Even though other natural communities and species ranges may be better addressed elsewhere, we cannot assume they will. We also, have a responsibility to keep natural communities and species native to the state for future generations. Natural community assessments describing the importance in maintaining community types, assess their current condition in the state, and identify opportunities for managing the community type form the basis for additional high priority areas within the confines of the state. These highly rated natural communities and species are also considered priorities in the state.

Extensive Grassland Communities. Native communities (prairies, sand barrens, and fens) and non-native grasslands such as pastures, hay fields, etc. make up the grassland communities. Wisconsin has some of the best opportunities in the Midwest to preserve and restore tallgrass prairie, and provide habitat for Henslow's Sparrow.

Working Northern Forest Communities. The 37 counties north of the Tension Zone have about 70% of the state's forested area. The area was drastically disturbed during the Cutover Period (1870 – 1930) and by subsequent fires. Currently maple-basswood and aspen-birch are the two most common forest types. Wisconsin is now one of the nation's top two forestry production states, and forestry is the largest employer in 27 northern forest counties. These large expanses of forest provide habitat for some of our most beloved species such as Ruffed Grouse, Scarlet Tanager, Black Bear, and White-tailed Deer. These species thrive precisely because we have abundant habitat for them. Most places need not be identified for changes in focus, because they are

accomplishing many conservation goals with existing direction, but other areas harbor large blocks of mature forest, forested wetland, conifer uplands, or beech-hardwood forest where tweaks in management direct could enhance the viability for several SGCN.

Floodplain Forest Communities. A mix of hardwoods and wetlands characterize floodplain forest. Smaller patches along mid-sized streams harbor some species not found in the forests along the major river ways. Fragmentation by agriculture, water impoundment, and development has reduced connectivity. Patch size is shrinking, and invasive species are an increasingly serious problem. With these combined factors, a few smaller floodplain forest systems merit priority to focus on resolving the threats and enhancing the potential the species will still be with us in the future.

High Quality Wetland Communities. Many different kinds of wetland communities have water-saturated soils or other substrates as their common characteristic. Ecological functions and food web relationships are different in wetlands than uplands. In Wisconsin 46% of the original wetlands were lost between 1780 and 1980. Wetlands are used by 43% of all federal listed threatened and endangered species and 32% of the state threatened/endangered species. Large patches of intact ash swamps or even disturbed, ditched and diked wetlands, such as Crex Meadows and Horicon Marsh provide habitat for and often times the largest populations of SGCNs in the state.

Diverse Aquatic Communities. The amount and high quality of Wisconsin's water resources is rare on a global scale. It ranges from small ephemeral ponds to the largest freshwater lake by surface area in the world, and includes a plentiful supply of groundwater. Runoff pollution, urbanization and development, recreation, fish stocking and harvest, and exotic species invasions are significant threats. Large river systems harbor a vast majority of the aquatic diversity, but several reaches of mid-sized streams provide habitat for specialized species.