



## **Rapid Ecological Assessment for Rib Mountain State Park, Marathon County, WI**

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**A Rapid Ecological Assessment Focusing on Breeding Passerine Birds, Bats, and High-quality Natural Communities**

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# Rib Mountain State Park at a Glance:

## Exceptional Characteristics of the Study Area

- **Older Upland Forest.** Rib Mountain State Park (RMSP) harbors approximately 1063 acres of moderate quality Northern Mesic and Dry-mesic Forest. Nearly 80% of the trees in these stands are 15 inches or larger in diameter at breast height. Currently many of the forest stands have been aged at 60-70 years old, while some are 100 years old or older. The WDNR has identified a need to conserve, protect, and manage for older forest and old-growth forests to provide the diverse range of habitats needed for sustainable forest management. This large forested block provides important habitat for area-dependent species such as forest interior birds. Additional maturation of these forests will enhance their value to many plant and animal species.
- **Forest Interior Birds.** Large blocks of older, upland forest, both within the park and in conjunction with those in the surrounding area, provide important habitat for numerous forest interior birds, many of which are rare or declining and are considered to be Species of Greatest Conservation Need.
- **Bats.** Older forests provide habitat for Wisconsin's summer resident cave-dwelling bats, all of which were recently listed as State Threatened due to the imminent threat of white-nose syndrome. The park and surrounding landscape provide valuable habitat for bat foraging and summer roosting.
- **Ephemeral Seeps and Springs, Streams, and Ponds.** Ephemeral water features, including Ephemeral Ponds and Forested Seeps, are scattered throughout the property. Ephemeral Ponds provide habitat for a range of species, including rare and declining amphibians and invertebrates that require fishless ponds for their life cycles.
- **Bedrock-Controlled Features.** Bedrock Glades and talus slopes are scattered across the park and are generally best developed on the upper third of the slopes. The glades and talus slopes (some of which are open, some of which are forested) provide habitat for rare species as well as some species that are habitat specialists.

## Site Specific Opportunities for Biodiversity Conservation

One ecologically important site, or "Primary Site," is identified. "Primary Sites" are typically delineated because they encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. This site warrants high protection and/or restoration consideration during the development of the property master plan.

### Primary site highlights:

- Larger block of older Northern Mesic and Dry-mesic Forest
- Bedrock-controlled features (e.g., Bedrock Glades)
- Ephemeral water features: seeps and springs, streams, and ponds.
- Rare species including both plants and animals

# Introduction

## Purpose and Objectives

This report is intended to be used in conjunction with other sources of information for master planning Rib Mountain State Park (RMSP). This assessment addresses issues specifically related to the conservation of biological diversity for this property.

The primary objectives of this project were to collect biological information and to analyze, synthesize and interpret this information for use by the planning team. This effort focused on assessing areas of potential habitat for rare species and identifying natural community management opportunities.

Survey efforts for RMSP were limited to a “rapid assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting passerine bird occurrences, 3) documenting bat occurrences, and 4) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning, although it is a scaled-down version in terms of both the time and effort expended when compared to similar projects conducted on much larger properties, such as state forests. The information collected was the result of survey work in 2015. There will, undoubtedly, be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified by the Wisconsin Department of Natural Resources (WDNR) or others as representing either an opportunity or a need for future work.

## Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program resides in the Wisconsin DNR’s Bureau of Natural Heritage Conservation and is part of an international network of NHI programs. The defining and unifying characteristic of this network is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers was established by The Nature Conservancy and is currently coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on natural communities, rare plant and animal species, and other natural features, referred to as *elements* of biodiversity. Elements tracked by the Wisconsin NHI Program are listed on the Wisconsin NHI Working List (WNHI 2014), which is the list of Endangered, Threatened, and Special Concern plants and animals, all natural communities, and other special features such as bird rookeries. This list changes over time as the populations of species change (both up and down) and as knowledge about species and natural community status and distribution increases. An explanation of the terms used in the working list can be found in Appendix A. The most recent Working List for the State of Wisconsin is available through the WDNR Bureau of Natural Heritage Conservation ([dnr.wi.gov](http://dnr.wi.gov), keyword “working list”).

The Wisconsin NHI program uses a standardized approach for biotic inventory work that supports master planning (Appendix B). Generally, the approach involves data collection and development, data analysis, and presentation of results. Details of standardized NHI methodology can be found on the NatureServe website: [www.natureserve.org](http://www.natureserve.org).

Data for this report were compiled using existing NHI data as well as surveys for natural communities, breeding birds, and bats conducted in 2015. Current WDNR forest reconnaissance data were also obtained from the forestry database, WisFIRS ([dnr.wi.gov](http://dnr.wi.gov), keyword “wisfirs” for more information).

## General Background Information

Various biotic inventory and planning efforts have identified RMSP as being ecologically significant. The following are examples of such projects and the significant features identified.

### Previous Inventory Efforts

Past surveys and biotic inventory efforts have highlighted the ecological importance of Rib Mountain State Park. In 2001, natural community and rare plant surveys were done by a private contractor on approximately 30 acres on the north-facing slope to inform an earlier ski hill expansion at Granite Peak. Natural community, rare plant, and limited breeding bird surveys were conducted by NHI staff in the western half of the park in 2003 to support park master planning.

### Planning Efforts

Recent planning efforts have used the biodiversity information gathered by past biological inventories. Ecological information on good quality natural communities and rare species was incorporated into the **Rib Mountain State Park Master Plan** (WDNR 2005). The master plan established vegetation management goals and actions to help maintain the ecological integrity of the park.

The **Land Legacy Report** (WDNR 2006a) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The description of the Middle Wisconsin River legacy area, including the area around Rib Mountain State Park, noted that upland and floodplain forests and associated marshes provide important habitat for resident and migratory wildlife. The Middle Wisconsin River legacy area was assigned a score of three points on their five-point scale for conservation significance, meaning it possesses "very good ecological qualities, is of adequate size to meet the needs of some of the critical components, and/or harbors natural communities or species of state significance. Restoration efforts will typically be important and have a very good chance of success."

## Special Management Designation

### Forest Certification

Forest Certification is established on all DNR-managed lands, including state parks, wildlife and fishery areas, and natural areas. Certified forests are recognized by the Forest Stewardship Council and the Sustainable Forestry Initiative as being responsibly managed (WDNR 2009). This certification emphasizes the state's commitment to responsibly managing and conserving its lands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

### State Natural Areas

State Natural Areas (SNAs) are places on the landscape that protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. Designation confers a significant level of land protection through state statutes, administrative rules, and guidelines. One SNA occurs at RMSP:

- **Rib Mountain Talus Forest** covers 215 acres at Rib Mountains State Park. Formed 1.5 billion years ago and standing 750 feet above the surrounding landscape, Rib Mountain is composed of a single large block of quartzite. The site supports an extensive second-growth mesic forest of sugar maple (*Acer saccharum*), paper birch (*Betula papyrifera*), red oak (*Quercus rubra*), and big-tooth aspen (*Populus grandidentata*) among the scattered quartzite rocks on the top and south side of Rib Mountain. Scattered conifers are present but are greatly reduced from their historic abundance. Unique microhabitats within crevices of the jumbled talus support rare

plants. Rib Mountain Talus Forest was designated a State Natural Area in the 2005 master plan (WDNR 2005).

## Ecological Context

*This section is largely reproduced from two sources: The Ecological Landscapes of Wisconsin (WDNR 2012) and Wisconsin Wildlife Action Plan (WDNR 2006b).*

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et al. 1994, Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

Rib Mountain State Park is located in the Forest Transition Ecological Landscape (Figure 1). The Forest Transition Ecological Landscape lies along the northern border of Wisconsin's Tension Zone (Curtis 1959), through the central and western part of the state, and supports both northern forests and agricultural areas. The central portion of the Forest Transition lies primarily on a glacial till plain that was deposited between 25,000 and 790,000 years ago. The eastern and western portions are on moraines of the Wisconsin glaciation from 14,000 to 18,000 years ago. The growing season in this part of the state is long enough that agriculture is viable, although climatic conditions are not as favorable for crops as they are in southern Wisconsin. Soils are diverse, ranging from sandy loams to loams or shallow silt loams and from poorly drained to well-drained.

The ecological landscape's flora shows characteristics of both northern and southern Wisconsin, corresponding to its position along the northern margin of the Tension Zone.

The historical vegetation of the Forest Transition Ecological Landscape was primarily northern hardwood and hemlock-hardwood forests. These mesic forests were dominated by sugar maple and eastern hemlock (*Tsuga canadensis*) and contained some yellow birch (*Betula alleghaniensis*), red pine (*Pinus resinosa*), and white pine (*Pinus strobus*). Currently, 44% of this ecological landscape is forested compared to 86% forested before Euro-American settlement.

Forested areas now consist primarily of northern hardwoods and aspen (*Populus* spp.), with smaller amounts of oak (*Quercus* spp.) and lowland hardwoods. Coniferous and deciduous swamps are scattered throughout the ecological landscape and are often found near the headwaters of streams or associated with lakes in kettle depressions on moraines.

Small kettle lakes are common on the moraines in the western and eastern parts of the ecological landscape, but there are few lakes in the central glacial till plain. Several streams have their headwaters in the moraines. Many small creeks and rivers flow across the plain including the Big Rib, Little Rib, Trappe, and Wisconsin rivers. A short stretch of the St. Croix River forms the western boundary of this ecological landscape.



**Figure 1.** Ecological Landscapes of Wisconsin. Rib Mountain State Park is represented by the circled black dot.

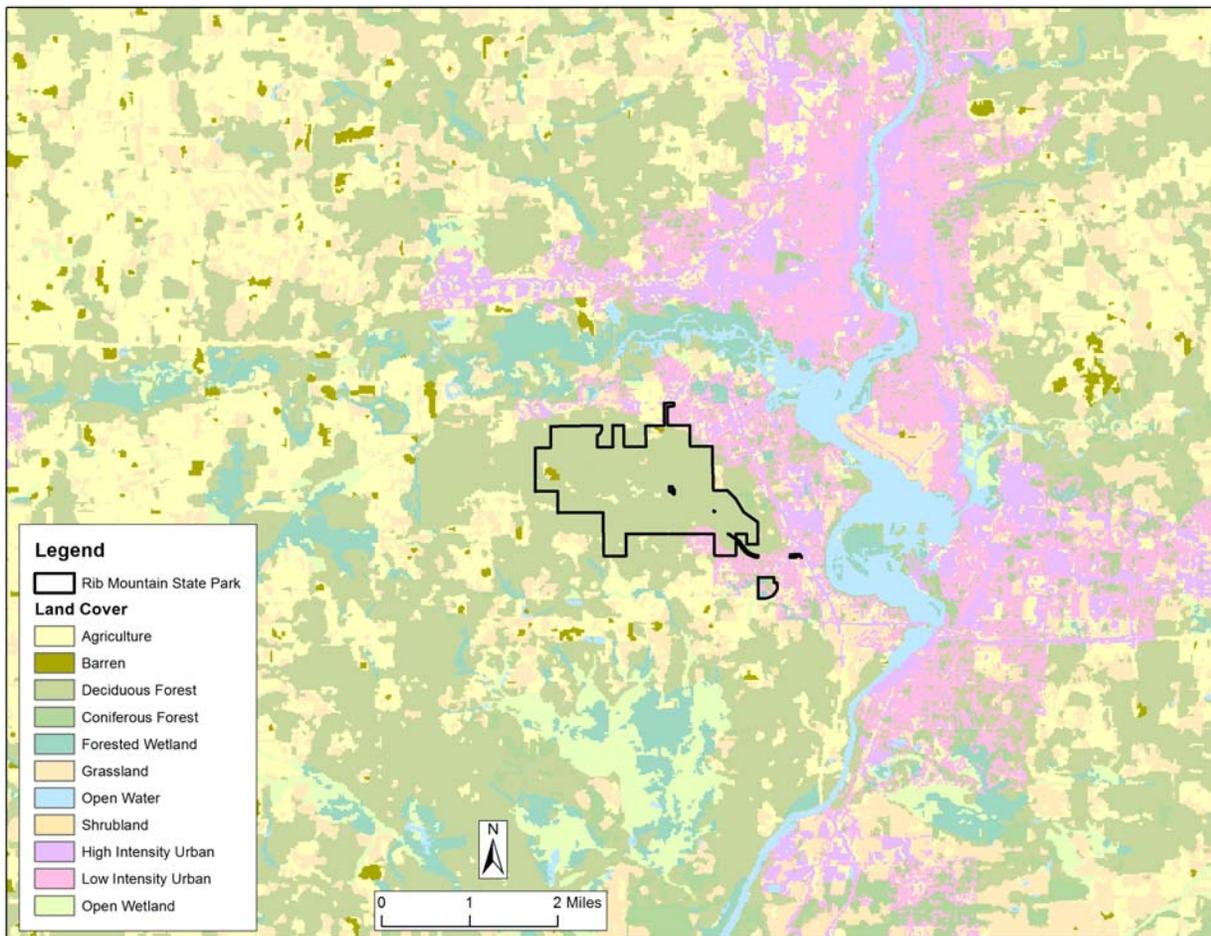
Rib Mountain State Park is dominated by a large block of older upland forested block situated south of the Big Rib River (flowing west to east) and west of the Wisconsin River (flowing north to south). The land surrounding the park is in a mixture of uses and cover types (Figure 2). Additional upland forests extend immediately from the park boundary to the south (limited) and toward the west. Fairly extensive upland forest is present on a tract of Marathon County Forest located over a mile south of the park. There are upland woodlands embedded in the areas of extensive agriculture west of the park and north of the Big Rib River. Forested wetlands, open wetlands, and Shrub-carr are common along the Big Rib River, along smaller streams on the landscape, and in the county forest south of RMSP. Small wetlands are widely distributed across the surrounding landscape. The eastern third of the park abuts the Wausau metropolitan area, and there is exurban and scattered homesteads elsewhere around the park. A commercially-operated downhill ski area has been developed on the north-facing slope of Rib Mountain.

## Regional Biodiversity Needs and Opportunities

Different opportunities exist for sustaining natural communities in the Forest Transition Ecological Landscape. Ecological landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007; WDNR 2012) and later focused on wildlife Species of Greatest Conservation Need (SGCN) and their habitat in the Wisconsin Wildlife Action Plan (WAP; WDNR 2006b). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the ecological landscape while maintaining important components of ecological diversity and function.

Based on EMPT’s criteria, these are the most appropriate community types that could be considered for management activities within the Forest Transition Ecological Landscape.

Natural community opportunities in the WAP were identified as “major”, “important”, or “present.” A “major” opportunity indicates that the natural communities can be sustained in the ecological landscape, either because many significant occurrences of the natural community have been recorded in the landscape or major restoration activities are likely to be successful in maintaining the community’s composition, structure, and ecological function over a longer period of time. An “important” opportunity indicates that although the natural community does not occur extensively or commonly in the ecological landscape, one or more occurrences are present and are important in sustaining the community in the state. In some cases, important opportunities may exist because the natural community may be restricted to just one or a few ecological landscapes within the state, and there may be a lack of opportunities elsewhere. “Present” indicates that a natural community occurs in an ecological landscape but better management opportunities appear to exist in other parts of the state.



**Figure 2.** Land cover from the WISCLAND GIS coverage (WDNR 1993).

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies 23 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Forest Transition Ecological Landscape**. Of these, four are present at RMS (Table 1).

**Table 1.** Major and important natural community management opportunities in the Forest Transition Ecological Landscape (WDNR 2006b). Opportunities that occur at RMSP are marked with \*.

Major Opportunities	Important Opportunities
Coldwater Streams	Alder Thicket
Coolwater Streams	*Bedrock Glade
Impoundments/Reservoirs	Dry Cliff
*Northern Mesic Forest	Emergent Marsh
Northern Wet Forest	*Ephemeral Pond
Northern Wet-mesic Forest	Floodplain Forest
Warmwater Rivers	Inland lakes
Warmwater Streams	Moist Cliff
	*Northern Dry-mesic Forest
	Northern Hardwood Swamp
	Northern Sedge Meadow
	Open Bog
	Shrub-carr
	Submergent Marsh
	Surrogate Grasslands

## Rare Species of the Forest Transition Ecological Landscape

Numerous rare species are known from the Forest Transition Ecological Landscape. “Rare” species include all of those species that appear on the WDNR’s NHI Working List ([dnr.wi.gov](http://dnr.wi.gov), keyword “working list”; WDNR 2014) and are classified as “Endangered,” “Threatened,” or “Special Concern.” Table 2 lists the number of species known to occur in the Forest Transition Ecological Landscape based on information stored in the NHI database as of October 2015.

**Table 2.** Listing status for rare species in the Forest Transition Ecological Landscape as of October 2015. Source is the NHI database. Listing status is based on the NHI Working List published June 2014 (WDNR 2014).

Listing Status	Animal Taxa					Total Animals	Total Plants	Total Listed
	Mammals	Birds	Herptiles	Fishes	Invertebrates			
Federally Endangered	1	0	0	0	5	6	0	6
Federally Threatened	1	0	0	0	0	1	0	1
Federal Candidate	0	0	0	0	0	0	0	0
State Endangered	0	4	1	2	9	16	5	21
State Threatened	1	6	1	7	7	22	9	31
State Special Concern	7	12	2	9	26	56	45	101

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need which are animals that have low and/or declining populations that are in need of conservation action. They include various

birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g., dragonflies, butterflies, and freshwater mussels) that are:

- Already listed as threatened or endangered;
- At risk because of threats to their life history needs or their habitats;
- Stable in number in Wisconsin, but declining in adjacent states or nationally; or,
- Of unknown status in Wisconsin and suspected to be vulnerable.

There are 31 vertebrate SGCN significantly associated with the Forest Transition Ecological Landscape. This designation means that the species are (and/or historically were) significantly associated with each of these ecological landscapes. Also, restoration of natural communities with which these species are associated would significantly improve conditions for the species. See the Wisconsin Wildlife Action Plan for information about the individual species associated with this ecological landscape ([dnr.wi.gov](http://dnr.wi.gov), keyword “wildlife action plan”).

## Description of the Study Area

### Location, Size, and General Information

Rib Mountain State Park, located in Marathon County, is adjacent to the City of Wausau and within the Town of Rib Mountain. The park is over 1,500 acres in size with about 1.5 acres of private in-holdings. The park’s defining and dominant feature is Rib Mountain itself. The mountain is one of the tallest natural features in Wisconsin at 1940 feet. There is over 750 feet of local relief from the top of the mountain to the Wisconsin River. The mountain’s eastern, southern, and western slopes consist of steep, rocky, forested terrain. A popular downhill ski area (Granite Peak) is located on the mountain’s northern face.

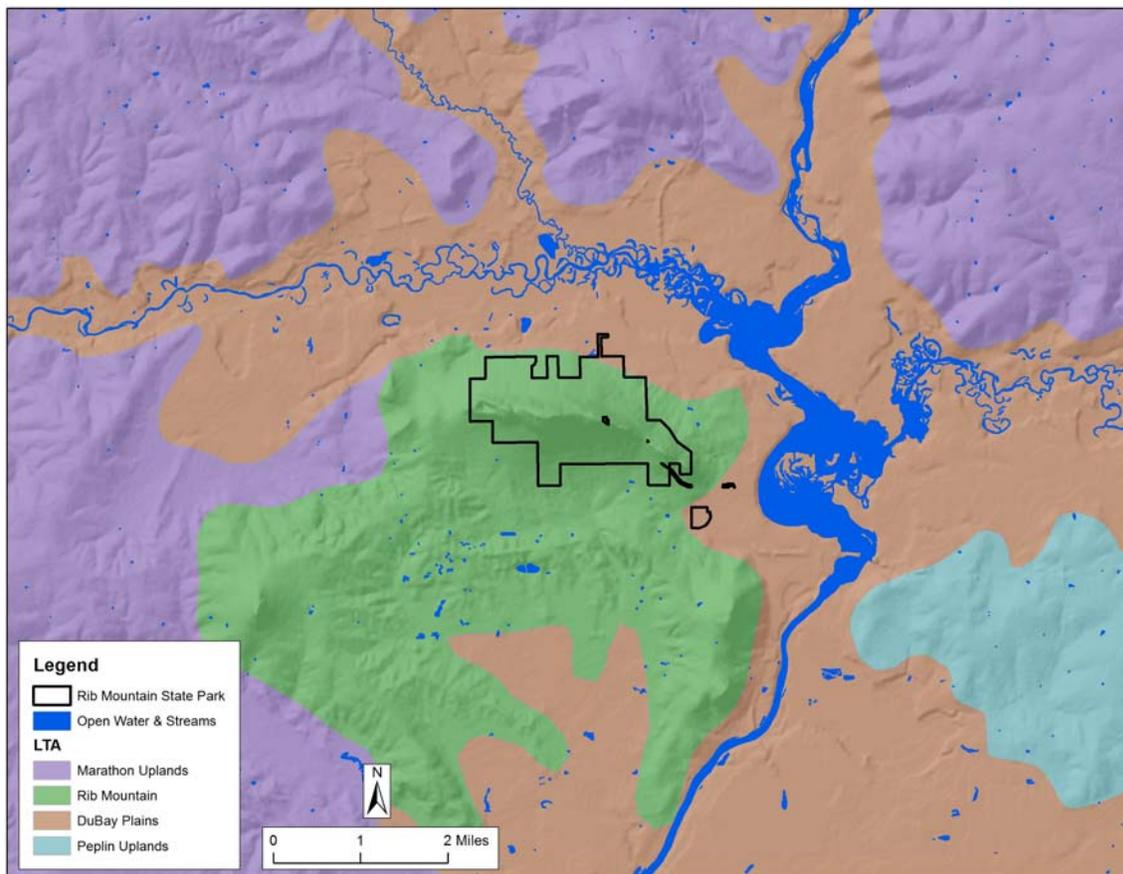
Except for the ski area, most of the park’s intensive use areas and facilities are clustered along the more level terrain at the mountain’s ridge top, where visitors can enjoy the scenic views of the surrounding landscape. This area currently accommodates several buildings, parking areas, an outdoor amphitheater, an observation tower, and several privately owned or leased areas for communications towers and associated buildings. Other park facilities extending out from the ridge include day use areas and just over 13 miles of trails.

Although Rib Mountain State Park was established in rural Marathon County, communities around the park continue to grow. Residential subdivisions and other types of development continue to expand westward and now border much of the park on its northern, eastern, and southern sides. Consequently, Rib Mountain State Park is quickly becoming an “island” of green space that provides valuable recreational open space and conserves unique geological features, native ecological communities, wildlife habitat, and culturally important structures.

### Ecoregion

Land Type Associations (LTAs) are a finer division of the National Hierarchical Framework of Ecological Units (Cleland 1997). The NHFEU is a classification system that divides landscapes into ecologically significant regions at multiple scales. Ecological types are classified and units are mapped based on the associations of biotic and environmental factors which include climate, physiography, water, soils, hydrology, and potential natural communities. While the Rib Mountain LTA (212Qd04) covers almost of the park, the DuBay Plains LTA (212Qd05) is present on the far northeastern boundary of the park (Figure 3).

- **212Qd04 (Rib Mountain).** The characteristic landform pattern of this LTA is steep monadnock and bedrock controlled erosional surface. Soils are predominantly well-drained silt loam surface over quartzite and igneous/metamorphic bedrock. Bedrock is between 5 and 50 feet of the land surface with some exposures. Deciduous upland forest (61%) is the predominant land use followed by agriculture (16%), grasslands (7%), and forested wetlands (4%). No other individual land use is greater than 3%.
- **212Qd05 (DuBay Plains).** The characteristic landform pattern of this LTA is nearly level glacial outwash plain, stream terrace, and floodplain complex. Soils are predominantly well-drained loamy sand over outwash. Bedrock is between 5 and 50 feet of the land surface and consists of igneous, metamorphic, and volcanic rock. Land use types are more evenly distributed than in the Rib Mountain LTA; each of these following cover types ranges between 10 and 20%: upland deciduous forest, agricultural land, open water, grassland, and forested wetland coverage. Urban areas cover about 16%.



**Figure 3.** Landtype Associations at Rib Mountain State Park.

### Geology and Glaciation

This section is largely based on information from the [Wisconsin Geological and Natural History Survey](#), keyword “Marathon County” and from [“A geological history of Rib Mountain, Wisconsin”](#) by Keith Montgomery, UW-Marathon County.

Rib Mountain is a four mile-long ridge of ancient rock dating back about 1.7 billion years. It is composed of a single, large block (a monadnock) of the hard, metamorphic rock quartzite. The Rib Mountain monadnock is embedded in a much larger mass of a rock called "syenite." In the 1.7 billion years since its intrusion, erosion in the landscape by rivers and other agents, such as glacial ice, has

worn away the rocks that the syenite intruded. Indeed, erosion has also worn away a good deal of the syenite that encapsulated the quartzite. But the quartzite, unlike the syenite and other surrounding rocks, has survived the elements on account of its hardness.

The mid to lower slopes of Rib Mountain are part of the undifferentiated Marathon Formation which contains material that is predominantly derived from the weathering of Precambrian or Cambrian rocks. The formation also includes some glacially transported materials. The surface topography is very nearly the same as that of the underlying rock, and exposures of Precambrian rock are numerous.

The very northeastern corner of the park (DuBay Plains LTA) is formed from the meltwater-stream sediment of the Copper Falls formation.

## **Soils**

*Main reference: Soil Survey Staff, Natural Resource Conservation Service, USDA, Web Soil Survey.*

The predominant soils at the park are cobbly silt loams, stony, on variably steep slopes in the Rib Mountain LTA. Loam and loamy sand are found on the more level ground in the DuBay Plains LTA in the northeastern part of the park.

## **Hydrology**

There are scattered forested springs, seeps, streams, and ponds at the park, nearly all of which are ephemeral. Water has been heard running under the rock in some of the stream channels. A couple of small, open wetlands support wetland vegetation that would indicate the presence of a long-term source of water.

## **Vegetation**

### **Historical Vegetation**

Data from the original Public Land Surveys are often used to infer vegetation cover types for Wisconsin prior to widespread Euro-American settlement. Public Land Surveys for the area comprising the RMSP were conducted in 1839 and 1852. Finley's (1976) Original Vegetation Map described the area that now comprises the RMSP (Figure 4) as dominated by a conifer-deciduous hardwood forest of hemlock, sugar maple, yellow birch, and white and red pine. An extensive conifer-dominated swamp extended south from the southern border of the park.

### **Current Vegetation**

Current vegetation of the study area has been influenced by many historical factors including logging, homesteading and farming attempts, rock quarrying, wildfires, fire suppression, and recreational development. Current factors that influence the vegetation include recreational management (including a commercial downhill ski operation) and invasive species. Finally, broad environmental factors, including geology, soils, natural hydrology, and weather and climate, have a profound impact on today's vegetation.

The park is a largely forested block in a fragmented landscape that is dominated by development and agriculture; a largely wooded tract of county forest lies to the south of the park, and large wetlands are centered along rivers and streams.

The park is predominantly moderate quality Northern Mesic Forest with inclusions of Northern Dry-mesic Forest, Bedrock Glades, talus forests, small, apparently ephemeral, open wetlands, and ephemeral seeps, streams, and ponds. There are also one or more permanent, seep-fed small open wetlands. Other

than the ski hill developed on the north-facing slope, recreational facilities and telecommunications facilities are centered on level ground on the top of Rib Mountain. There is a network of recreational trails throughout the park as well as an old rock quarry in the western part of the park.



**Figure 4.** Vegetation prior to widespread Euro-American settlement for Rib Mountain State Park and vicinity. Data are from Finley (1976).

The majority of the park is typed as moderate quality Northern Mesic Forest with inclusions of Northern Dry-mesic Forest depending on aspect and elevation. The forest, especially on the north-facing slope, is dominated by sugar maple, red oak, paper birch, and white ash (*Fraxinus americana*). Basswood (*Tilia americana*), yellow birch, red maple (*Acer rubrum*), and aspens also occur in the canopy. There are small pockets dominated by hemlock, white pine, and red pine. Canopy closure is high overall, with pockets of younger forest dominated by paper birch, aspens, red maple, and ash (*Fraxinus* spp). The south-facing slope, especially the upper slope, tends to be more dry-mesic, and aspen and red oak are dominant. Wind throw is present, and coarse woody debris is occasional to moderate. The shrub layer is variable but has low coverage overall. There are denser pockets scattered throughout, generally centered on canopy gaps or other past disturbances. Shrub species include saplings of canopy species, mountain maple (*Acer spicatum*), round-leaved and pagoda dogwood (*Cornus rugosa* and *C. alternifolia*), and American witch hazel (*Hamamelis virginiana*). Ground flora coverage is low to moderate overall and is variable in distribution and composition. Species include several ferns (e.g., lady [*Athyrium filix-femina*], northern maidenhair [*Adiantum pedatum*], interrupted [*Osmunda claytoniana*]), Canada mayflower (*Maianthemum canadense*), Jack-in-the-pulpit (*Arisaema*

*triphillum*), and wild geranium (*Geranium maculatum*). Some areas are dominated by Pennsylvania sedge (*Carex pensylvanica*). Spring ephemerals, such as sharp-lobed hepatica (*Anemone acutiloba*), blue cohosh (*Caulophyllum thalictroides*), and Virginia waterleaf (*Hydrophyllum virginianum*), are present, with the greatest abundance and widest distribution in the northwestern part of the park. Recreational trails and other developments are embedded within this natural community. Invasive species are scattered and include Tatarian honeysuckle (*Lonicera tatarica*) and Japanese barberry (*Berberis thunbergii*). The highly invasive garlic mustard (*Alliaria petiolata*) and glossy buckthorn (*Rhamnus frangula*) have been documented in the past at the park. Deer sign, such as browsed vegetation, trails, and rubs, are common throughout the forest.

Bedrock Glades, bedrock outcrops, and talus are scattered on the upper slopes especially in the western half of the park. The glades are generally small, and their quality varies depending on disturbance. Open-grown red oaks are common on or surrounding the glades; red maple, black cherry (*Prunus serotina*), white ash, and big-tooth aspen are also present. Shrubs include northern bush-honeysuckle (*Diervilla lonicera*), early low blueberry (*Vaccinium angustifolium*), brambles (*Rubus* spp), staghorn sumac (*Rhus hirta*), mountain maple, and maple-leaved viburnum (*Viburnum acerifolium*). Bracken fern (*Pteridium aquilinum*), common polypody (*Polypodium virginianum*), poverty grass (*Danthonia spicata*), false melic grass (*Schizachne purpurascens*), rice grasses (*Oryzopsis* spp), Kentucky bluegrass (*Poa pratensis*), and purple clematis (*Clematis occidentalis*) are common herbs. Spotted knapweed (*Centaurea biebersteinii*) occurs on some glades and in the abandoned quarry. Some of the talus is in canopy gaps, and some of the talus is forested. The open talus generally has little vegetation other than thick stands of common polypody and mosses. The species composition of the forested talus is similar to that of the surrounding forest.

Seeps, springs, streams, and ponds, almost all apparently ephemeral, are scattered through the park. Many of the streams are in rocky, somewhat eroded channels. Water can be heard flowing beneath the rocks of some of the otherwise dry stream channels. A very low number of small, permanent, seep-fed, open wetlands are present. While the permanent wetlands contain impatiens (*Impatiens* spp), arrow-leaved tear-thumb (*Polygonum sagittatum*), willow-herb (*Epilobium* spp), and other native species, reed canary grass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*) are common. Some of the Ephemeral Ponds form on bedrock glades; otherwise, they are distributed on level areas on the ridge top and upper slopes or on the more gentle lower slopes. The floor of the abandoned quarry provides Ephemeral Pond habitat that, in wetter years, can be extensive. A small stream was also flowing out of the quarry entrance.

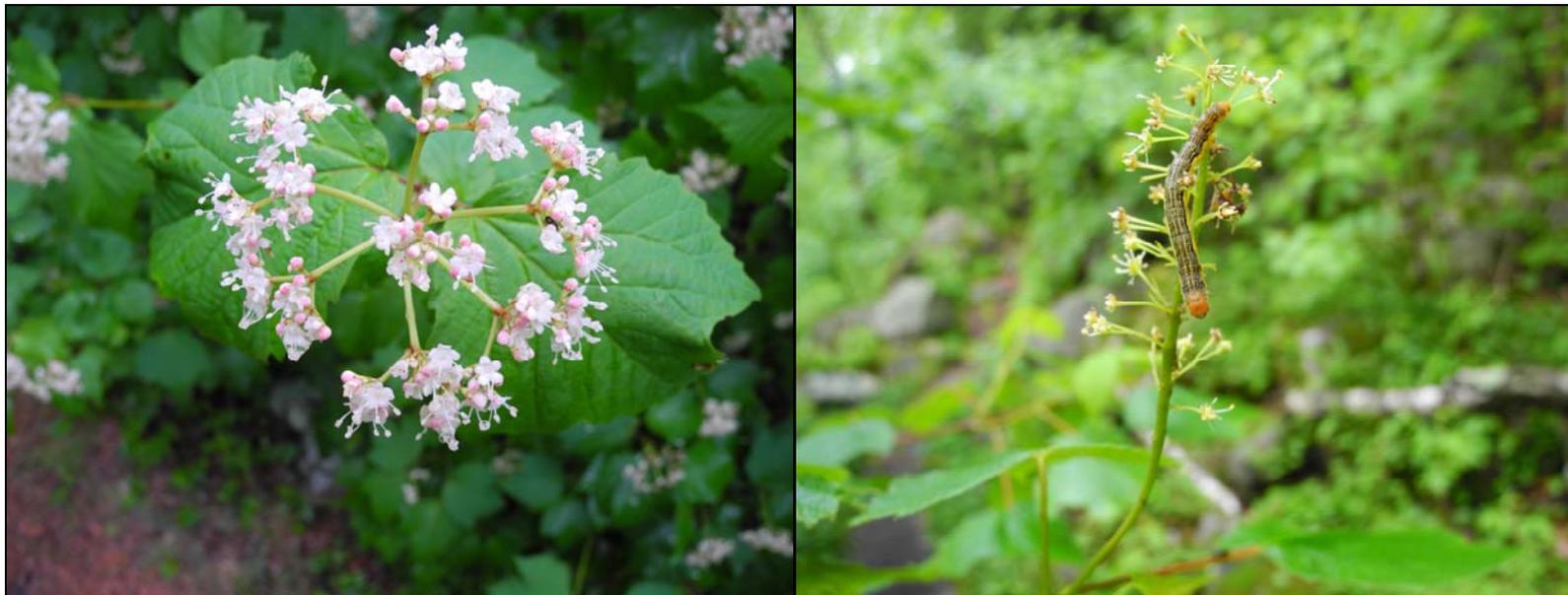
## Rare Species and High Quality Natural Communities Surrounding Rib Mountain State Park

Rare species and high-quality natural communities that have been documented in the town of Rib Mountain (Township 28N Range 7E) that includes Rib Mountain State Park can be found in Table 3. Bird occurrences refer only to breeding activity. Summary descriptions for these element occurrences can be found in Appendix C. Appendix D lists the rare species known to occur on the park (because Appendix D contains locational information on rare species it is not available for public distribution).

**Table 3.** Rare species, high quality natural communities, and other special features documented in the township (Township 28N Range 7E) surrounding Rib Mountain State Park.

Common Name	Scientific Name	Last Observation Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Birds</b>								
Acadian Flycatcher	<i>Empidonax virescens</i>	2015	S3B	G5	THR		Y	Y
American Bittern	<i>Botaurus lentiginosus</i>	2010	S3B	G4	SC/M		Y	Y
Least Flycatcher	<i>Empidonax minimus</i>	2015	S4B	G5	SC/M		Y	N
Peregrine Falcon	<i>Falco peregrinus</i>	2009	S1S2B	G4	END		Y	Y
Veery	<i>Catharus fuscescens</i>	2015	S3S4B	G5	SC/M		Y	N
Wood Thrush	<i>Hylocichla mustelina</i>	2015	S4B	G5	SC/M		Y	N
<b>Fish</b>								
Black Redhorse	<i>Moxostoma duquesnei</i>	2013	S1	G5	END		Y	Y
<b>Mammals</b>								
Big Brown Bat	<i>Eptesicus fuscus</i>	2015	S2S4	G5	THR		N	Y
Little Brown Bat	<i>Myotis lucifugus</i>	2015	S2S4	G3	THR		N	Y
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	2004	S3	G5	SC/P		Y	Y
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	2015	S1S2	G1G2	THR	LT	Y	Y
<b>Natural Communities</b>								
Northern Mesic Forest	<i>Northern mesic forest</i>	2003	S4	G4	N/A		N/A	Y
Northern Sedge Meadow	<i>Northern sedge meadow</i>	1980	S3	G4	N/A		N/A	Y
Shrub-carr	<i>Shrub-carr</i>	1980	S4	G5	N/A		N/A	Y
Stream--Fast, Soft, Cold	<i>Stream--fast, soft, cold</i>	1980	SU	GNR	N/A		N/A	Y
<b>Other</b>								
Bird Rookery	<i>Bird Rookery</i>	2003	SU	G5	SC		N/A	Y
<b>Plants</b>								
Butternut	<i>Juglans cinerea</i>	2015	S3?	G4	SC		N/A	N
Drooping Sedge	<i>Carex prasina</i>	2003	S3	G4	SC		N/A	Y
Missouri Rock-cress	<i>Boechera missouriensis</i>	2003	S2	G5	SC		N/A	Y
Snowy Campion	<i>Silene nivea</i>	1976	S3	G4?	SC		N/A	Y
<b>Reptiles</b>								
Blanding's Turtle	<i>Emydoidea blandingii</i>	2006	S3S4	G4	SC/P		Y	Y

Wood Turtle	<i>Glyptemys insculpta</i>	2007	S3	G3	THR	Y	Y
<b>Snails</b>							
Broad-banded Forestsnail	<i>Allogona profunda</i>	2010	S2S3	G5	SC/N	Y	Y



Flowers of two common shrubs/small trees at Rib Mountain State Park, from left to right, maple-leaved viburnum and mountain maple with a caterpillar.

# Management Considerations and Opportunities for Biodiversity Conservation

## Landscape Level Opportunities and Considerations

### Wisconsin’s Statewide Forest Strategy

Wisconsin’s Statewide Forest Assessment (WDNR 2010a) was based on Wisconsin’s Forest Sustainability Framework (Wisconsin Council on Forestry 2008) and was designed to assess the current state of Wisconsin’s public and private forests and analyze the sustainability of our forested ecosystems. Wisconsin’s Statewide Forest Strategy (WDNR 2010b) contains a collection of strategies and actions designed to address the management and landscape priorities identified in the Statewide Forest Assessment. The strategies are broad guidelines intended to focus the actions of the forestry community.

The above documents include topics related to biological diversity in Wisconsin’s forests and provide information useful for department master planning and management activities. Several Statewide Forest Strategies are particularly pertinent to the park’s planning efforts in regard to opportunities to maintain or enhance biological diversity (Table 4, WDNR 2010b).

**Table 4.** Selected Wisconsin Statewide Forest Strategies relevant to the park.

Strategy Number	Strategy
13	Increase forest structure and diversity.
15	Maintain the appropriate forest types for the ecological landscape while protecting forest health and function.
19	Adapt forest management practices to sustainably manage forests with locally high deer populations.
22	Strive to prevent infestations of invasive species before they arrive.
23	Work to detect new (invasive species) infestations early and respond rapidly to minimize impacts to forests.
24	Control and manage existing (invasive species) infestations.
25	Rehabilitate, restore, or adapt native forest habitats and ecosystems.

### High Conservation Value Forests

The Wisconsin DNR manages 1.5 million acres that is certified by the Forest Stewardship Council (FSC) and the Sustainable Forest Initiative. Forest certification requires forests to be managed using specified criteria for ecological, social, and economic sustainability. Principle 9 of the *Draft 7 FSC-US Forest Management Standard* concerns the maintenance of High Conservation Value Forests (HCVF). High Conservation Value Forests are defined as possessing one or more of the following High Conservation Values:

- Contain globally, regionally, or nationally significant concentrations of biodiversity values, including rare, threatened, or endangered species and their habitats
- Globally, regionally, or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
- Are in or contain rare, threatened, or endangered ecosystems
- Provide basic services of nature in critical situations (e.g., watershed protection, erosion control)
- Are fundamental to meeting basic needs of local communities (e.g., subsistence, health)
- Are critical to local communities' traditional cultural identity (areas of cultural, ecological, economic, or religious significance identified in cooperation with such local communities)

The forest, including embedded bedrock and ephemeral water features, at Rib Mountain State Park supports populations of at least 12 rare species and good quality natural communities and the Primary Site (see page 25) could be considered for classification as a High Conservation Value Forest. At the very least, the State Natural Area could be considered as a High Conservation Value Forest

### **Non-native Invasive Species**

While non-native invasive species (NNIS) thrive in newly disturbed areas, they also may invade and compromise high-quality natural areas. NNIS generally establish quickly, tolerate a wide range of conditions, are easily dispersed, and are relatively free of the diseases, predators, and competitors that kept their populations in check in their native range. Non-native invasive plants can out-compete and even kill native plants by monopolizing light, water, and nutrients and by altering soil chemistry and mycorrhizal relationships. In situations where non-native invasive plants become dominant, they may alter ecological processes by limiting use of prescribed fire, by modifying hydrology, and by limiting tree regeneration thereby ultimately impacting forest composition (e.g., Dukes and Mooney 2004, Brooks et al. 2004). In addition to the threats to native communities and native species diversity, non-native invasive species negatively impact forestry (by reducing tree regeneration, growth, and longevity; Wisconsin Council on Forestry 2009), recreation (Eiswerth et al. 1005), agriculture (Pimental et al. 2005), and human health (Juliano and Lounibos 2005). Non-native invasive plants and animals can also have negative impacts on fish and wildlife species by long-term displacement of native food sources (e.g., for deer and turkey; Gorchov and Trisel 2003), diminishing habitat for ground-nesting birds (e.g., Ovenbirds [*Seiurus aurocapilla*] and American Woodcock [*Scolopax minor*]; Miller and Jordan 2011, Loss et al. 2012), and altering aquatic macro-invertebrate communities in streams, thereby impacting fish that feed on them (McNeish et al. 2012).

Non-native invasive species that pose the greatest immediate threat to native species diversity at RMSP, rare species habitats, or high-quality natural communities are listed in Table 5.

When resources for complete control of widespread invasive species are lacking, containment (i.e., limiting further spread) may be considered as an alternative action. Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010). A number of non-native invasive species are known in the vicinity of the park (Table 6); monitoring for these species and rapid response to small infestations represent high-impact actions.

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR ([dnr.wi.gov](http://dnr.wi.gov), keyword "invasives") and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species coordinators and groups:

- For aquatic invasive species, contact Golden Sands RC&D (<http://www.goldensandsrcd.org/our-work/water/aquatic-invasive-species-program>).

**Table 5.** Invasive species known to occur at Rib Mountain State Park

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Comments
		Open	Wooded	Open	Wooded	
<b>Plants</b>						
Bush honeysuckle*	<i>Lonicera tatarica</i> *	x	x			Scattered
Burdock	<i>Arctium minus</i>	x	x			Disturbed areas, occasional near trails in canopy gaps
Canada thistle*	<i>Cirsium arvense</i> *	x		x		Scattered, often in/near small permanent wetlands
Common buckthorn*	<i>Rhamnus cathartica</i> *	x	x			Scattered
Garlic mustard*	<i>Alliaria petiolata</i> *		x			Previously observed
Glossy buckthorn	<i>Rhamnus frangula</i> (= <i>Frangula alnus</i> )	x	x	x	x	Observed & removed in 1993, not seen since; could reappear
Japanese barberry*	<i>Berberis thunbergii</i> *		x			Scattered
Kentucky bluegrass	<i>Poa pratensis</i>	x				Quarry, bedrock glades, along rails
Motherwort	<i>Leonurus cardiaca</i>	x				Disturbed areas, localized
Reed canary grass	<i>Phalaris arundinacea</i>		x	x	x	In small permanent wetlands, ditches
Spotted knapweed*	<i>Centaurea biebersteinii</i> (= <i>C. stoebe</i> , <i>C. maculosa</i> )*	x				Present at all dry, open sites, including abandoned quarry
<b>Animals</b>						
Gypsy moth*	<i>Lymantria dispar</i> *		x			Marathon County is under gypsy moth quarantine
<b>Fungi</b>						
Oak Wilt	<i>Ceratocystis fagacearum</i>		x		x	Recently verified at & near the park

\*NR-40 Restricted Species

**Table 6.** Invasive species known to occur or that may occur in the vicinity of Rib Mountain State Park.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Comments
		Open	Wooded	Open	Wooded	
<b>Plants</b>						
Bigleaf lupine	<i>Lupinus polyphyllus</i>	x				Known in Marathon County
Dame's rocket*	<i>Hesperis matronalis</i> *	x	x			Potential habitat present
Giant hogweed**	<i>Heracleum mantegazzianum</i> **	x				Known just to south in Portage County
Hemp nettle*	<i>Galeopsis tetrahit</i> *	x	x			Potential habitat present
Hounds tongue*	<i>Cynoglossum officinale</i> *	x				Known in Marathon County
Japanese knotweed*	<i>Polygonum cuspidatum</i> *			x		Known in Marathon County

Purple loosestrife*	<i>Lythrum salicaria</i> *			x		Potential habitat present
Queen-of-the-prairie	<i>Filipendula rubra</i>			x		Known from Portage County
Siberian pea shrub*	<i>Caragana arborescens</i> *	x	x			Known in Marathon County
Wild parsnip*	<i>Pastinaca sativa</i> *	x				Known in Marathon County
<b>Animals</b>						
Emerald ash borer*	<i>Agrilus planipennis</i> *		x		x	Currently not known to occur in the area
Non-native earthworms (including jumping worms*)	The families Acanthodrilidae, Lumbricidae, & Megascolecidae (including <i>Amyntas</i> or <i>Amyntus</i> spp*)	x	x			Potential habitat present

\*NR-40 Restricted Species, \*\*NR-40 Prohibited Species

The following are brief descriptions of specific potential forest health issues.

#### Emerald Ash Borer

The emerald ash borer (EAB) (*Agrilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008, and, as of August 2015, Wisconsin has 39 counties quarantined for EAB; Marathon County is not under quarantine at this time. The beetle attacks all native species of ash in Wisconsin, and the risk to forests is high: models predict that a healthy forest could lose 98% of its ash trees in six years (<http://www.emeraldashborer.wi.gov>).

The forests of RMSF are somewhat vulnerable to the effects of emerald ash borer, as white ash is present, and, indeed, common in some areas, in the upland forest. Large-scale loss of ash in this area, whether through EAB-caused mortality or harvesting, could cause a cascade of negative impacts. Degradation of diverse, high-quality forests and loss of forest cover could further lead to diminishment of important habitat for rare plants and animals (especially forest interior birds) and infestation of disturbance-loving invasive species (WDNR 2010a). It is important to note that removal of all ash as a stopgap measure against EAB is not recommended (WDNR 2010c).

#### Gypsy Moth

Gypsy moth is an invasive, leaf-eating insect that can feed on most types of trees and shrubs found in North America. When their populations are high, gypsy moth caterpillars can strip an entire neighborhood or forest of leaves in May and June. The gypsy moth (*Lymantria dispar*) was first found in Wisconsin in the mid-1970s in the eastern part of the state. By 1989, it was well-established along Wisconsin's eastern shore from Milwaukee to Green Bay. Since then, moths have been found in nearly every county and the eastern half of the state is considered infested. Additional information about gypsy moths can be found at ([dnr.wi.gov](http://dnr.wi.gov), keyword "gypsy moth"). Marathon County is under gypsy moth quarantine.

#### Non-native Invasive Earthworms

The invasion of forests by non-native earthworms of the families Acanthodrilidae, Lumbricidae, and Megascolecidae is a concern throughout Wisconsin. While native earthworms were absent from this landscape after the last glaciation, non-native invasive earthworms have been introduced since Euro-

American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Non-native invasive earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (Suárez et al. 2004, Bohlen et al. 2004), and fine-root biomass (Groffman et al. 2004). These physical changes in the forest floor reduce densities of tree seedlings and rare herbs (Gundale 2002) and can favor invasive plants (Kourtev et al. 1999). In a study of 51 northern Wisconsin forest stands, Wiegmann (2006) found that shifts in understory plant community composition due to non-native invasive earthworms were more severe in stands with high white-tailed deer densities. Further assessments are needed to evaluate the effects of earthworms within the park.

Oak Wilt

Oak wilt is caused by a fungus, *Ceratocystis fagacearum*, which affects water movement within oak trees, often killing the trees. The fungus was thought to be native, but the most recent science suggests that it is not (J. Cummings Carlson, WDNR, personal communication). It has been in the state for at least 100 years and is widespread throughout the southern part of the state and has recently been verified in and near the park. It can have significant impacts to forested stands with a heavy oak component such as in parts of the park.

## Community Level Opportunities and Considerations

### Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies three natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the Forest Transition Ecological Landscape (Table 7) at Rib Mountain State Park. These opportunities are explored further in the following section “Upland Forests: an Opportunity for Older Forest Management.”

**Table 7.** Important natural community management opportunities in the Forest Transition Ecological Landscape that occur in the park (WDNR 2006b).

Major Opportunity	Important Opportunity
Northern Mesic Forest	Bedrock Glade
	Ephemeral Pond
	Northern Dry-mesic Forest

### Upland Forests: an Opportunity for Older Forest Management

The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 2006b, WDNR 2004, WDNR 1995), and old-growth management is a component of Forest Certification. Old-growth forests can support high densities of certain forest herbs, as well as certain assemblages of birds and other animals that are scarce in the state. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR In Prep.).

Old-growth stands are sometimes characterized by a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; and significant amounts of coarse woody debris and tip-up mounds (WDNR In prep.). The structural diversity provided by old-growth and older forests support unique assemblages of plants, birds, and other animals. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2010b).

Larger forested blocks, especially those that are mature or older, are important for area-dependent species such as forest interior birds. Large blocks of older forests can provide habitat for many rare and declining species, including Cerulean Warbler (*Dendroica cerulea*), Acadian Flycatcher (*Empidonax vireescens*), Hooded Warbler (*Setophaga citrina*), Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Red-shouldered Hawk (*Buteo lineatus*), and Northern Goshawk (*Accipiter gentilis*). Older forests also provide habitat for Wisconsin's summer resident cave-dwelling bats, including big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*), all of which were recently listed as State Threatened due to the imminent threat of white-nose syndrome. The northern long-eared bat was also listed as Federally Threatened in 2015.

A significant area of Northern Mesic Forest with inclusions of Northern Dry-mesic Forest occurs at the park and in the surrounding area. Both of these natural communities have been identified as management opportunities ("major" and "important," respectively) for the Forest Transition Ecological Landscape (WDNR 2006b). According to forest reconnaissance data, about 49% of all of Rib Mountain SP is typed as northern hardwoods, and nearly 80% of that is dominated by trees that are 15 inches or larger in diameter at breast height (d.b.h.). This type of forest is likely to increase in the park with time, given that most of the forest stands typed as aspen have a secondary type of northern hardwood. Currently many of the forest stands have been aged at 60-70 years old while some, especially the oak and some of the northern hardwood stands, are 100 years or older. There is good potential for the forest to maintain the current trajectory and develop older forest characteristics.

### Bedrock-controlled Features

Quartzite Bedrock Glades, bedrock outcrops, and open and forested talus slopes are scattered along the ridgetop and steeper upper slopes throughout the park. Bedrock features can provide habitat for rare plants and invertebrates as well as specialized lichens and mosses. In fact, at least one rare plant has been documented on bedrock features at the park. Some of the glades, outcrops, and talus are relatively undisturbed, and some have been moderately to greatly disturbed. Some of the recreational trails and old field roads pass over or through bedrock features. The talus within the ski area has been disturbed. Bedrock glades have been identified as an important natural community management opportunity in the Wildlife Action Plan (WDNR 2006b), and there is an opportunity to protect and maintain the existing quartzite glades at Rib Mountain State Park. Additional recreational development should consider potential impacts on bedrock features.

### Ephemeral Water Features

A number of ephemeral seeps, springs, streams, and ponds occur within the park. These ephemeral features provide habitat for a number of species; at least one rare plant has been associated with a seep at the park. The Ephemeral Ponds at RMSP vary in size and associated vegetation. Ephemeral Ponds have been recognized as an important natural community management opportunity in the Forest Transition Ecological Landscape (WDNR 2006b). These ponds are depressions with impeded drainage (usually in forest landscapes), that hold water for a period of time following snowmelt and spring rains but typically dry out by mid-summer. They flourish with productivity during their brief existence and provide critical breeding habitat for certain invertebrates, as well as for many amphibians such as wood frogs and salamanders. They also provide feeding, resting and breeding habitat for songbirds and a source of food for many mammals. Numerous frogs were heard calling in the surrogate Ephemeral Pond in the quarry in May and June, 2015.

Rare animal species that are significantly associated with Ephemeral Ponds include Red-shouldered Hawk, eastern red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), northern long-eared bat, silver-haired bat (*Lasionycteris noctivagans*), boreal chorus frog (*Pseudacris maculata*), pickerel frog (*Rana palustris*), and four-toed salamander (*Hemidactylium scutatum*). Five other vertebrate species are

moderately associated with Ephemeral Ponds. Most rare plants that are significantly or moderately associated with Ephemeral Ponds are sedges including many-headed sedge (*Carex sychnocephala*), ravenfoot sedge (*C. crus-corvi*), and false hop sedge (*C. lupuliformis*).

Trees adjacent to Ephemeral Ponds provide a variety of benefits such as maintaining cool water temperatures, preventing premature drying, and adding to the food web. The annual input of leaves from trees around the pool supports a detritus-based food web and a variety of invertebrates that are part of that food web. Recommendations for management of Ephemeral Ponds could include maintaining shade around the pond, minimizing soil compression, and maximizing the abundance of decomposing downed woody debris in order to maintain the core terrestrial habitat for pond-breeding amphibians.

The other ephemeral water features (seeps, springs, streams) on the park can be important components on the landscape. As with Ephemeral Ponds, these other ephemeral water features can provide unique habitat. Positioned at the terrestrial-aquatic ecotone, species have developed adaptations and life histories to cope within such hydrologically dynamic systems. Ephemeral water features provide zones of nutrient cycling and carbon processing. Ephemeral streams are connectivity corridors linked to the watersheds they drain and the river networks to which they are periodically connected (McDonough et al. 2011).

## Species Level Opportunities and Considerations

### Ecological Priorities for SGCN

Ecological priorities, as identified in the Wisconsin Wildlife Action Plan (WDNR 2006b), are the natural communities in each ecological landscape that are most important to the Species of Greatest Conservation Need. Note that these ecological priorities include all of the natural communities and associated SGCN that have been determined to provide the best opportunities for management at the study area from an ecological/biodiversity perspective.

The Wildlife Action Plan also describes Priority Conservation Actions that make effective use of limited resources and address multiple species with each action. Implementing these actions and avoiding activities that may preclude successful implementation of these actions in the future would greatly benefit the SGCN. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the Forest Transition Ecological Landscape that apply to Rib Mountain State Park are as follows:

- Maintain the largest blocks of northern mesic and oak forest, especially in the identified Conservation Opportunity Areas.
- Increase connectivity of forest patches, especially in the identified conservation opportunity areas.
- Encourage regeneration and reestablishment of eastern hemlock, Canada yew (*Taxus canadensis*), northern white cedar (*Thuja occidentalis*), other conifers, and yellow birch, where appropriate through adaptive management techniques.
- Research eastern red bat life history, including roosting and foraging habitat, population dynamics, trends, migration, and dispersal patterns.

### Forest Interior Birds

Historically vegetation of the Forest Transition Ecological Landscape was primarily northern hardwood and hemlock-hardwood forests. These mesic forests were dominated by sugar maple and eastern hemlock and contained some yellow birch, red pine, and white pine. Currently, the composition of the

forest at the park is similar to that occurring elsewhere in the landscape, consisting primarily of northern hardwoods and aspen, with smaller amounts of oak. Conifers are present but uncommon.

Primary determinants of forest interior habitat quality include stand composition, age, size, structure, and canopy closure, proximity to water or roads, slope and aspect, stand size and shape, and proximity to other stands on the landscape (Wilson 2008). In general, area sensitive forest interior birds, such as Acadian Flycatchers and Cerulean Warblers, benefit from forested blocks that are 250 acres or larger. Limiting habitat fragmentation associated with, but not limited to clear-cutting, road building, or utility and pipeline development is important to the continued viability of these large, older blocks of forest and their associated bird species (WDNR 2006b).

With Rib Mountain State Park as the core protected area among other adjacent forested lands, the effective block size of the forest is such that it is capable of supporting the forest interior birds that have been documented at or near the park.

## Bats

Bats are a vital part of many ecosystems and white-nose syndrome has significant environmental, economic, and public health implications. Insectivorous bats consume large numbers of agricultural pests, which cost farmers and foresters billions of dollars yearly.

Suitable summer foraging and roosting habitat for several of Wisconsin's bat species occurs in the landscape of and surrounding Rib Mountain State Park. Any management activities at the park must follow species guidance and the broad incidental take permit ([dnr.wi.gov](http://dnr.wi.gov), keyword "bat conservation plan") for Wisconsin's cave bat species. Linear corridors are important for bat commuting, and common burdock (*Arctium minus*) has been observed along some sections of hiking trails and in other open areas of the park. Burdock produces fruits that trap and cause death to bats from exposure. Management of the trail corridors and open areas can include reducing or eliminating the abundance of burdock.

## Terrestrial snails

A rare terrestrial snail is known to occur in Rib Mountain Township, and there is suitable habitat at Rib Mountain State Park. Rare terrestrial snails can be found in leaf litter, becoming active during periods of damp, warm weather. In general, terrestrial snails have restricted ranges, are limited by their dispersal ability, and their presence is circumscribed by the biotic (e.g., vegetation) and abiotic (e.g., geology) features. Consequently, they are very vulnerable to management activities that alter temperature, moisture, and/or food supplies in populated sites. Impacts from activities that disturb the soil or open the forest canopy can create warmer and drier conditions due to changes in shade, increased interstitial sedimentation, and introduction of invasive plant species.

## Primary Sites: Site-specific Opportunities for Biodiversity Conservation

An outcome of analyzing biotic inventory results can be the delineation of Primary Sites which generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the new property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

One ecologically important site, or "Primary Site," was identified at Rib Mountain State Park:

## RMSP01 Rib Mountain Forest

A complete description of the Primary Site can be found in Appendix E. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site's ecological significance, and management considerations. Appendix F lists the rare species and high-quality natural communities currently known from the Primary Sites at the park (because Appendix F contains locational information on rare species it is not available for public distribution).

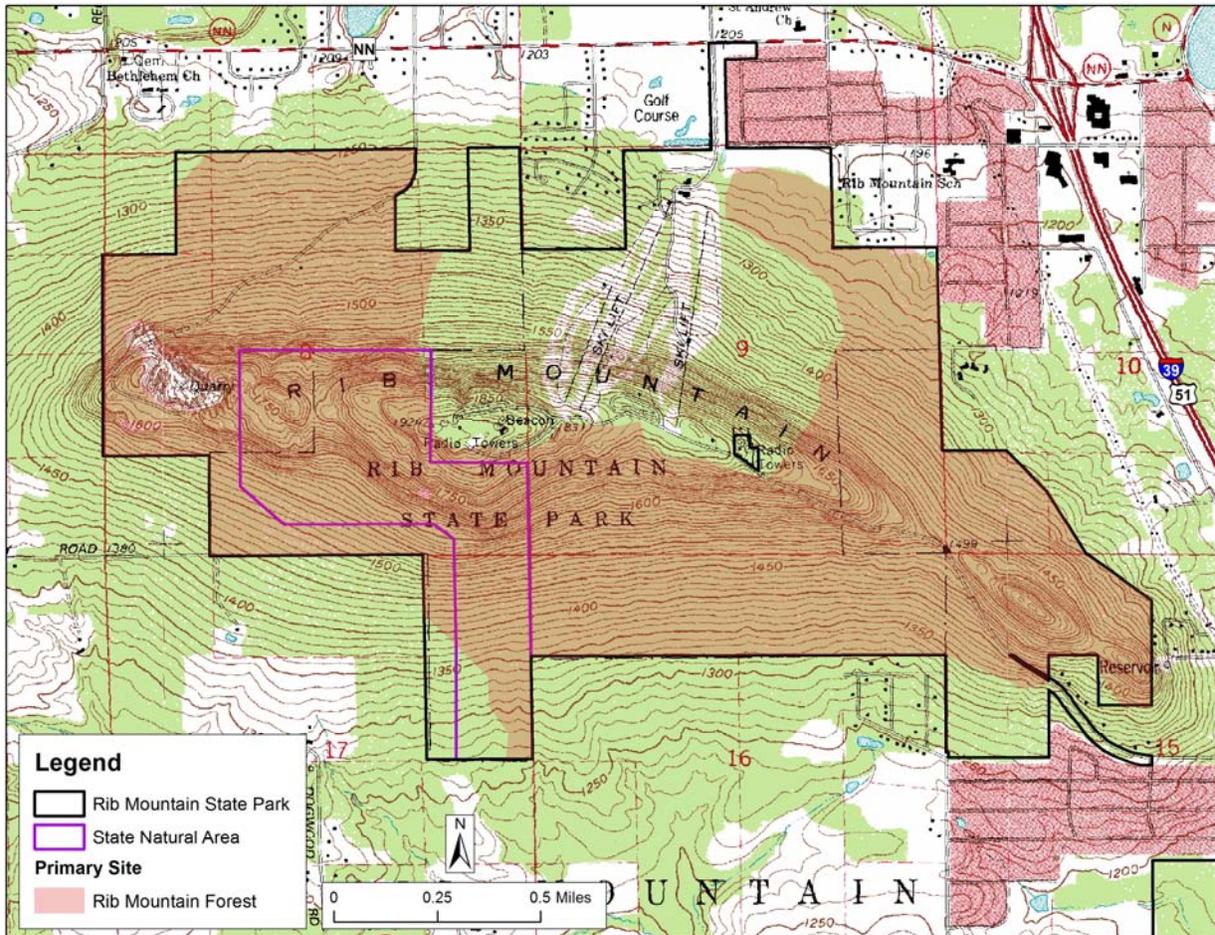


Figure 5. Primary site at Rib Mountain State Park.

## Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for RMSP. Although the report is adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species at RMSP.

- A baseline inventory of invasive species is needed. The inventory will help determine priorities for control efforts. Public lands throughout Wisconsin are facing major management problems because of serious infestations of highly invasive species. Some of these species are easily dispersed by humans and vehicles; others are spread by birds, mammals, insects, water, or wind. In order to protect the important biodiversity values of Rib Mountain State Park, a comprehensive invasive

species monitoring and control plan will be needed for detecting and rapidly responding to new invasive threats as well as managing existing invasive species.

- Rare snails are known from the Rib Mountain Township. Comprehensive surveys for snails are recommended to help determine the distribution, diversity, and abundance of this taxon group at the park.
- Additional rare plant surveys could be conducted at the park focusing on different times of the year to take advantage of phenology, especially from mid-summer through fall.
- Additional bat surveys, both acoustic and tracking individual bats, could be done to better determine the use, including foraging and summer roost sites, of the park by bats.

## Glossary

**Area Sensitive** – species that respond negatively to decreasing habitat patch size. Area-sensitive species exhibit an increase in either population density or probability of occurrence with increasing size of a habitat patch.

**Ecological Landscape** - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological

Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

**Ecological Priority** – the natural communities (habitats) in each Ecological Landscape that are most important to the Species of Greatest Conservation Need, as identified in the Wisconsin Wildlife Action Plan (WDNR 2006b). Three sources of data were used to derive this information: 1) the probability that a species will occur in a given landscape, 2) the degree to which a species is associated with a particular natural community, and 3) the degree to which there are opportunities for sustaining a given natural community in any given Ecological Landscape. See [dnr.wi.gov](http://dnr.wi.gov), keyword “wildlife action plan” for more information.

**Element** – the basic building blocks of the Natural Heritage Inventory. They include natural communities, rare plants, rare animals, and other selected features such as colonial bird rookeries and mussel beds. In short, an element is any biological or ecological entity upon which we wish to gather information for conservation purposes.

**Forest interior birds** - Forest interior breeding birds are those species that need relatively large contiguous tracts of forest to support viable breeding populations. They are generally adversely affected by edge conditions. This diverse group includes colorful songbirds---tanagers, warblers, vireos---that breed in North America and winter in the Caribbean, Central and South America, as well as residents and short-distance migrants---woodpeckers, hawks, and owls.

**Fragmentation** - fragmentation is the process of breaking up continuous habitats and thereby causing habitat loss, patch isolation and edge effects. **Forest fragmentation** a form of habitat fragmentation, occurring when forests are cut down in a manner that leaves relatively small, isolated patches of forest known as forest fragments or forest remnants. The intervening matrix that separates the remaining woodland patches can be natural open areas, farmland, or developed areas. Following the principles of island biogeography, remnant woodlands act like islands of forest in a sea of pastures, fields, subdivisions, shopping malls, etc.

**Landtype Association (LTA)** - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

**Monadnock** - used to describe a hill or mountain that rises from an area of relatively flat and/or lower terrain.

**National Hierarchical Framework of Ecological Unit** - a land unit classification system developed by the U.S. Forest Service and many collaborators. As described by Avers et al (1994): “The NHFEU can provide a basis for assessing resource conditions at multiple scales. Broadly defined ecological units can be used for general planning assessments of resource capability. Intermediate scale units can be used to identify areas with similar disturbance regimes. Narrowly defined land units can be used to assess specific site conditions including: distributions of terrestrial and aquatic biota; forest growth, succession, and health; and various physical conditions.”

**Natural community** – an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.

**Representative** - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

**SGCN (or “Species of Greatest Conservation Need”)** – native wildlife species with low or declining populations that are most at risk of no longer being a viable part of Wisconsin’s fauna (from the “Wisconsin Wildlife Action Plan,” WDNR 2006b).

**Surrogate grasslands** - these are the main habitats (e.g., CRP, old field, pasture) now available for birds that require grasslands, especially large grasslands, for portions or all of their life cycles. These communities are similar in structure (but not species composition) to the native prairies and open (i.e., recently burned) barrens that were formerly more abundant in Wisconsin. The dominant plants in “surrogate” grasslands are typically exotic “cool season” grasses. See Sample and Mossman (1997) for more information.

**Syenite** - a coarse-grained intrusive igneous rock with a general composition similar to that of granite, but deficient in quartz, which, if present at all, occurs in relatively small concentrations (<5%).

**Tension Zone** – a band between two floristic provinces marked by the intermingling of species from both; influenced by climate, geology, and soils (Curtis 1959).

**Watch list** – consists of species that have experienced, or are believed to have experienced, a statewide or range-wide decline, but are not currently tracked in the Natural Heritage Inventory (NHI) database. The watch list includes newly discovered species for which origin and rarity need to be determined, certain animals designated as Species of Greatest Conservation Need (SGCN) in the Wisconsin Wildlife Action Plan, and species that were tracked in the past but proved more abundant, widespread, or less vulnerable than previously thought. Although watch list species are not actively tracked by NHI, occurrences documented during surveys are often stored by NHI, as these species could be tracked in the future if there is further evidence of their decline.

## Species List

The following is a list of species referred to by common name in the report text.

Common Name	Scientific Name
<b>Animals</b>	
Acadian Flycatcher	<i>Empidonax vireescens</i>
American Woodcock	<i>Scolopax minor</i>
boreal chorus frog	<i>Pseudacris maculata</i>
big brown bat	<i>Eptesicus fuscus</i>
Cerulean Warbler	<i>Setophaga cerulea</i>
four-toed salamander	<i>Hemidactylium scutatum</i>
eastern red bat	<i>Lasiurus borealis</i>
emerald ash borer	<i>Agrilus planipennis</i>
gypsy moth	<i>Lymantria dispar</i>
hoary bat	<i>Lasiurus cinereus</i>
Hooded warbler	<i>Setophaga citrina</i>
little brown bat	<i>Myotis lucifugus</i>
Northern Goshawk	<i>Accipiter gentilis</i>
northern long-eared bat	<i>Myotis septentrionalis</i>
Ovenbird	<i>Seiurus aurocapilla</i>
pickerel frog	<i>Lithobates palustris</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
silver-haired bat	<i>Lasionycteris noctivagans</i>
Veery	<i>Catharus fuscescens</i>
Wood Thrush	<i>Hylocichla mustelina</i>
<b>Plants</b>	
American witch hazel	<i>Hamamelis virginiana</i>
arrow-leaved tear-thumb	<i>Polygonum sagittatus</i>
ash	<i>Fraxinus spp</i>
aspen	<i>Populus spp</i>
basswood	<i>Tilia americana</i>
big-tooth aspen	<i>Populus grandidentata</i>
blue cohosh	<i>Caulophyllum thalictroides</i>
black cherry	<i>Prunus serotina</i>
bracken fern	<i>Pteridium aquilinum</i>
brambles	<i>Rubus spp</i>
Canada mayflower	<i>Maianthemum canadense</i>
Canada thistle	<i>Cirsium arvense</i>
Canada yew	<i>Taxus canadensis</i>
common burdock	<i>Arctium minus</i>
common polypody	<i>Polypodium virginianum</i>
early low blueberry	<i>Vaccinium angustifolium</i>
eastern hemlock	<i>Tsuga canadensis</i>
false hop sedge	<i>Carex lupuliformis</i>
false melic grass	<i>Schizachne purpurascens</i>
garlic mustard	<i>Alliaria petiolata</i>
glossy buckthorn	<i>Rhamnus frangula</i>
impatiens	<i>Impatiens spp</i>
interrupted fern	<i>Osmunda claytoniana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>

Japanese barberry	<i>Berberis thunbergii</i>
Kentucky bluegrass	<i>Poa pratensis</i>
lady fern	<i>Athyrium filix-femina</i>
many-headed sedge	<i>Carex sychnocephala</i>
maple-leaved viburnum	<i>Viburnum acerifolium</i>
mountain maple	<i>Acer spicatum</i>
northern bush-honeysuckle	<i>Diervilla lonicera</i>
northern maidenhair fern	<i>Adiantum pedatum</i>
northern white cedar	<i>Thuja occidentalis</i>
oaks	<i>Quercus</i> spp
pagoda dogwood	<i>Cornus alternifolia</i>
paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
poverty grass	<i>Danthonia spicata</i>
purple clematis	<i>Clematis occidentalis</i>
ravenfoot sedge	<i>Carex crus-corvi</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
rice grasses	<i>Oryzopsis</i> spp
round-leaved dogwood	<i>Cornus rugosa</i>
sharp-lobed hepatica	<i>Anemone acutiloba</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
staghorn sumac	<i>Rhus hirta</i>
sugar maple	<i>Acer saccharum</i>
Tatarian honeysuckle	<i>Lonicera tatarica</i>
Virginia waterleaf	<i>Hydrophyllum virginianum</i>
white ash	<i>Fraxinus americana</i>
white pine	<i>Pinus strobus</i>
wild geranium	<i>Geranium maculatum</i>
willow-herb	<i>Epilobium</i> spp
yellow birch	<i>Betula alleghaniensis</i>
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<b>Fungus</b>	
oak wilt	<i>Ceratocystis fagacearum</i>
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## Appendix A

### Wisconsin Natural Heritage Working List Explanation

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. Most of the species and natural communities on the list are actively tracked and we encourage data submissions on these species. This list is meant to be dynamic - it is updated as often as new information regarding the biological status of species becomes available. See the Endangered Resources Program web site for the most recent Natural Heritage Inventory Working List (<http://dnr.wi.gov/topic/NHI/WList.html>).

#### Key

**Scientific Name:** Scientific name used by the Wisconsin Natural Heritage Inventory Program.

**Common Name:** Standard, contrived, or agreed upon common names.

**Global Rank:** Global element rank. See the rank definitions below.

**State Rank:** State element rank. See the rank definitions below.

**US Status:** Federal protection status in Wisconsin, designated by the Office of Endangered Species, U.S. Fish and Wildlife Service through the U.S. Endangered Species Act. LE = listed endangered; LT = listed threatened; XN = non-essential experimental population(s); LT,PD = listed threatened, proposed for de-listing; C = candidate for future listing.

**WI Status:** Protection category designated by the Wisconsin DNR. END = endangered; THR = threatened; SC = Special Concern.

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are SC/P = fully protected; SC/N = no laws regulating use, possession, or harvesting; SC/H = take regulated by establishment of open closed seasons; SC/FL = federally protected as endangered or threatened, but not so designated by WDNR; SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

## **Global & State Element Rank Definitions**

### **Global Element Ranks:**

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU = Possibly in peril range-wide, but their status is uncertain. More information is needed.

GX = Believed to be extinct throughout its range (e.g. Passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? = Not ranked.

Species with a questionable taxonomic assignment are given a "Q" after the global rank.

Subspecies and varieties are given subranks composed of the letter "T" plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

### **State Element Ranks**

S1 = Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in Wisconsin because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in Wisconsin (21 to 100 occurrences).

S4 = Apparently secure in Wisconsin, with many occurrences.

S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly although not every year); a few of these species (typically long-distance migrants such as some birds and butterflies) may have even bred on one or more of the occasions when they were recorded.

SE = An exotic established in the state; may be native elsewhere in North America.

SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SN = Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in Wisconsin. This category includes migratory birds and bats that pass through twice a year or, may remain in the winter (or, in a few cases, the summer) along with certain lepidoptera which regularly migrate to Wisconsin where they reproduce, but then completely die out every year with no return migration. Species in this category are so widely and unreliably distributed during migration or in winter that no small set of sites could be set aside with the hope of significantly furthering their conservation.

SZ = Not of significant conservation concern in Wisconsin, invariably because there are no definable occurrences in the state, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long-distance migrants whose occurrence during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. Typically, the SZ rank applies to a non-breeding population.

SR = Reported from Wisconsin, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports that are hard to dismiss because the habitat is now destroyed.

SRF = Reported falsely (in error) from Wisconsin but this error is persisting in the literature.

SU = Possibly in peril in the state, but their status is uncertain. More information is needed.

SX = Apparently extirpated from the state.

### **State Ranking of Long-Distance Migrant Animals:**

Ranking long distance aerial migrant animals presents special problems relating to the fact that their non-breeding status (rank) may be quite different from their breeding status, if any, in Wisconsin. In other words, the conservation needs of these taxa may vary between seasons. In order to present a less ambiguous picture of a migrant's status, it is necessary to specify whether the rank refers to the breeding (B) or non-breeding (N) status of the taxon in question. (e.g. S2B, S5N).

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## Appendix B

### Natural Heritage Inventory Overview and General Methodology

This biotic inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program. The Wisconsin NHI program is part of the Wisconsin DNR's Bureau of Endangered Resources and a member of an international network of Natural Heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share standardized methods for collecting, processing, and managing data for rare species, natural communities, and certain other natural features (e.g., bird rookeries). NatureServe, an international non-profit organization, coordinates the network. This appendix provides a general overview of the methodology we use for these projects. Please see the NatureServe Web site for more detailed information about standard methods used by the Heritage Network ([www.NatureServe.org](http://www.NatureServe.org)) for locating, documenting, and ranking rare species and natural community occurrences.

#### General Process Used when Conducting Biotic Inventories for Master Planning

The Wisconsin NHI Program typically uses a "coarse filter-fine filter" approach to conducting biotic inventory projects for master planning. This approach begins with a broad assessment of the natural communities and aquatic features present, along with their relative quality and condition. The area's landforms, soils, topography, hydrology, current land uses, and the surrounding matrix are also evaluated using Geographic Information Systems (GIS) and other electronic and hardcopy data sources. Data that describe conditions for the area prior to Euro-American settlement are often used during this step and at other times to further understand the ecological capabilities of the area. Often, we consult with local managers, biologists, or others familiar with the ecology of the area when preparing for an inventory project. The goals for this step are to identify the important ecological attributes and biological processes present, as well as to focus our inventory efforts.

The level of survey intensity varies based on the size and ecological complexity of the property or group of properties, as well as the resources available. For larger properties such as state forests, biotic inventory efforts typically take more than one year. Ideally, taxa surveys are conducted following a coarse-filter analysis that sometimes include extensive natural community surveys. There is often time for "mop-up work" during the year following the completion of the main survey effort, whereby additional surveys are conducted for areas that could not be reached the first year or for which new information has become available. For smaller properties, a "Rapid Ecological Assessment" often takes the place of a full-scale biotic inventory. The level of effort for these projects varies based on the needs of the study area, although surveys are almost always completed during one field season. Coarse filter work for rapid assessments is often done based on GIS data, aerial photos, data acquired from previous efforts, and information from property managers and others knowledgeable about the area.

Taxa-specific surveys can be costly and intensive and sometimes must be completed during a very narrow period of time. For example, bird surveys must be completed within an approximately one-month time window. For this and several other reasons, ***our surveys cannot locate every rare species occurrence within a given area.*** Therefore, it is important to use resources as efficiently as possible, making every effort to identify the major habitats present in the study area from the start. This approach concentrates inventory efforts on those sites most likely to contain target species to maximize efficient use of resources. Communication among biologists during the field season can help identify new areas of interest or additional priorities for surveys. The goal is to locate species populations with the highest conservation value whenever possible.

After all of the data are collected, occurrences of rare species, high-quality natural communities, and certain other features are documented, synthesized, and incorporated into the NHI Database. The NHI program refers to this process as “mapping” the data and uses a tabular and spatial database application designed specifically for the Heritage Network. Other secondary databases are also used by the Wisconsin NHI Program for storing additional species and community information such as species lists, GPS waypoints, photos, and other site documentation.

Once the data mapping and syntheses are completed, the NHI Program evaluates data from the various department biologists, contractors, and other surveyors. This information is examined along with many other sources of spatial and tabular information including topographic maps, various types of aerial photography, digital soil and wetland maps, hydrological data, forest reconnaissance data, and land cover data. Typically, GPS waypoints and other spatial information from the various surveys are superimposed onto these maps for evaluation by NHI biologists.

In addition to locating important rare species populations and high-quality natural community occurrences, the major products culminating from all of this work are the “Primary Sites.” These areas contain relatively undisturbed, high-quality, natural communities; provide important habitat for rare species; offer opportunities for restoration; could provide important ecological connections; or some combination of the above factors. The sites are meant to highlight, based on our evaluation, the best areas for conserving biological diversity for the study area. They often include important rare species populations, High Conservation Value Forests, or other ecologically important areas.

The final report describes the Primary Sites, as well as rare or otherwise notable species, and other ecological opportunities for conserving or enhancing the biological diversity of the study area. The report is intended for use by department master planning teams and others and strives to describe these opportunities at different scales, including a broad, landscape context that can be used to facilitate ecosystem management.

### **Select Tools Used for Conducting Inventory**

The following are descriptions of standard tools used by the NHI Program for conducting biotic inventories. Some of these may be modified, dropped, or repeated as appropriate to the project.

**File Compilation:** Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the NHI Database. Other databases with potentially useful information may also be queried, such as: forest reconnaissance data; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; the Wisconsin Breeding Bird Atlas; other NHI “atlas” and site databases; museum/herbarium collections for various target taxa; soil surveys; geological surveys; and the department's fish distribution database.

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources, including the State Natural Area files, often contain information on a variety of subjects relevant to the inventory of natural features for an area.

**Literature Review:** Field biologists involved with a given project consult basic references on the natural history and ecology of the area, as well as any documented rare species. This sometimes broadens and/or sharpens the focus of the inventory efforts.

**Target Elements:** Lists of target elements including natural communities, rare plants and animals, and aquatic features are developed for the study area. Field inventory is then scheduled for the times when these elements are most identifiable or active. Inventory methods follow accepted scientific standards for each taxon.

**Compilation of Maps and Other Spatial Data:** USGS 7.5 minute topographic quadrangles, most often in digital form, serve along with aerial photos as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features. These are used in conjunction with numerous GIS layers, which are now a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth. These polygons have been digitized for most counties, and the resulting GIS layers can be superimposed onto other maps.

Ecoregion GIS layers are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. Ecological Landscapes provide the broad framework most often used in Wisconsin; however smaller units, including Landtype Associations, can be very helpful for evaluating ecoregions at finer scales.

**Aerial photographs:** These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. The Wisconsin NHI Program uses several different types of both color and black and white air photos. Typically, these are in digital format, although paired photos in print format can be valuable for stereoscopic viewing. High-resolution satellite imagery is often cost-prohibitive but is available for some portions of the state and is desirable for certain applications.

**Original Land Survey Records:** The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. Their notes also included general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns. The tree data are available in GIS format as raw points or interpreted polygons, and the notes themselves can provide helpful clues regarding the study area's potential ecological capabilities.

**Interviews:** Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield invaluable information.

**Global Positioning Systems (GPS):** Small, portable GPS units are now a routine piece of field equipment used for virtually all NHI survey work. Collecting coordinates (waypoints) facilitates mapping and makes it easy to quickly communicate specific locations among biologists. Often waypoints are paired with photos and/or other information and stored in a waypoint tracking database.

**Aerial Reconnaissance:** Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most easily identified and

differentiated. They are also useful for observing the general lay of the land, vegetation patterns and patch sizes, aquatic features, infrastructure, and disturbances within and around the site

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## Appendix C

# Descriptions of Rare Species, High Quality Natural Communities, and Other Special Features Documented in the Township surrounding Rib Mountain State Park

The following paragraphs provide brief summary descriptions for the rare species, high quality natural communities, and other features documented at Blue Mound State Park and mapped in the NHI database. More information, including species guidance, can be found on the Natural Heritage Conservation website ([dnr.wi.gov](http://dnr.wi.gov), keyword “ER”) for several of these species.

### Rare Animals

#### **Acadian Flycatcher**

Acadian Flycatcher (*Empidonax vireescens*), a State Threatened bird, prefers lowland deciduous forests and heavily wooded hillsides in large blocks of southern forests.

#### **American Bittern**

American Bittern (*Botaurus lentiginosus*) is a Special Concern bird species in Wisconsin. The species can be found in shallow marshes, meadows and wetlands of many sizes but prefers large open marshes and meadows. During the breeding season, from late April through the end of July, it nests in areas with thick, emergent vegetation like cattails, sedges, reed, and bulrushes.

#### **Big Brown Bat**

The big brown bat (*Eptesicus fuscus*) is a Threatened species in Wisconsin. During the summer months, big brown bats are found in various habitats including mixed landscapes of deciduous woodlands, farmlands, edges near water and urban areas. Female big brown bats may form large colonies in bat houses and buildings over the summer. During the winter months, they are found in natural and manmade structures such as caves, mines and human dwellings. The big brown bat is insectivorous and feeds primarily on small beetles found among tree foliage. Mating occurs in the fall at cave and mine entrances and females store sperm until the spring. One to two pups are born in early June and mature after six weeks.

#### **Black Redhorse**

Black Redhorse (*Moxostoma duquesnei*) is a fish listed as Endangered in Wisconsin. In Wisconsin, the only known extant population is in the Wisconsin and Eau Claire Rivers near Wausau. It is found in clear water over gravel, bedrock, and sand where siltation is at a minimum. Spawning occurs in from late May through early June.

#### **Blanding’s Turtle**

Blanding’s turtles (*Emydoidea blandingii*) are listed as a Special Concern species in Wisconsin. They utilize a wide variety of aquatic habitats including deep and shallow marshes, shallow bays of lakes and impoundments where areas of dense emergent and submergent vegetation exists, sluggish streams, oxbows and other backwaters of rivers, drainage ditches (usually where wetlands have been drained), and sedge meadows and wet meadows adjacent to these habitats. This species is semi-terrestrial and individuals may spend a good deal of time on land. They often move between a variety of wetland types

during the active season, which can extend from early March to mid-October. They overwinter in standing water that is typically more than 3 feet deep and with a deep organic substrate but will also use both warm and cold-water streams and rivers where they can avoid freezing.

### **Broad-banded Forestsnail**

Broad-banded forestsnail (*Allogona profunda*) is a terrestrial snail of Special Concern in Wisconsin. It is found in leaf litter in rich forests on floodplains or hilly terrain.

### **Least Flycatcher**

The Least Flycatcher (*Empidonax minimus*) is a State Special Concern species that is found in almost every major type of deciduous and mixed forest, although less commonly in conifers. Although Least Flycatcher historically bred throughout Wisconsin, the breeding range shifted mostly to the northern part of the state as deciduous forest cover was lost in the south. Nesting occurs from mid-May to mid-July.

### **Little Brown Bat**

The little brown bat (*Myotis lucifugus*) is a Threatened species in Wisconsin. Its dorsal fur is a glossy dark-brown to olive-brown color with a lighter ventral side. The little brown bat is insectivorous and feeds on aquatic soft-bodied insects. The species is found roosting in warm microclimates provided by tree snags, bat houses and buildings during the summer. It forages primarily over open water and along edge habitat. This bat hibernates in caves and mines from October through April. Mating occurs in the fall, and females store sperm until emergence in the spring. Usually one pup is born in early June and matures after six weeks.

### **Northern Flying Squirrel**

Northern flying squirrel (*Glaucomys sabrinus*) is a Special Concern species in Wisconsin and a Protected Wild Animal under NR 10.02 Wis. Admin. Stats. It inhabits a number of natural communities in the northern portion of Wisconsin, and the presence of conifers and a relatively moist environment are important habitat components. Although it does not require old-growth, it is generally associated with certain characteristics of older forests, such as standing live and dead trees, an abundance of decaying coarse woody debris, a diverse understory, and high truffle abundances

### **Northern Long-eared Bat**

Northern Long-eared Bat, (*Myotis septentrionalis*), a species listed as Threatened by both Wisconsin and federal government, is usually a dull or light brown color, with a gray underbelly. Habitat for the summer may include day roosts in buildings, under tree bark or shutters, or caves during the night. Hibernation sites are often in mines or caves, and this species may co-hibernate with other species. Foraging habitat includes forested hillsides and ridges, and small ponds or streams. Mating occurs in the fall with delayed fertilization in the spring, and one young produced between May and July.

### **Peregrine Falcon**

Peregrine Falcon (*Falco peregrinus*), is listed as Endangered in Wisconsin. It prefers relatively inaccessible rock ledges on the sides of steep bluffs and ledges on high-rise buildings in urban areas. The recommended avoidance period is from March 1 through July 31.

### **Veery**

Veeries (*Catharus fuscescens*), a Special Concern species, are found in a wide variety of forest habitats, provided there is thick deciduous undergrowth present, resulting in a broad distribution throughout the state. They are most common in northern and central Wisconsin forests, but also occur southward in large forested tracts such as the Baraboo Hills. Veeries nest on the ground or within approximately three feet of the ground. Nesting occurs from late May to early July.

### **Wood Thrush**

The Wood Thrush (*Hylocichla mustelina*) is a Special Concern species that prefers large blocks of upland moist forests with mature trees, moderate to dense canopy cover, moderate undergrowth, and ample leaf litter. Nesting occurs from mid-May to late July.

### **Wood Turtle**

Wood turtles (*Clemmys insculpta*), a Threatened species in Wisconsin, prefer rivers and streams with adjacent riparian wetlands and upland deciduous forests. This species often forages in open wet meadows or in shrub-carr habitats dominated by speckled alder. They overwinter in streams and rivers in deep holes or undercut banks where there is enough water flow to prevent freezing. This semi-terrestrial species tends to stay within about 300 meters of rivers and streams but exceptions certainly occur, especially within the Driftless Area of southwestern and western Wisconsin. This species becomes active in spring as soon as the ice is gone and air temperatures reach around 50 degrees in March or April. They can remain active into mid-October.

### **Rare Plants**

#### **Butternut**

Butternut (*Juglans cinerea*), a State Special Concern plant, is found in mesic hardwoods and riparian hardwood forests. Blooming occurs April to June; fruiting occurs October. The optimal identification period for this species is all year.

#### **Drooping Sedge**

Drooping Sedge (*Carex prasina*), a State Special Concern plant, is found in shaded, seeping ravine bottoms in deciduous or mixed woods, occasionally in sedge meadows. Blooming occurs early May through early June; fruiting occurs early June through early September. The optimal identification period for this species is early June through late July.

#### **Missouri Rock-cress**

Missouri Rock-cress (*Boechera missouriensis* (= *Arabis missouriensis*)), a State Special Concern plant, is found in soil pockets on acidic cliffs, as well as in pine forests on sterile sand and gravel outwash plains. Blooming occurs late May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late June.

#### **Snowy Campion**

Snowy Campion (*Silene nivea*), a State Special Concern plant, is found on stream banks and stream-side meadows, often in reed canary grass. It also occurs along deciduous forest margins, near streams and rivers. Blooming occurs late June through late July; fruiting occurs early July through late August. The optimal identification period for this species is late June through late July.

### **Natural Communities**

#### **Northern Mesic Forest**

Northern Mesic Forest is found primarily north of the Tension Zone, on loamy soils of glacial till plains and moraines deposited by the Wisconsin glaciation. Sugar maple is dominant or co-dominant in most stands. Historically, eastern hemlock was the second most important species, sometimes occurring in nearly pure stands with eastern white pine; both of these conifer species are greatly reduced in today's forests. American beech can be a co-dominant with sugar maple in the counties near Lake Michigan. Other important tree species were yellow birch, basswood, and white ash. The ground layer varies from sparse and species poor (especially in hemlock stands) with woodferns, blue-bead lily, club-mosses, and

Canada mayflower, to lush and species-rich with fine spring ephemeral displays. Historically, Canada yew was an important shrub, but it is now absent from nearly all locations. Historic disturbance regimes were dominantly gap-phase wind-throw; large windstorms occurred with long return periods. After old-growth stands were cut, trees such as quaking and big-tooth aspens, white birch, and red maple became abundant and still are important in many second-growth northern mesic forests.

### **Northern Sedge Meadow**

Northern Sedge Meadow is an open wetland community that is dominated by sedges and grasses and occurs primarily in northern Wisconsin. There are several common, fairly distinctive, subtypes: Tussock meadow, dominated by tussock sedge and Canada bluejoint grass; Broad-leaved sedge meadow, dominated by the robust sedges like common lake sedge and yellow lake; and Wire-leaved sedge meadow, dominated by woolly sedge and/or few-seeded sedge. Frequent associates include blue flag, marsh fern, marsh bellwort, manna grasses, paniced aster, Joe-Pye weed, and bulrushes. Sphagnum mosses are either absent or they occur in scattered, discontinuous patches. Sedge meadows occur on a variety of landforms and in several ecological settings that include depressions in outwash or ground moraine landforms in which there is groundwater movement and internal drainage, on the shores of some drainage lakes, and on the margins of streams and large rivers.

### **Shrub-carr**

Shrub-carr is a wetland community dominated by tall shrubs such as red-osier dogwood, silky dogwood, meadowsweet, and various willows. Canada bluejoint grass is often very common. Associates are similar to those found in alder thickets and tussock-type sedge meadows. This type occupies areas that are transitional between open wetlands such as wet prairie, calcareous fen, or southern sedge meadow, and forested wetlands such as floodplain forest or southern hardwood swamp. Shrub-carr can persist at a given site for a very long time if natural hydrologic cycles are maintained. This type often occurs in bands around lakes or ponds, on the margins of river floodplains, or, more extensively, in glacial lakebeds. It is common and widespread in southern Wisconsin but also occurs in the north. In the south, shrub-carr was often an integral part of prairie-savanna landscapes, though it also occurred in wetlands within more forested regions. In the north, the landscape matrix around the shrub-carr type was usually upland forest. Statewide, shrub-carr remains quite common, and has fared considerably better than many of the other native wetland types within its range.

### **Stream—Fast, Soft, Cold**

Coldwater streams are best described as flowing waters with maximum summer water temperatures that are typically below 22 degrees Celsius (about 72 degrees Fahrenheit). The watersheds of these streams are usually less than 100 square miles, and the streams exhibit mean annual flow rates of less than 50 cubic feet per second. Coldwater streams can be found statewide, but they are concentrated in southwestern and parts of central and northern Wisconsin. These communities contain relatively few fish species and are dominated by trout and sculpins. The unglaciated Driftless Area in the state's southwestern corner exhibits a classically branched stream pattern and sharper, more eroded terrain. The rest of the state, smoothed by glaciers, has less topographic relief, creating sinuous streams with less average elevation drop.

### **Other**

#### **Bird Rookery**

A bird rookery is an area where more than one pair of birds nest in a group. The number of nests can vary from just a few to hundreds and can include one to many different species of birds. Sites can include rare and non-rare species. The breeding time will vary based on the species present at the site. Rookeries are typically located in inaccessible locations including forests, shrub communities, wetlands adjacent to water (lakes, rivers or streams), and islands. These sites are important as large numbers of breeding individuals can be found in a single place.

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## APPENDIX E

### Primary Inventory Site at Rib Mountain State Park<sup>1</sup>

One ecologically important site is identified at Rib Mountain State Park. “Primary Sites” are delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during master planning.

Information provided in the summary paragraphs includes location information, a brief description of the natural features present, the site’s ecological significance, management considerations and a site map. Appendix F lists the rare species and high-quality natural communities currently known to occur within this Primary Site at Rib Mountain State Park (this appendix contains locational information on rare species and is not available for public distribution).

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<sup>1</sup> A list of species referred to by common name is found at the end of this appendix.

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## RMSP01. RIB MOUNTAIN WOODS

### Location

Property:	Rib Mountain State Park
Counties:	Marathon
Landtype Association:	Rib Mountain (212Qd04)
Approximate Size (acres):	1,063

### Description of Site

This primary site encompasses the majority of Rib Mountain State Park outside of the intensive use areas including the downhill ski area, picnic area, park entry station and the communications towers. The site is predominantly covered by moderate- to high-quality Northern Mesic Forest with inclusions of Northern Dry-mesic Forest. The site also includes talus forest and other bedrock-influenced communities like Bedrock Glades; Forested Seeps and ephemeral springs, streams and ponds are scattered throughout the primary site. Several rare species have been documented in or near the primary site. There is a network of recreational trails throughout the site.

The forest, especially on the north-facing slope, is dominated by sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), paper birch (*Betula papyrifera*), and white ash (*Fraxinus americana*). Basswood (*Tilia americana*), yellow birch (*B. alleghaniensis*), red maple (*A. rubrum*), and aspens (*Populus* spp) also occur in the canopy. There are small pockets dominated by eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and red pine (*P. resinosa*). Canopy closure is high overall, with pockets of younger forest dominated by paper birch, aspens, red maple, and ash (*Fraxinus* spp). The south-facing slope, especially the upper slope, tends to be more dry-mesic, and aspen and red oak are dominant. Wind-thrown trees are present, and coarse woody debris is occasional to moderate. The shrub layer is variable but generally has low coverage overall. There are denser pockets scattered throughout, generally centered on canopy gaps or other past disturbances. Shrub species include saplings of canopy species, mountain maple (*Acer spicatum*), round-leaved and pagoda dogwood (*Cornus rugosa* and *C. alternifolia*), and American witch hazel (*Hamamelis virginiana*). Ground flora coverage is low to moderate overall and is variable in distribution and composition. Species include several ferns (e.g., lady [*Athyrium filix-femina*], northern maidenhair [*Adiantum pedatum*], and interrupted [*Osmunda claytoniana*]), Canada mayflower (*Maianthemum canadense*), Jack-in-the-pulpit (*Arisaema triphyllum*), and wild geranium (*Geranium maculatum*). Some areas are dominated by Pennsylvania sedge (*Carex pensylvanica*). Spring ephemerals, such as sharp-leaved hepatica (*Anemone acutiloba*), blue cohosh (*Caulophyllum thalictroides*), and Virginia waterleaf (*Hydrophyllum virginianum*), are present, with the greatest abundance and widest distribution in the northwestern part of the park. Invasive species are scattered and include Tatarian honeysuckle (*Lonicera tatarica*). Deer sign, such as browsed vegetation, trails, and rubs, are common throughout the forest.

Bedrock Glades, bedrock outcrops, and talus are scattered on the upper slopes especially in the western half of the park. The glades are generally small, and their quality varies depending on disturbance. Open-grown red oaks are common on or surrounding the glades; red maple, black cherry (*Prunus serotina*), white ash, and big-tooth aspen (*Populus grandidentata*) are also present. Shrubs include northern bush-honeysuckle (*Diervilla lonicera*), early low blueberry (*Vaccinium angustifolium*), brambles (*Rubus* spp), staghorn sumac (*Rhus hirta*), mountain maple, and maple-leaved viburnum (*Viburnum acerifolium*). Bracken fern (*Pteridium aquilinum*), common polypody (*Polypodium virginianum*), poverty grass (*Danthonia spicata*), false melic grass (*Schizachne purpurascens*), rice grasses (*Oryzopsis* spp), Kentucky bluegrass (*Poa pratensis*), and purple clematis

(*Clematis occidentalis*) are common herbs. Some of the talus is in canopy gaps, and some of the talus is forested. The open talus generally has little vegetation other than thick stands of common polypody and mosses. The species composition of the forested talus is similar to that of the surrounding forest.

Seeps and springs, streams, and ponds, almost all of which are apparently ephemeral, are scattered through the park. Many of the streams are in rocky, somewhat eroded channels. Water can be heard flowing beneath the rocks in some of the otherwise dry stream channels. A very low number of small, permanent, seep-fed, open wetlands are present. While the permanent wetlands contain impatiens (*Impatiens* spp), arrow-leaved tear-thumb (*Polygonum sagittatum*), willow-herb (*Epilobium* spp), and other native species, reed canary grass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*) are common. Some of the Ephemeral Ponds form on bedrock glades; otherwise, they are distributed on level areas on the ridge top and upper slopes or on the more gentle lower slopes. The floor of the abandoned quarry provides surrogate Ephemeral Ponds habitat that, in wetter years, can be extensive. (Numerous frogs were heard calling and tadpoles were observed in the quarry in May and June, 2015. A small stream was also flowing out of the quarry entrance at that time.)

### **Significance of Site**

Almost all of Rib Mountain Woods is in the Forest Transition Ecological Landscape. The 1,000 plus-acre primary site acts as a core of intact upland forest that continues onto surrounding properties within a one-mile radius, where an additional 1,000 acres of deciduous forest can be found on private lands, especially to the west and south. A largely forested unit of Marathon County Forest is about 1.5 miles south of the park; the extensively forested lowlands along the Rib River are about a half mile north of Rib Mountain State Park. The Northern Mesic Forest with Northern Dry-mesic Forest inclusions have been identified as major and important, respectively, management opportunities for the Forest Transition Ecological Landscape in the Wisconsin Wildlife Action Plan ([dnr.wi.gov](http://dnr.wi.gov), keyword “wildlife action plan”).

Rib Mountain Woods and adjoining forest lands provide an important 2,000-acre block of habitat for forest interior birds, a suite of species that are declining due in large part to forest fragmentation, i.e., the division of large tracts of contiguous forest into smaller isolated tracts surrounded by human-modified environments. There are other rare animals and plants, including Species of Greatest Conservation Need (SGCN), at Rib Mountain Woods. Terrestrial snails live in the leaf litter of the forest. Based on recent surveys, several of Wisconsin’s cave-dwelling bat species, all listed as Threatened with one species also listed as federally Threatened, have been documented in Marathon County. Bats are a vital part of many ecosystems. In general, they help control pests and are pollinators and seed-dispersers for countless plants. As predators of biting insects, bats may also play an important role in reducing risk of insect-borne diseases, such as the West-Nile Virus. This primary site affords both foraging habitat and summer roosting places for the bats.

The primary site also encapsulates bedrock exposure features including Bedrock Glades and forested and open talus slopes. Bedrock exposures can provide habitats for highly specialized plants and animals due to their unique physical characteristics. At least one Special Concern plant has been found on bedrock features at the park; purple clematis, a plant formerly listed as Special Concern, frequently grows on talus. Bedrock Glades have been identified as an important management opportunity for the Forest Transition Ecological Landscape in the Wildlife Action Plan ([dnr.wi.gov](http://dnr.wi.gov), keyword “wildlife action plan”).

Ephemeral water features, including seeps and springs, streams, and ponds, are scattered throughout the site and can provide significant habitat for a range of species, including frogs, toads, salamanders, and aquatic invertebrates. Ephemeral Ponds have been identified as an important management opportunity for the Forest Transition Ecological Landscape in the Wildlife Action Plan ([dnr.wi.gov](http://dnr.wi.gov), keyword “wildlife action plan”). The other ephemeral water features (seeps, springs, streams) on the

park can be important components on the landscape. As with Ephemeral Ponds, these other ephemeral water features can provide unique habitat. Positioned at the terrestrial-aquatic ecotone, species have developed adaptations and life histories to cope within such hydrologically dynamic systems. Ephemeral water features provide zones of nutrient cycling and carbon processing. Ephemeral streams are connectivity corridors linked to the watersheds they drain and the river networks to which they are periodically connected (McDonough et al. 2011).

A full list of the rare species associated with this primary site can be found in Appendix F (this appendix contains locational information on rare species and is not available for public distribution).

### **Management Considerations**

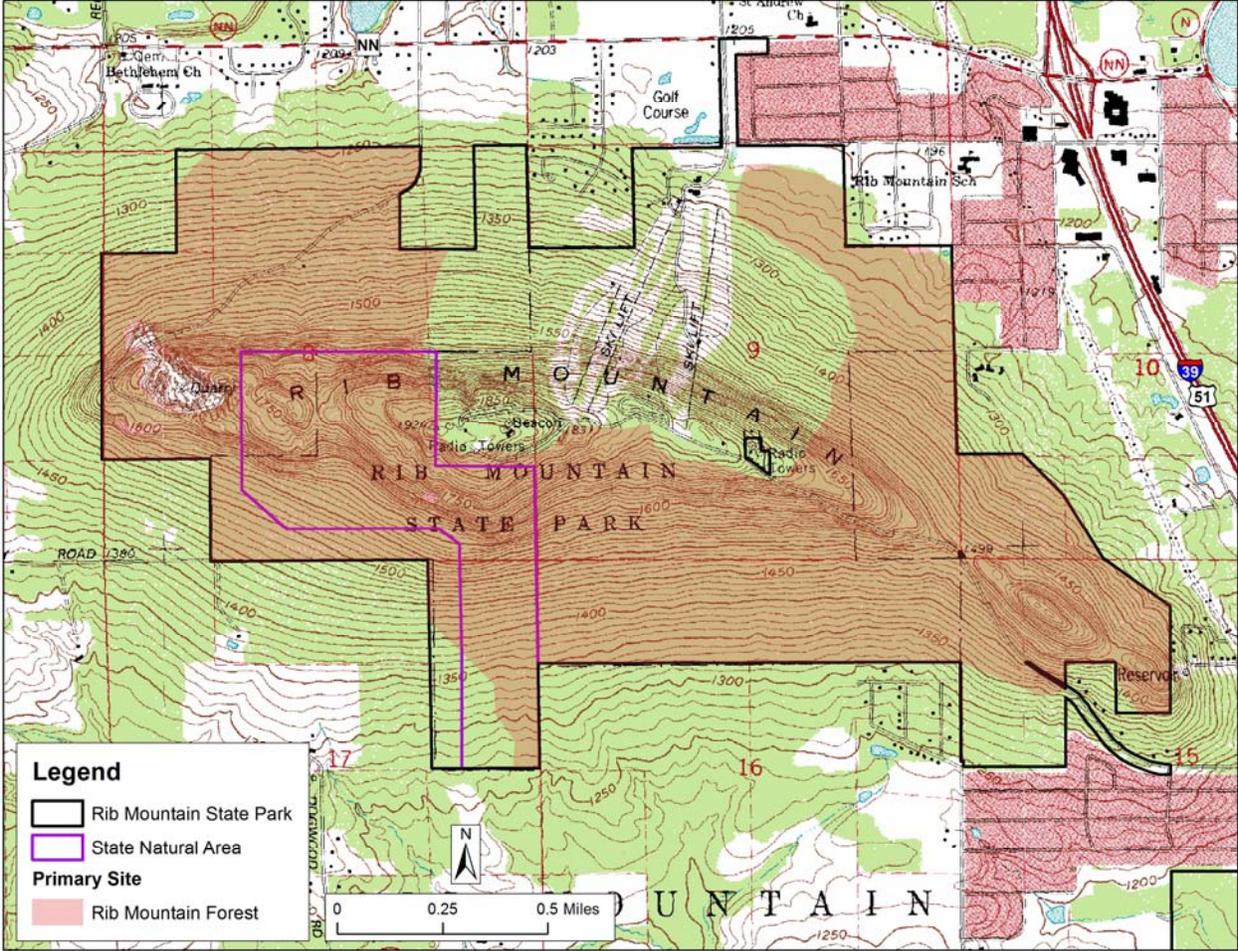
Opportunities to manage a large block of older forest at a landscape scale are very good at this site, with over 1,000 acres of moderate quality Northern Mesic and Dry-mesic Forest in the park and an equivalent or larger acreage of variable quality forest on private land adjacent to the park. Management could seek to maintain older forest in a large-sized block at this site and promote the maintenance of forest on nearby lands, thereby benefitting area-dependent species such as forest interior birds. Trail density and landscape position can be points of consideration in managing a range of recreational uses within larger blocks of forest that support forest interior birds.

Several invasive species have been found within the forest at the site. The mostly commonly observed species were Tatarian honeysuckle and Japanese barberry (*Berberis thunbergii*), both in relatively low numbers. Garlic mustard (*Alliaria petiolata*) and glossy buckthorn (*Rhamnus frangula*) have been identified at the site in the past, especially along trail corridors. In areas that are lightly infested with invasive species, eradication is a practical and high-impact goal. In other, more heavily infested areas, management may be more of a matter of containment and minimizing the spread of the target invasive species rather than eradication. Areas with burdock (*Arctium minus*) along trails, access roads, and in open areas can be a hazard to foraging bats, and burdock management would benefit both the bats and the surrounding plant community. It is recommended that the primary site be routinely monitored for invasive species and new populations and species be controlled at an early stage.

Some of the Bedrock Glades have been disturbed by past developments or by current visitor use. Better quality glades could be maintained or restored by prescribed fire, manual removal of encroaching woody vegetation, and control of herbaceous invasive species such as spotted knapweed (*Centaurea biebersteinii*).

Ephemeral Ponds benefit from shaded conditions, from the presence of coarse woody debris, and from minimizing soil compaction in the immediate vicinity of the pond. Recreational development and natural resource management activities could include considerations for management of ephemeral ponds, streams, and seeps and springs such as by following forestry Best Management Practices for Water Quality ([dnr.wi.gov](http://dnr.wi.gov), keyword “bmp water quality”).

RMSP01. Rib Mountain Woods



## SPECIES LIST

List of species referred to by common name in Appendix E.

Common Name	Scientific Name
American Robin	<i>Turdus migratorius</i>
American witch hazel	<i>Hamamelis virginiana</i>
Arrow-leaved tear-thumb	<i>Polygonum sagittatus</i>
ash	<i>Fraxinus</i> spp
aspen	<i>Populus</i> spp
basswood	<i>Tilia americana</i>
big-tooth aspen	<i>Populus grandidentata</i>
blue cohosh	<i>Caulophyllum thalictroides</i>
Blue Jay	<i>Cyanocitta cristata</i>
bracken fern	<i>Pteridium aquilinum</i>
black cherry	<i>Prunus serotina</i>
brambles	<i>Rubus</i> spp
Brown-headed Cowbird	<i>Molothrus ater</i>
burdock	<i>Arctium minus</i>
Canada mayflower	<i>Maianthemum canadense</i>
Canada thistle	<i>Cirsium arvense</i>
common polypody	<i>Polypodium virginianum</i>
early low blueberry	<i>Vaccinium angustifolium</i>
eastern hemlock	<i>Tsuga canadensis</i>
false melic grass	<i>Schizachne purpurascens</i>
garlic mustard	<i>Alliaria petiolata</i>
glossy buckthorn	<i>Rhamnus frangula</i>
impatiens	<i>Impatiens</i> spp
interrupted fern	<i>Osmunda claytoniana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
Japanese barberry	<i>Berberis thunbergii</i>
Kentucky bluegrass	<i>Poa pratensis</i>
lady fern	<i>Athyrium filix-femina</i>
maple-leaved viburnum	<i>Viburnum acerifolium</i>
mountain maple	<i>Acer spicatum</i>
northern bush-honeysuckle	<i>Diervilla lonicera</i>
northern maidenhair fern	<i>Adiantum pedatum</i>
pagoda dogwood	<i>Cornus alternifolia</i>
paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
poverty grass	<i>Danthonia spicata</i>
purple clematis	<i>Clematis occidentalis</i>
raccoon	<i>Procyon lotor</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
rice grasses	<i>Oryzopsis</i> spp
round-leaved dogwood	<i>Cornus rugosa</i>

sharp-leaved hepatica	<i>Anemone acutiloba</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
staghorn sumac	<i>Rhus hirta</i>
sugar maple	<i>Acer saccharum</i>
Tatarian honeysuckle	<i>Lonicera tatarica</i>
Virginia waterleaf	<i>Hydrophyllum virginianum</i>
white ash	<i>Fraxinus americana</i>
white pine	<i>Pinus strobus</i>
wild geranium	<i>Geranium maculatum</i>
willow-herb	<i>Epilobium spp</i>
yellow birch	<i>Betula alleghaniensis</i>

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