



Rapid Ecological Assessment for Blue Mound State Park, Dane and Iowa Counties, Wisconsin

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

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- B. Natural Heritage Inventory Methods Overview
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- D. Descriptions of Some of the Rare Species, High Quality Natural Communities, and Other Features Documented in the Townships Surrounding Blue Mound State Park
- E. Primary Sites at Blue Mound State Park
- F. Rare Species and High Quality Natural Communities of Blue Mound State Park in each Primary Site*

* This appendix contains locational information on rare species and is not for public distribution.

Blue Mound State Park at a Glance:

Exceptional Characteristics of the Study Area

- **Older Upland Forest.** Several significant blocks of older, moderate to high-quality southern mesic and dry-mesic forest occur. The WDNR has identified a need to conserve, protect, and manage old-growth forests. The forests in the park are part of larger forested blocks that are important for area-dependent animals like 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 the surrounding area, provide important habitat for several forest interior birds, including one species with a population of statewide significance.
- **Grassland-Shrub Birds.** Areas in a grassland-shrubland mix provide habitat for priority and more common bird species requiring shrubby vegetation.
- **Ephemeral Ponds and Forested Seeps.** Ephemeral ponds and forested seeps are scattered across the park. Ephemeral ponds and forested seeps provide habitat for a range of species, including SGCN amphibians and invertebrates that require fishless ponds for their life cycles.
- **Bats.** The park and surrounding landscape in Dane and Iowa counties provide valuable habitat for foraging, summer roosting, and winter hibernation.

Site Specific Opportunities for Biodiversity Conservation

Two ecologically important sites, or “Primary Sites,” were 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. These sites warrant high protection and/or restoration consideration during the development of the property master plan.

Primary Sites:

- | | | |
|--------|-----------------------|---|
| BMSP01 | Pleasure Valley Woods | <ul style="list-style-type: none">• Moderate to good quality Southern Mesic Forest,• Ryan Creek: Exceptional Resource Water, Class II trout stream• Several rare species, including forest interior birds with one having a population of statewide significance• Suitable foraging and summer roosting habitat for bats• Restorable small Dry Prairie-Oak Woodland complex |
| BMSP02 | Blue Mound Woods | <ul style="list-style-type: none">• Extensive moderate quality Southern Dry-mesic Forest• Several rare species, including forest interior birds• Suitable foraging and summer roosting habitat for bats• Ephemeral water features (ponds, streams) and Forested Seeps |

Introduction

Purpose and Objectives

This report is intended to be used in conjunction with other sources of information for master planning Blue Mound State Park (BMSP). 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 inventory 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 BMSP were limited to a “rapid assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting passerine bird occurrences, 3) documenting bat usage, 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 taxon groups; these groups have been identified by the DNR or others as representing either an opportunity or a need for future work.

Methods

The Wisconsin Natural Heritage Inventory (NHI) program resides in the Wisconsin DNR’s (WDNR) 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 2014a), which is the list of natural communities and Endangered, Threatened, and Special Concern plants, animals maintained by NHI. 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, keyword “working list”).

The Wisconsin NHI program uses a standard 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 Web site: www.natureserve.org.

Data for this report were compiled using existing NHI data as well as surveys for natural communities, breeding birds, and bats in 2015. WDNR forest reconnaissance data were also obtained from the Wisconsin Forest Inventory & Reporting System (WisFIRS; dnr.wi.gov, keyword “wisfirs”).

General Background Information

Previous efforts

Past surveys and inventory efforts highlighting the ecological importance of BMSP include the Land Legacy Report (WDNR 2006a) which was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The Blue Mound State Park legacy area was assigned a score of four points on their five-point scale for conservation significance, meaning it possesses "excellent ecological qualities, is of adequate size to meet the needs of most of the critical components, and/or harbors natural communities or species of continental or Great Lakes regional significance." Restoration efforts at four-point sites will typically be important and have a high likelihood of success.

Surveys for specific taxa have been conducted at or near the park in past ten years. NHI conducted a breeding bird and limited natural community surveys in 2006 west of Mounds Park Road. As part of a state wildlife grant for terrestrial snails in the Driftless Area, snails were surveyed west of Mounds Park Road at the park in 2010. During routine surveys related to white-nose syndrome, the Wisconsin Bat Monitoring program documented several cave bat species in Iowa County.

Special Management Designation

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.

Ecological Context

This section is largely reproduced from two sources: The Ecological Landscapes of Wisconsin (WDNR 2014b) 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) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

Most of Blue Mound State Park is located in the Southwest Savanna Ecological Landscape with roughly 15% of the northeastern corner of the park in the Western Coulee and Ridges Ecological Landscape (Figure 1). The **Southwest Savanna Ecological Landscape** is part of Wisconsin's Driftless Area, a region that has not been glaciated for at least the last 2.4 million years. The topography is characterized by broad, open ridgetops, deep valleys, and steep, wooded slopes. The Southwest Savanna Landscape is underlain by sedimentary bedrock, especially dolomites (dolostones) and sandstones. Soils on hilltops are mostly silt loams. In some areas soils are shallow, with bedrock or stony red clay subsoil very close to or at the surface. In other locales the ridgetops have a deep cap of loess-derived silt loam (these are the most productive agricultural soils). Valley soils include alluvial sands, loams, and, occasionally, peats. The drainage patterns of streams in the Southwest Savanna are dendritic, which is a pattern characteristic of unglaciated regions but absent or uncommon in most of Wisconsin. Flowing waters include warmwater rivers and streams, coldwater streams, and springs. Natural lakes are virtually absent, although there are a few associated with the floodplains of the larger rivers.



Figure 1. Ecological Landscapes of Wisconsin. Blue Mound State Park is represented by the circled black dot.

The Southwest Savanna EL was once dominated by fire-dependent natural communities representing the continuum of prairie, oak (*Quercus* spp) savanna, oak woodland, and oak forest. Agricultural and residential interests throughout the landscape have significantly altered the historical vegetation and hydrology. Agricultural crops (corn, soybeans, small grains, hay) cover 70% of this ecological landscape, with lesser amounts of grassland (mostly pasture), forest, and residential areas. The major forest types are oak-hickory and maple-basswood. Prairie remnants of varying quality persist in a few places, mostly on rocky hilltops or slopes that are too steep to farm. Some pastures have never been plowed, and those that historically supported prairie may retain remnants of the former prairie flora. Pastures with scattered open-grown oaks still exist in some areas, mimicking oak savanna structure. A complement of native plants persists in some of these pastured savannas. Now dominated mostly by agricultural lands, and with less than one percent in public ownership, this landscape still offers good opportunities to maintain expansive grassland and savanna habitats through public/private partnerships. Restoration and management of the entire continuum of fire-dependent natural communities native to southern Wisconsin are possible here.

The **Western Coulee and Ridges Ecological Landscape** in southwestern and west central Wisconsin is characterized by its lack of glacial features. It too is part of the Driftless Area. The topography is unique in the state due to the long periods of erosion which have created dissected ridges, steep-sided valleys, and extensive stream networks with dendritic drainage patterns. The Western Coulee and Ridges EL is more forested than the rest of southern Wisconsin. Soils are mostly silt loams (loess) and sandy loams,

over dolomite and sandstone bedrock. Several large rivers flow through or border the ecological landscape.

Historical vegetation consisted of upland southern hardwood forests of several major types, oak savanna, and prairie, with extensive floodplain forests, sedge meadows, and marshes along the major rivers. With Euro-American settlement, most of the more level lands on ridge tops and in valley bottoms was cleared of native vegetation for agricultural uses. The steep slopes between valley bottom and ridge top, unsuitable for raising crops, either remained in forest or the former savannas and prairies grew up into oak- or maple-dominated forests after the wildfires common in Native American times were suppressed.

Current vegetation is a mix of forest (the largest land cover component, at over 40%), agriculture, and grassland (mostly consisting of non-native species); wetlands are restricted almost entirely to the river valleys. The primary forest cover is oak-hickory (51%) dominated by oaks and shagbark hickory (*Carya ovata*). Mesic forests (28%), dominated by sugar maple (*Acer saccharum*), red maple (*A. rubrum*), and basswood (*Tilia americana*), are common in areas that were not subjected to repeated wildfires prior to Euro-American settlement. Bottomland hardwoods (10%) are restricted to the valley bottoms of the larger rivers and are dominated by silver maple (*Acer saccharinum*), ashes (*Fraxinus* spp), elms (*Ulmus* spp), and eastern cottonwood (*Populus deltoides*). Coniferous forests are not extensive, and include the so-called “relict” conifer stands of white and red (rarely jack) pines (*Pinus strobus*, *P. resinosa*, and *P. banksiana*) on dry sites and mesic stands of eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*) on steep slopes with cool, moist micro-climates. In a few valley locations there are lowland forests dominated by tamarack (*Larix laricina*), although many, if not most, of these are now in serious decline.

The landscape surrounding BMSP (Figure 2) is dominated by agriculture, especially in the Southwest Savanna EL. There is a more even admixture of agriculture and forested lands in the Western Coulee and Ridges EL. Homes and farmsteads are scattered with some exurban development present; the communities of Mount Horeb, Blue Mounds, and Barneveld are within six miles of the park. Blue Mound State Park abuts the Military Ridge State Trail on the south, and there are other DNR lands, including fishery areas, within six miles of the property. Dane County Park land borders Blue Mound State Park on a stretch of the east side, and there are private lands with conservation easements to the northeast of the park.

Regional Biodiversity Needs and Opportunities

Different opportunities exist for sustaining natural communities in the Southwest Savanna and Western Coulee and Ridges ecological landscapes. Ecological landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007; WDNR 2014b) and later focused on wildlife 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 Southwest Savanna and Western Coulee and Ridges ecological landscapes.

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.

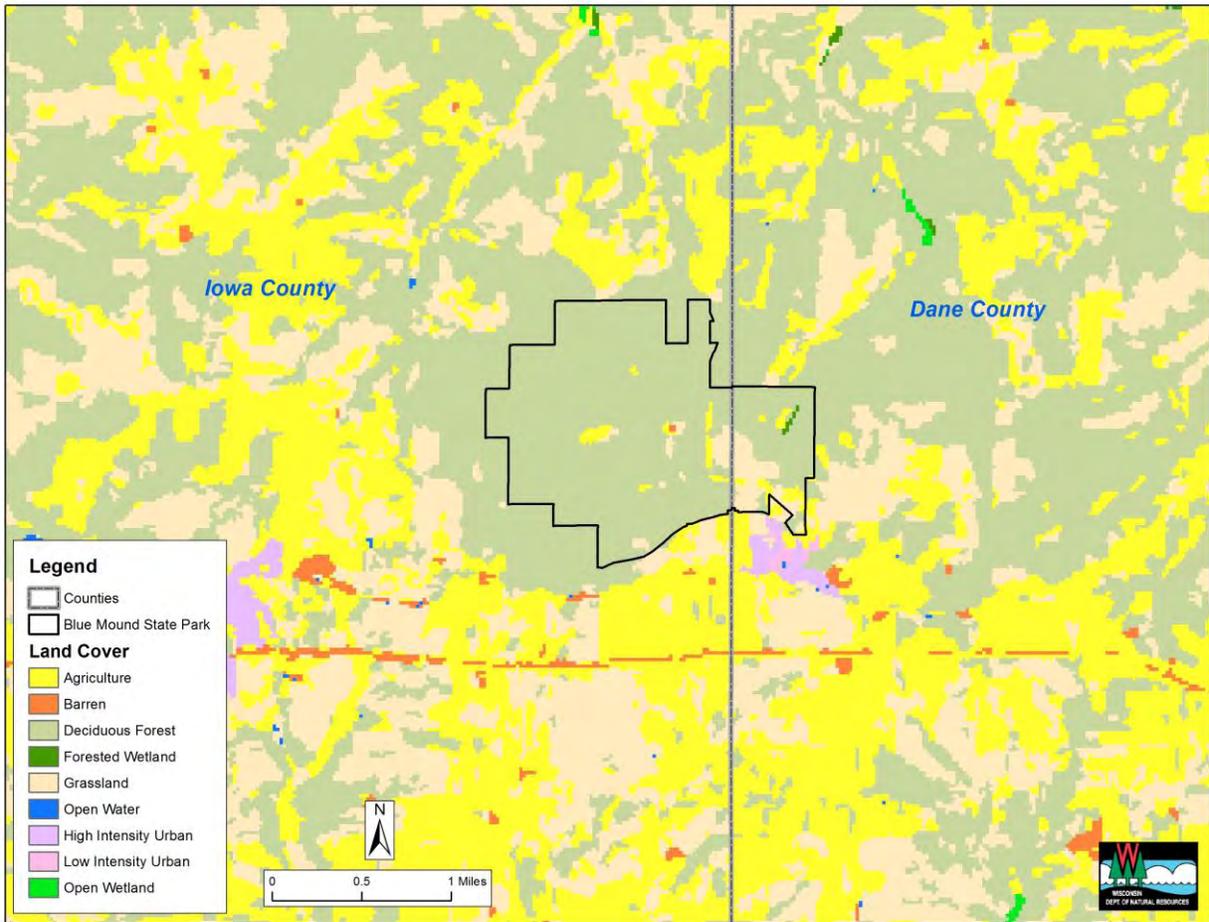


Figure 2. Land cover from the WISCLAND GIS coverage (WDNR 1993).

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies 17 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Southwest Savanna Ecological Landscape**. Of these, 3 are present at BMSP (Table 1).

Table 1. Major and important natural community management opportunities in the **Southwest Savanna Ecological Landscape** (WDNR 2006b). Asterisks indicate opportunities that occur at BMSP.

Major Opportunities	Important Opportunities
Dry Prairie	*Coldwater streams
Dry-mesic Prairie	Coolwater streams
Mesic Prairie	Dry Cliff
Oak Opening	Hemlock Relict

Oak Woodland	Moist Cliff
Surrogate Grasslands	Pine Relict
Warmwater streams	Southern Dry Forest
	*Southern Dry-mesic Forest
	*Southern Mesic Forest
	Wet-mesic Prairie

The Wisconsin Wildlife Action Plan (WDNR 2006b) also identifies 37 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Western Coulee and Ridges Ecological Landscape**. Of these, eight are present at BMSP (Table 2).

Table 2. Major and important natural community management opportunities in the **Western Coulee and Ridges Ecological Landscape** (WDNR 2006b). Asterisks indicate opportunities that occur at BMSP.

Major Opportunities	Important Opportunities
Algific Talus Slope	Alder Thicket
Bedrock Glade	Emergent Marsh - Wild Rice
Cedar Glade	*Ephemeral Pond
*Coldwater streams	Mesic Prairie
Coolwater streams	Northern Dry-mesic Forest
Dry Cliff	Northern Sedge Meadow
*Dry Prairie	Northern Wet Forest
Dry-mesic Prairie	Pine Barrens
Emergent Marsh	Southern Sedge Meadow
Floodplain Forest	Southern Tamarack Swamp (rich)
Hemlock Relict	Wet Prairie
Moist Cliff	Wet-mesic Prairie
Oak Barrens	White Pine - Red Maple Swamp
Oak Opening	
*Oak Woodland	
Pine Relict	
Sand Prairie	
*Shrub-Carr	
Southern Dry Forest	
*Southern Dry-mesic Forest	
*Southern Mesic Forest	
Submergent Marsh	
*Surrogate Grasslands	
Warmwater rivers	

Rare Species of the Two Ecological Landscapes

Numerous rare species are known from the Southwest Savanna and Western Coulee and Ridges ecological landscapes. “Rare” species include all of those species that appear on the WDNR’s NHI Working List (dnr.wi.gov, keyword “working list”) classified as “Endangered,” “Threatened,” or “Special Concern.” Table 3 lists the number of species known to occur in each landscape based on information stored in the NHI database as of August 2015.

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need (SGCN) 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 18 and 59 vertebrate SGCN significantly associated with the Southwest Savanna and Western Coulee and Ridges ecological landscapes, respectively. See the Wisconsin Wildlife Action Plan for information about the individual species associated with each ecological landscape (dnr.wi.gov, keyword “wildlife action plan”). 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.

Table 3. Listing status for rare species in the two ecological landscapes (SWS=Southwest Savanna, WCR=Western Coulee and Ridges) as of August 2015. Source is the NHI database. Listing status is based on the NHI Working List published June 2014.

Listing Status	Ecological Landscape	Animal Taxa					Total Animals	Total Plants	Total Species Listed
		Mammals	Birds	Herptiles	Fishes	Invertebrates			
Federally Endangered	SWS	0	0	0	0	0	0	0	0
	WCR	1	0	0	0	5	6	0	6
Federally Threatened	SWS	1	0	0	0	0	1	1	2
	WCR	1	0	0	0	1	0	2	4
Federal Candidate	SWS	0	0	0	0	0	0	0	0
	WCR	0	0	1	0	0	1	0	1
State Endangered	SWS	0	1	1	2	3	7	10	17
	WCR	0	6	5	7	19	37	22	59
State Threatened	SWS	5	5	0	2	5	17	10	27
	WCR	4	11	1	9	12	37	21	58
State Special Concern	SWS	4	4	6	1	14	29	42	71
	WCR	7	14	12	10	93	136	97	233

Description of the Study Area

Location, Size, and General Information

Blue Mound State Park covers 1159 acres just north of the village of Blue Mounds and is within Dane and Iowa counties. Perched atop the highest point in southern Wisconsin, Blue Mound State Park offers spectacular views and unique geological features. For the quarter century before it became a state park in 1959, Blue Mound was operated as a private recreation area. Development of the state park began in 1961. A swimming pool is available during summer. There are also over 25 miles of recreational trails, a

family campground, access to the Military Ridge State Trail with bike-in campsites, and a rustic cabin for people with disabilities at BMSP.

Ecoregion

Land Type Associations (LTA) of Wisconsin represent 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, air, hydrology, and potential natural communities. Each of the two ecological landscapes at BMSP has its own LTA (Figure 3).

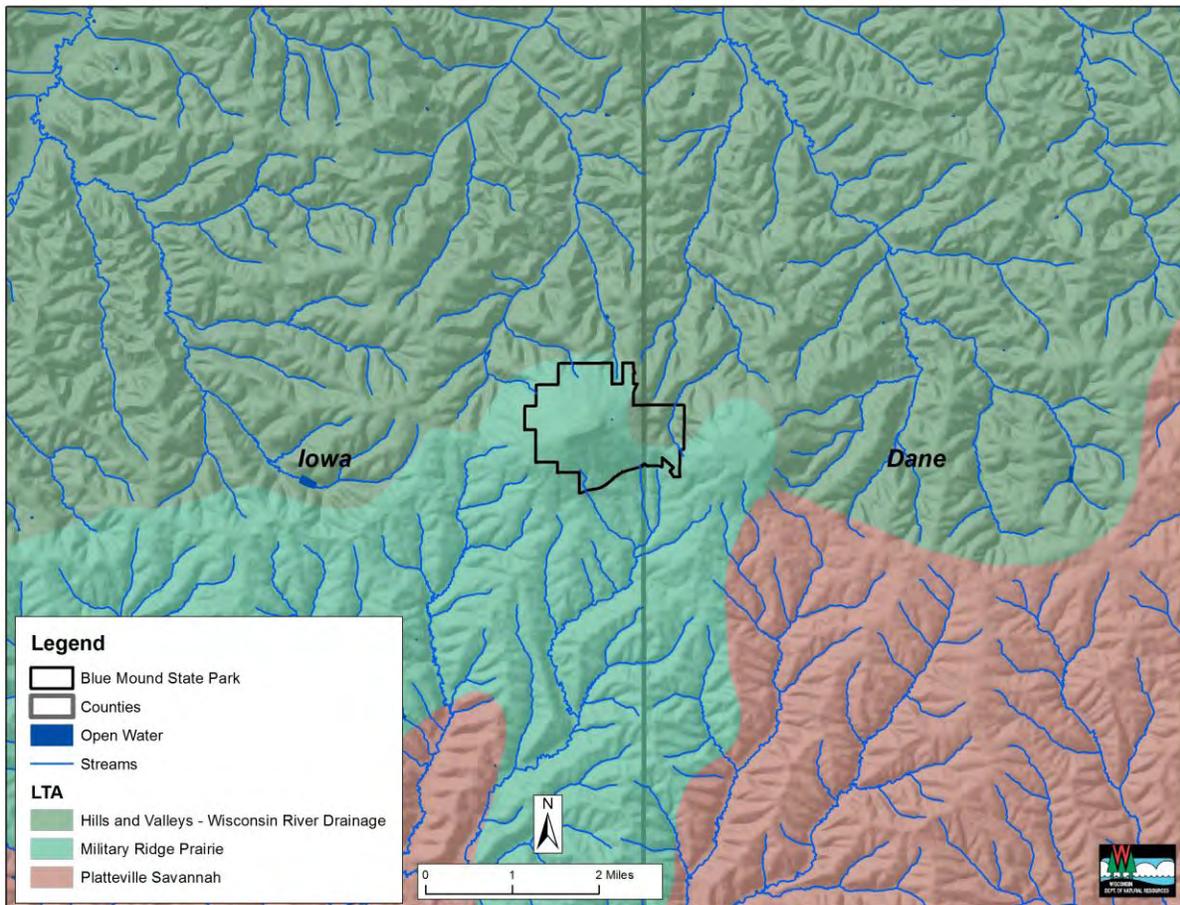


Figure 3. Landtype Associations at Blue Mound State Park.

- **222Le01** (Military Ridge Prairie; Southwest Savanna EL). The characteristic landform pattern of this LTA is steep with summits and shoulders of ridges common. Soils are well-drained and moderately well-drained silty and loamy soils with a silt loam surface over calcareous and non-calcareous clayey, sandy, or loamy residuum, or over calcareous silty loess; most areas are over dolostone, limestone, or sandstone bedrock. Agriculture is the predominant land use (79%) followed by grasslands (9%) and deciduous upland forests (9%).
- **222Lc18** (Hills and Valleys – Wisconsin River Drainage; Western Coulee and Ridges EL). The characteristic landform pattern of this LTA is hilly. Soils are predominantly well-drained and moderately well-drained silty and loamy soils with a silt loam or sandy loam surface over non-calcareous clayey or loamy residuum or over silty loess; most areas are over limestone,

sandstone, or shale bedrock. Greater than 70% of the area has bedrock within 5 feet of the land surface. Nearly half of the LTA is in upland deciduous trees (47%). Agriculture is the next largest category at 38%, and grasslands cover about 12%.

Geology and Glaciation

This section is largely based on information from the [Wisconsin Geological and Natural History Survey](#), keyword “blue mounds geology”.

Blue Mound State Park is in the Driftless Area of Wisconsin where there is no evidence of glacial deposits. The mound itself is capped by Niagara dolostone which is underlain by Ordovician Period shale, sandstone, and limestone which in turn rests upon Cambrian sandstone and limestone.

Soils

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

The predominant soils at the park are silt loams with rock outcrops and stony silt loams. There are some clay soil types as well. Slope is variable, and some of the soils on the slopes are classified as eroded.

Hydrology

There are forested seeps and ephemeral ponds scattered at the park as well as ephemeral streams that flow mainly south or north off of the slopes. There is one perennial stream that flows through the park, Ryan Creek. Blue Mound State Park is immediately north of the headwaters of Ryan Creek, a northerly flowing stream. The creek is listed by the DNR as an Exceptional Resource Water which is defined as a surface water providing outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. Ryan Creek is a cold water stream that is a Class II trout stream. It is affected by hydrologic modifications, e.g., ditching, and has erosion problems (wi.dnr.gov, keyword “Ryan Creek”).

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 BMSP were conducted in 1832. Finley’s (1976) Original Vegetation Map described the area that now comprises the BMSP (Figure 4) as oak-dominated forest, or possibly oak woodland, with white oak (*Quercus alba*), black oak (*Q. velutina*), and bur oak (*Q. macrocarpa*).

Current Vegetation

Current vegetation of the study area has been influenced by many historical factors including logging, homesteading and farming attempts, wildfires, fire suppression, and recreational development. Current factors that influence the vegetation include recreation management and invasive species. Finally, broad environmental factors have a profound impact on the vegetation including geology, soils, natural hydrology, and weather and climate.

The park is a largely forested block in a fragmented landscape, especially to the south and west where agriculture is the primary land use (Figure 2). North and east of the park the landscape is a mixture of forest, agriculture, and development. Several communities occur near the park, including the Village of Blue Mounds adjacent southwest of the park. Madison is only about 20 miles to the east. Blue Mound State Park abuts Dane County Park property to the east, and there are other DNR lands, including several

Fishery Areas, nearby. Additionally, there are forested areas on privately-owned lands having conservation easements just to the northeast of the park.



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

The park is predominantly covered by moderate to good quality Southern Dry-mesic and Mesic Forest. Some formerly open areas have been allowed to grow into forest or are still in grass or shrub cover. One small, moderate quality Dry Prairie remnant surrounded by degraded Oak Woodland has been identified near the eastern border of the park; these small remnants are in the Western Coulee and Ridges Ecological Landscape.

Wetlands include moderate quality forested seeps and ephemeral ponds that embedded in the upland forests. There are low quality Shrub-carrs and small, open wetlands along Ryan Creek.

The majority of the upland forest is Southern Dry-mesic Forest dominated by red and white oak with shagbark hickory, basswood, sugar maple, ash, and black cherry (*Prunus serotina*). As is typical in areas with variable topographical relief and exposures and land use histories, canopy species dominance varies between white oak and sugar maple/basswood. Canopy closure is high, generally over 80%, with scattered canopy gaps. There are occasional large, open- to semi-open grown trees, especially oaks, as well as some savanna indicator herbs along trails and near former canopy gaps and openings. Some areas of embedded old fields have succeeded to younger forest. The shrub layer is variable, in some areas

mostly lacking, in others areas, dense. Shrub species include dogwoods (*Cornus* spp), American hazelnut (*Corylus americana*), witch-hazel (*Hamamelis virginiana*), saplings of canopy trees, and some non-native bush honeysuckles (*Lonicera* spp). Ground flora coverage is moderate overall and is variable in species composition and distribution. Species include several ferns, bedstraws (*Galium* spp), Jack-in-the-pulpit (*Arisaema triphyllum*), and wild geranium (*Geranium maculatum*). Spring ephemerals, such as sharp-lobed hepatica (*Anemone acutiloba*), are present. Some areas are dominated by Pennsylvania sedge (*Carex pensylvanica*). Recreational trails and other developments are embedded within this natural community. Invasive species are patchily distributed and seem most closely associated with former openings (especially multi-flora rose, *Rosa multiflora*) and along trails (such as garlic mustard, *Alliaria petiolata*). Rock outcrops and loose rock are throughout the forest.

There are two main areas of Southern Mesic Forest: one on the east side of the park in Pleasure Valley and the other in the northwest corner of the park. Canopy dominants include sugar maple, basswood, and red oak along with white oak and hickories. Canopy closure is high with scattered canopy gaps. The Pleasure Valley forest is bisected by Ryan Creek, and there is a network of recreational trails throughout. The coverage of the shrub layer is variable and is generally open to moderately open; sugar maple saplings are common. The ground flora is diverse and spring ephemerals are well-represented. Some areas, variable in size, are nearly monocultures of either sugar maple seedlings or of bellwort (*Uvularia* spp). Rock outcrops and scattered rocks are common. The topography of the Pleasure Valley side is steep and small draws are common; aspects are various. The mesic forest in the northwest corner is centered on moderate to steep north and northwest trending valley. Invasive species, especially garlic mustard, are associated with field roads, the trail network, and in the Ryan Creek corridor.

Deer sign, such as trails and browsing, is common throughout the park. Some areas appeared to be affected by invasive earthworms although no worm-specific surveys have been done.

The Dry Prairie is small (less than one acre) and is in the Hills and Valleys – Wisconsin River Drainage LTA. Common species include little bluestem (*Schizachyrium scoparium*), bird's-foot violet (*Viola pedata*), bastard toadflax (*Comandra umbellata*), hoary puccoon (*Lithospermum canescens*), hairy rock-creep (*Arabis hirsuta*), and bee balm (*Monarda fistulosa*). The prairie is being encroached upon by woody plants including common juniper (*Juniperus communis*), ironwood (*Ostrya virginiana*), non-native bush honeysuckle, and brambles (*Rubus* spp). The Oak Woodland around the prairie is small and is succeeding to closed canopy forest. This remnant has open grown bur oaks and some savanna indicator herbs such as shooting stars (*Dodecatheon meadia*) and horse gentian (*Triosteum aurantiacum*). However, sugar maple and other more mesic tree species are becoming more common.

There are over 100 acres of upland surrogate grasslands and shrublands. Lower quality Shrub-carr and small open wetlands are found along Ryan Creek.

Rare Species and High Quality Natural Communities at and Surrounding Blue Mound State Park

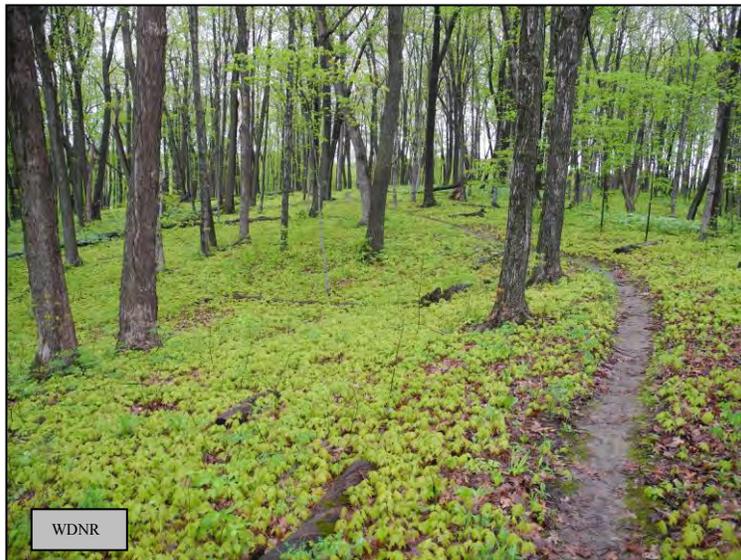
A number of rare species have been documented at or around BMSP (Appendix C). Of the animal species, nine are listed as Threatened (including one also listed as Threatened at the federal level), two are Special Concern, and eleven are on the watch list; all of the watch list species are Species of Greatest Conservation Need (SGCN) and also have a designation of Special Concern. The population of one rare animal species may be significant at a statewide level. There is one plant species listed as Threatened and another tracked as Special Concern; a third plant species is Special Concern species that is on the watch list. The rare species and high quality natural communities that have been documented in the townships

surrounding the park, or at the county level for species and other natural features considered to be especially sensitive to collection or disturbance, can be found in Table 4.

The Southern Dry-mesic Forest and Southern Mesic Forest are of moderate to high quality and are included in NHI's database. The remaining natural communities either did not meet criteria for entry into the database or were not evaluated during this study. Summary paragraphs describing some of the rare species, natural communities, and other features known to occur in the townships (or counties for sensitive features) surrounding Blue Mound State Park and entered in the NHI database can be found in Appendix D.



Bloodroot (*Sanguinaria canadensis*), a spring ephemeral flower found in the upland forest at Blue Mound State Park.



Carpet of sugar maple seedlings in Southern Mesic Forest at the park.

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 5, WDNR 2010b).

Table 5. Selected Wisconsin Statewide Forest Strategies relevant to the park.

Strategy Number	Strategy
13	Increase forest structure and diversity.
14	Encourage the use of disturbance mechanisms to maintain diverse forest communities.
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 are 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)

Blue Mound State Park supports populations of more than twenty rare species and moderate to high quality natural communities, and much of the park (including both Primary Sites) could be considered for classification as 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 and ultimately impacting forest composition. In addition to the threats to native communities and native species diversity (e.g., Burghardt and Tallamy 2015), non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity; Wisconsin Council on Forestry 2009), recreation, agriculture, and human health (by causing skin rashes and increasing incidence of tick-borne diseases). 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; Gorchoff 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, rare species habitats, or high-quality natural communities are listed in Table 6. Invasive species that are regulated under the Wisconsin invasive species rule (NR-40, dnr.wi.gov, keyword “nr 40”) are indicated by asterisks.

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, including species that are classified as Prohibited under NR-40, are known from the vicinity of the park (Table 7). Monitoring for these species and rapid response to small infestations represent high-impact actions.

Table 6. Invasive species known to occur at Blue Mound State Park

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Comments
		Open	Wooded	Open	Wooded	
Plants						
Non-native bush honeysuckles***	<i>Lonicera</i> spp*, includes <i>L. mackii</i>	x	x			Patchily distributed, often associated with trails or former openings
Burdock	<i>Arctium minus</i>	x	x			Disturbed areas, occasional near trails in canopy gaps
Canada bluegrass	<i>Poa compressa</i>	x				Prairie remnant, along trails, in fields
Canada thistle*	<i>Cirsium arvense</i>	x		x		Seen along Ryan Creek
Common buckthorn*	<i>Rhamnus cathartica</i> *	x	x			Scattered
Crown vetch	<i>Coronilla varia</i>	x				By bike campground, along Mounds Park Road
Dame's rocket*	<i>Hesperis matronalis</i> *		x			Disturbed areas, may be spreading into higher quality forest in places

Garlic mustard*	<i>Alliaria petiolata</i> *		x			Abundant in places, absent from others. Most widespread invasive noted.
Japanese barberry*	<i>Berberis thunbergii</i> *		x			Scattered
Kentucky bluegrass	<i>Poa pratensis</i>	x				Prairie remnant
Live forever	<i>Sedum telephium</i>	x	x			Scattered but expanding patches near trail to bike campground
Motherwort	<i>Leonurus cardiaca</i>	x				Disturbed areas, localized
Multi-flora rose*	<i>Rosa multiflora</i> *	x	x			In former open areas
Reed canary grass	<i>Phalaris arundinacea</i>			x	x	Along Ryan Creek, ditches
White mulberry*	<i>Morus alba</i> *	x				In old fields
Wild parsnip*	<i>Pastinaca sativa</i> *	x				In old fields
Animals						
Gypsy moth*	<i>Lymantria dispar</i> *		x			Both Dane and Iowa counties are under gypsy moth quarantine
Fungi						
Oak Wilt	<i>Ceratocystis fagacearum</i>		x		x	Throughout southern Wisconsin

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

***NR-40 Split Restricted/Prohibited Designation

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as those that are maintained by the WDNR (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 including:

- Southwest Wisconsin Cooperative Weed Management Area (<http://www.swbadger.org/weed-management-area.html>)
- Blue Mounds Area Project (<http://www.bluemounds.org/>)

Table 7. Invasive species known to occur in the vicinity of Blue Mound State Park.

Common Name	Latin Name	Upland Habitats		Wetland Habitats	
		Open	Wooded	Open	Wooded
Plants					
Autumn olive*	<i>Elaeagnus umbellata</i> *	x			
Black locust*	<i>Robinia pseudoacacia</i> *	x	x		
Black swallow-wort***	<i>Vincetoxicum nigrum</i> ***	x	x		
Celandine*	<i>Chelidonium majus</i> *	x	x		
Common barberry**	<i>Berberis vulgaris</i> **	x	x		
False spiraea	<i>Sorbaria sorbifolia</i>			x	
Garden valerian*	<i>Valeriana officinalis</i> *	x	x	x	x
Hemp nettle*	<i>Galeopsis tetrahit</i>	x	x		
Hill mustard***	<i>Bunias orientalis</i> ***	x			
Japanese hedge parsley***	<i>Torilis japonica</i> ***	x	x		
Japanese hops***	<i>Humulus japonicas</i> ***			x	
Oriental bittersweet*	<i>Celastrus orbiculatus</i> *	x	x		
Poison hemlock***	<i>Conium maculatum</i> ***	x	x	x	x
Policeman’s helmet**	<i>Impatiens glandulifera</i> **	x	x	x	x
Tree of heaven*	<i>Ailanthus altissima</i> *	x	x		
Wild chervil***	<i>Anthriscus sylvestris</i> ***		x		

Yellow bedstraw	<i>Galium verum</i>	x			
Animals					
Emerald ash borer*	<i>Agrilus planipennis</i> *		x		x
Non-native earthworms (including jumping worms*)	The families Acanthodrilidae, Lumbricidae, and Megascolecidae (<i>Amyntas</i> (= <i>Amyntus</i>) spp*)	x	x		

*NR-40 Restricted Species, **NR-40 Prohibited Species, ***NR-40 Split Restricted/Prohibited Designation

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. On its own, the beetle will only fly a few miles. However, it is easily and quickly moved to new areas when people accidentally move emerald ash borer larvae inside of infested firewood, ash nursery stock, and other ash items. The beetle attacks all native species of ash (*Fraxinus* spp.) 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 and high use areas at BMSP are somewhat vulnerable to the effects of emerald ash borer as white ash (*Fraxinus americana*) and green ash (*F. pennsylvanica*) are present in the upland forests and developed areas in the park. Black ash (*Fraxinus nigra*) is often associated with the Forested Seeps at Blue Mound SP. Large-scale loss of ash in this area, such as from EAB-caused mortality, 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), elevated water tables for forested seeps, and infestation of disturbance-loving invasives (WDNR 2010a). It is important to note that removal of all ash as a stop-gap measure against EAB is not recommended (WDNR 2010c).

Gypsy Moth

The gypsy moth (*Lymantria dispar*) was first found in Wisconsin in the mid-1970s in the eastern part of the state. By 1989, it had settled in 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. 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. Additional information about gypsy moths can be found at (dnr.wi.gov, keyword "gypsy moth"). Both Dane and Iowa counties are under gypsy moth quarantine. Blue Mound State Park was sprayed for gypsy moth several years in the mid-2000's as part of DATCP's Slow the Spread program.

Non-native Invasive Earthworms

The invasion of forests by non-native earthworms of the families Acanthodrilidae, Lumbricidae, and Megascolecidae (including the jumping worm, *Amyntas* spp, discovered in Wisconsin in 2013) 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. It can have significant impacts to forested stands with a heavy oak component such as at the study area.

Community Level Opportunities and Considerations

Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies three natural communities for which there are “Important” opportunities for protection, restoration, or management in the **Southwest Savanna** Ecological Landscape (Table 8). The WAP identifies opportunities for eight natural communities for which there are “Major” opportunities in the **Western Coulee and Ridges** Ecological Landscape (Table 9).

Table 8. Important natural community management opportunities in the **Southwest Savanna Ecological Landscape** that occur in the park (WDNR 2006b).

Important Opportunities
Coldwater Stream
Southern Dry-mesic Forest
Southern Mesic Forest

Table 9. Major natural community management opportunities in the **Western Coulee and Ridges Ecological Landscape** that occur in the park (WDNR 2006b).

Major Opportunities
Coldwater Stream
Dry Prairie
Ephemeral Ponds
Oak Woodland
Shrub Carr
Southern Dry-mesic Forest
Southern Mesic Forest
Surrogate Grassland

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 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 are important for area-dependent species such as forest interior birds. Larger, older blocks of forests can provide habitat for many rare and declining species, including Cerulean Warbler (*Dendroica cerulea*), Acadian Flycatcher (*Empidonax virescens*), Hooded Warbler (*Setophaga citrina*), Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Red-shouldered Hawk (*Buteo lineatus*), and Northern Goshawk (*Accipiter gentilis*) (WDNR 2006b). Older forests also provide habitat for Wisconsin's summer resident forest bats, including big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*) (WDNR 2006b), all of which were recently listed as State Threatened due to the imminent threat of white-nose syndrome. Additionally, the northern long-eared bat was recently listed as Threatened by the federal government.

Significant areas of Southern Dry-mesic and Mesic Forest occur at the park. According to forest reconnaissance data, about 54% of Blue Mound State Park is typed as oak 15 inches or larger in diameter at breast height (d.b.h.). Most of the northern hardwood type is also dominated by large (15+ inches d.b.h.) trees. Additional contiguous forest on adjacent lands increases the effective forest block size. Some of the forested land is in other public ownership (Dane County Parks, roughly 240 acres) or under a conservation easement on privately owned parcels (about 260 acres). Some of the forest on the park was historically oak woodland or oak opening that has succeeded into closed canopy forest. Some of the former openings that were cleared for agriculture or other land uses continue to grow into dry-mesic or mesic forest.

Ephemeral Ponds and Forested Seeps

A number of Ephemeral Ponds and Forested Seeps were observed at the park. The ponds varied in both size (although were generally small) and in the vegetation that was present in each. Ephemeral Ponds have been recognized as an important Natural Community Management Opportunity in the Western Coulee and Ridges Ecological Landscapes (WDNR 2014b). 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.

Ephemeral Ponds can provide habitat for many species. Rare animal species that are significantly associated with this type of habitat 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 support a detritus-based food web and a variety of invertebrates that are part of that food web.

The seeps were generally forested with moderate canopy closure provided by black ash and surrounding sugar maple, green ash, and oaks. Some of the seeps consist of small patches connected by ephemeral rivulets. Plants in the seeps include orange jewelweed (*Impatiens capensis*), Canadian clearweed (*Pilea pumila*), beggar-ticks (*Bidens* spp), and fox sedge (*Carex vulpinoidea*). Again, most rare plants associated with Forested Seeps are sedges, including Schweinitz's sedge (*Carex schweinitzii*), smooth-sheath sedge (*C. laevivaginata*), and drooping sedge (*C. prasina*). Tufted hairgrass (*Deschampsia cespitosa*) and showy lady's-slipper (*Cypripedium reginae*) can also be found in seeps.

There are also ephemeral streams on the north and south slopes of Blue Mound State Park.

Coldwater Stream

Ryan Creek originates just south of Blue Mound State Park in Dane County. It flows northward for over six miles to meet Elvers Creek where they join to form the East Branch of Blue Mounds Creek. Ryan Creek drains 5.5 square miles of hilly pasture land and upland and lowland forest. Ryan Creek is listed as an Exceptional Resource Water and is a Class II trout stream. The lower portion has been ditched in an effort to drain a wetland area consisting of wet meadow and shallow marsh. The creek's flow is traced to five springs (DCRPC 1979), and the water quality is good. Because the watershed is steep and cattle have access to the creek in many areas outside of the park, grazing causes a fair amount of erosion. Erosion is also significant in the ditched section of the creek.

Fish species known to occur in Ryan Creek include American brook lamprey (*Lethenteron appendix*), brown and rainbow trout (*Salmo trutta* and *Oncorhynchus mykiss*), central mudminnow (*Umbra limi*), brassy minnow (*Hybognathus hankinsoni*), creek chub (*Semotilus atromaculatus*), white sucker (*Catostomus commersoni*), green sunfish (*Lepomis cyanellus*), Johnny darter (*Etheostoma nigrum*), and mottled sculpin (*Cottus bairdi*).

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 park 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 at these tracts. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the Southwest Savanna and Western Coulee and Ridges ecological landscapes that apply to Blue Mound State Park are as follows:

Southwest Savanna Ecological Landscape

- Actively manage appropriate patches for oak savanna and woodland restoration using prescribed fire.
- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie/savanna management practices.

Western Coulee and Ridges Ecological Landscape

- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie and savanna management practices.
- Identify additional sites containing high quality or restorable oak barrens, oak savannas and woodlands.
- Conduct inventories to better delineate Cerulean Warbler populations on public and private lands.

Forest Interior Birds

Forest interior breeding birds are those species that need relatively large contiguous tracts of forest to support viable breeding populations. Threats to forest interior birds come from the fragmentation and loss of existing large patches of older deciduous forest, and the continuing decline of oaks, especially white oak. Loss of appropriate vegetation structure within mature deciduous forests is also a concern because it may reduce species' reproductive success. Currently, in the landscape surrounding the park, large oak forests are somewhat unusual, especially in the Southwest Savanna EL.

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, forest interior birds benefit from 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 blocks of forest and their associated bird species (WDNR 2006b). Trails, even narrow recreational trails, can function as internal edge or fragmentation of larger forest blocks (e.g., Hickman 1990, Miller et al 1998)

With Blue Mound State Park as the core protected area and other surrounding or adjacent protected lands (county park, private lands with conservation easements), 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.

Grassland-Shrub Birds

Grasslands have declined extensively throughout Wisconsin due to fire suppression and conversion to agriculture. *Grassland-shrub* is a transitional grassland community that exists anywhere a grass-dominated field contains a light cover of scattered shrubs (Sample and Mossman 1997). It covers a wide moisture gradient and thus is considered to be a continuum of many grassland communities, including upland and lowland grass-dominated community types. As a result, the plant composition of grassland-shrub closely resembles its associated grassland type and contains no characteristic herbaceous species. It does differ structurally, however, from other grassland communities due to the higher woody plant coverage. Native and non-native woody plants constitute 5-30% of the vegetative cover in grassland-shrub; virtually all woody plants are <3 meters (about 10 feet) in height (Sample and Mossman 1997). Shrub species common to this community type include native common prickly-ash (*Zanthoxylum americanum*) and smooth sumac (*Rhus glabra*), non-native bush honeysuckles and multi-flora rose, and saplings of box elder (*Acer negundo*), eastern red-cedar (*Juniperus virginiana*), and a variety of cherries (*Prunus* spp). Willows (*Salix* spp) and dogwoods (*Cornus* spp) also can be present under certain conditions, especially on wet sites. If these species grow beyond 3 meters in height and reach cover values >30%, however, the community shifts to a savanna or woodland system. Thus, grassland-shrub can play a key transitional role in the conversion of grassland to woodland habitats (Lett and Knapp 2005).

Grassland-shrub is an important habitat for priority birds such as Willow Flycatcher (*Empidonax traillii*), Loggerhead Shrike (*Lanius ludovicianus*), Brown Thrasher (*Toxostoma rufum*), Bell's Vireo (*Vireo bellii*), and Field, Lark, and Clay-colored Sparrow (*Spizella pusilla*, *Chondestes grammacus*, and *Spizella pallida*) as well as more generalist species such as Song Sparrow (*Melospiza melodia*), American Goldfinch (*Spinus tristis*), and Red-winged Blackbird (*Agelaius phoeniceus*) (Sample and Mossman 1997).

The type and arrangement of woody vegetation are important factors in determining habitat occupancy. For instance, thorny shrubs and low trees are important to Loggerhead Shrikes for nesting, perching, and impaling prey. Shrikes, as well as Field Sparrows and Lark Sparrows, prefer woody vegetation that is either isolated or widely spaced. Conversely, Bell's Vireo and Brown Thrasher favor dense thickets of shrubs, particularly common prickly-ash, American plum (*Prunus americana*), and American hazelnut. In both circumstances, irregular patterns of woody vegetation are more beneficial to breeding birds than hard, linear edges because of reduced negative edge effects (Sample and Mossman 1997).

While there are Surrogate Grasslands at BMSP, they provide marginal to poor habitat opportunities for grassland birds. A stronger management alternative may be to let the grasslands succeed to forest or be managed as a transitional area of grassland-shrub or savanna restoration. BMSP is on the northern boundary of the Southwest Wisconsin Grassland & Stream Conservation Area (WDNR 2008).

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. Bats play an important role in sustaining many unique and fragile cave ecosystems. For example, bats are the primary source of nutrients in many cave systems, and many cave-obligate species depend on such input for survival. Thus, the loss or significant reduction of bat populations from caves could have cascading effects that impact the status of many other cave species.

Suitable summer habitat for many of Wisconsin's bat species occurs in the landscape of and surrounding Blue Mound State Park. Winter habitat (hibernacula) for the cave bats has been documented in Dane and Iowa counties. Any management activities at the park must follow species guidance and the broad incidental take permit and authorization (dnr.wi.gov, keyword "bat incidental take") that is available for the cave bat species.

Terrestrial snails

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. At least 15 species were documented during terrestrial snail surveys that were conducted at the park in 2010. Rare species recently documented in the townships surrounding BMSP are the state Threatened cherrystone drop (*Hendersonia occulta*) and the Special Concern broad-banded forestsnail (*Allogona profunda*).

Prairie and Oak Savanna Restoration

Historically, the park was predominantly oak-dominated woodland or forest (Finley 1976). In the early to mid-19th century, the oak savanna as an ecosystem in Wisconsin was thoroughly fragmented and

nearly totally destroyed throughout its range. Most of its acreage suffered one of the following fates: (1) clearing and plowing, (2) overgrazing, or (3) invasion by dense shrub and tree growth due to lack of fire, lack of grazing, or both. Oak savanna now shares equal billing with tallgrass prairie as the most threatened plant community in the Midwest and among the most threatened in the world. Intact examples of oak savanna vegetation are now so rare that less than 500 acres are listed in the Natural Heritage Inventory as having a plant assemblage similar to the original oak savanna. This is less than 0.01% of the original 5.5 million acres.

The presence of open grown and semi-open grown oaks and savanna indicator species provides an indication of a formerly more open condition near the small remnant Dry Prairie in the northeastern corner of the park (Western Coulee and Ridges EL). Because Dry Prairie occurs on sites that are not well-suited to other uses, it is better represented in today's landscape than any other prairie community. It is still a relatively rare natural community that is more abundant in Wisconsin than anywhere else because of the many steep-sided bluffs in the extensive Driftless Area, the rough terrain of the kettle interlobate moraine, and the north-south orientation of several major river valleys such as the Mississippi, the Chippewa, and the St. Croix. These topographic attributes provide suitable sites for the development and persistence of this prairie type. There is an opportunity to manage and restore this rare, albeit small, prairie-oak woodland complex.



Some of the plants found in Blue Mound State Park. From left to right: wild columbine (*Aquilegia canadensis*), fruit of wild yam (*Dioscorea villosa*), wood anemone (*Anemone quinquefolia*). All photos WDNR.

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.

Two ecologically important sites, or “Primary Sites,” were identified at Blue Mound State Park:

BMSP01	Pleasure Valley Woods
BMSP02	Blue Mound Woods

A complete description of the Primary Sites can be found in Appendix E. Information provided in the summary paragraphs includes location information, a brief summary 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 from the Primary Sites at the park (not available for public distribution due to detailed information on the location of rare species).

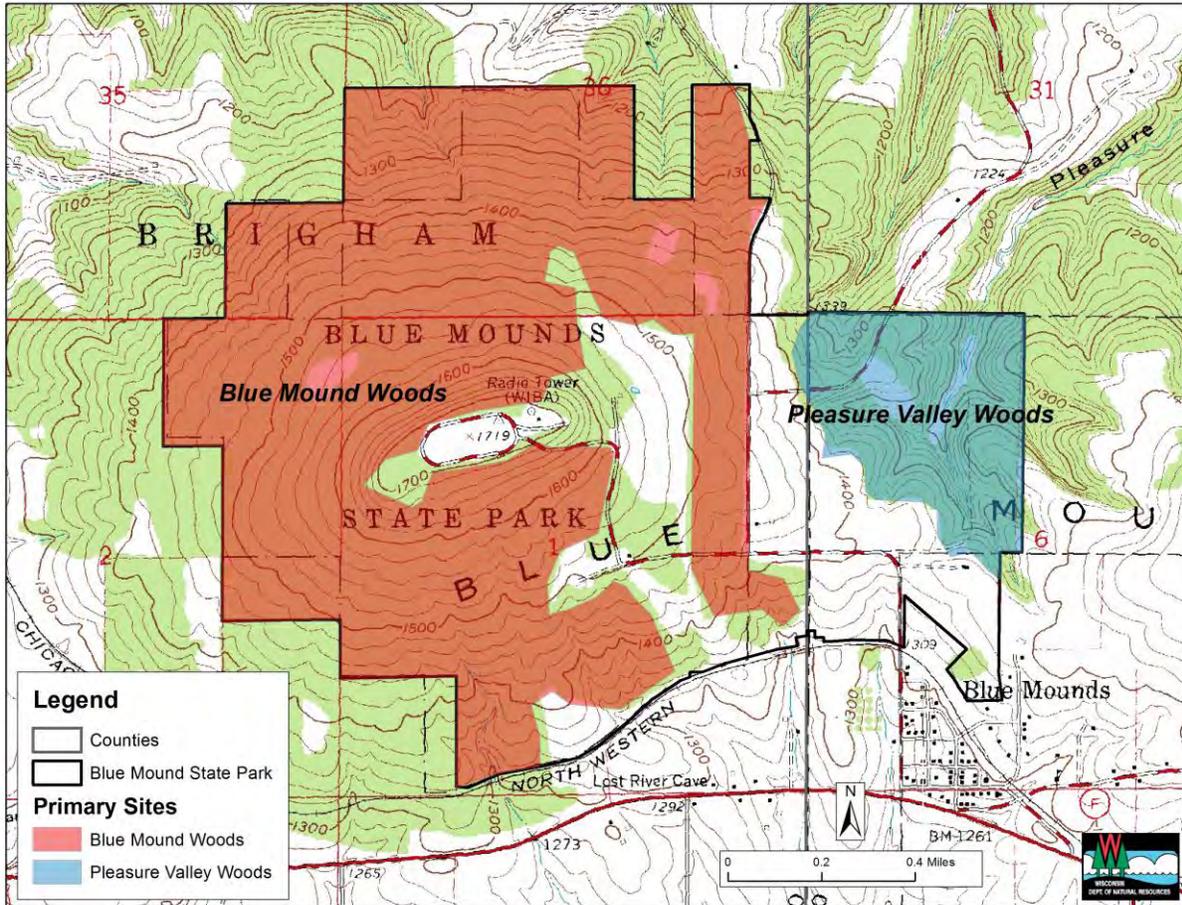


Figure 5. Primary sites at Blue Mound State Park.

Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for BMSP. 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 BMSP.

- 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 Blue Mound State Park, a comprehensive invasive species monitoring and control plan will be needed for detecting and rapidly responding to new invasive threats.

- A more comprehensive survey to document Ephemeral Ponds and seeps on the park could be conducted, including performing egg mass surveys and terrestrial searches for Ephemeral Pond-associated species following standardized monitoring methods.
- Rare snails are known from the vicinity of the park. 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 the period of mid-summer through the end of the growing season.
- Additional bat surveys, both acoustic and tracking individuals, 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, 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 and Central and South America, as well as residents and short-distance migrants like woodpeckers 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.

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 of a given natural community type, 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.

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
Animals	
Acadian Flycatcher	<i>Empidonax virescens</i>
American brook lamprey	<i>Lethenteron appendix</i>
American Goldfinch	<i>Spinus tristis</i>
American Woodcock	<i>Scolopax minor</i>
Bell's Vireo	<i>Vireo bellii</i>
big brown bat	<i>Eptesicus fuscus</i>
boreal chorus frog	<i>Pseudacris maculata</i>
brassy minnow	<i>Hybognathus hankinsoni</i>
broad-banded forestsnail	<i>Allogona profunda</i>
brown trout	<i>Salmo trutta</i>
Brown Thrasher	<i>Toxostoma rufum</i>
central mudminnow	<i>Umbra limi</i>
Cerulean Warbler	<i>Dendroica cerulea</i>
cherrystone drop	<i>Hendersonia occulta</i>
Clay-colored Sparrow	<i>Spizella pallida</i>
creek chub	<i>Semotilus atromaculatus</i>
eastern red bat	<i>Lasiurus borealis</i>
Field Sparrow	<i>Spizella pusilla</i>
four-toed salamander	<i>Hemidactylium scutatum</i>
green sunfish	<i>Lepomis cyanellus</i>
hoary bat	<i>Lasiurus cinereus</i>
Hooded Warbler	<i>Setophaga citrina</i>
Johnny darter	<i>Etheostoma nigrum</i>
Lark Sparrow	<i>Chondestes grammacus</i>
little brown bat	<i>Myotis lucifugus</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
mottled sculpin	<i>Cottus bairdi</i>
Northern Goshawk	<i>Accipiter gentilis</i>
northern long-eared bat	<i>Myotis septentrionalis</i>
Ovenbird	<i>Seiurus aurocapilla</i>
pickerel frog	<i>Rana palustris</i>
rainbow trout	<i>Oncorhynchus mykiss</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
silver bat	<i>Lasionycteris noctivagans</i>
Song Sparrow	<i>Melospiza melodia</i>
Veery	<i>Catharus fuscescens</i>
white sucker	<i>Catostomus commersoni</i>
Willow Flycatcher	<i>Empidonax traillii</i>
Wood Thrush	<i>Hylocichla mustelina</i>
Plants	
American hazelnut	<i>Corylus americana</i>
American plum	<i>Prunus americana</i>
ash	<i>Fraxinus spp</i>
basswood	<i>Tilia americana</i>
bastard toadflax	<i>Comandra umbellata</i>
bedstraws	<i>Galium spp</i>
beebalm	<i>Monarda fistulosa</i>
beggar-ticks	<i>Bidens spp</i>
bellworts	<i>Uvularia spp</i>
bitternut hickory	<i>Carya cordiformis</i>
bird's-foot violet	<i>Viola pedata</i>

black ash	<i>Fraxinus nigra</i>
black cherry	<i>Prunus serotina</i>
black oak	<i>Quercus velutina</i>
bloodroot	<i>Sanguinaria canadensis</i>
box elder	<i>Acer negundo</i>
brambles	<i>Rubus</i> spp
bur oak	<i>Quercus macrocarpa</i>
bur-reed	<i>Sparganium</i> spp
bush honeysuckle	<i>Lonicera</i> spp
Canadian clearweed	<i>Pilea pumila</i>
cherries	<i>Prunus</i> spp
common buckthorn	<i>Rhamnus cathartica</i>
common juniper	<i>Juniperus communis</i>
common prickly-ash	<i>Zanthoxylum americanum</i>
dogwoods	<i>Cornus</i> spp
drooping sedge	<i>Carex prasina</i>
eastern cottonwood	<i>Populus deltoides</i>
eastern hemlock	<i>Tsuga canadensis</i>
eastern red cedar	<i>Juniperus virginiana</i>
elms	<i>Ulmus</i> spp
false hop sedge	<i>Carex lupuliformis</i>
fox sedge	<i>Carex vulpinoidea</i>
garlic mustard	<i>Alliaria petiolata</i>
green ash	<i>Fraxinus pennsylvanica</i>
hairy rock cress	<i>Arabis hirsuta</i>
hoary puccoon	<i>Lithospermum canescens</i>
horse gentian	<i>Triosteum aurantiacum</i>
ironwood	<i>Ostrya virginiana</i>
jack pine	<i>Pinus banksiana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
little bluestem	<i>Schizachyrium scoparium</i>
many-headed sedge	<i>Carex sychnocephala</i>
maples	<i>Acer</i> spp
multi-flora rose	<i>Rosa multiflora</i>
oaks	<i>Quercus</i> spp
orange jewelweed	<i>Impatiens capensis</i>
Pennsylvania sedge	<i>Carex pennsylvanica</i>
ravenfoot sedge	<i>Carex crus-corvi</i>
red oak	<i>Quercus rubra</i>
red maple	<i>Acer rubrum</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
Schweinitz's sedge	<i>Carex schweinitzii</i>
shagbark hickory	<i>Carya ovata</i>
sharp-leaved hepatica	<i>Hepatica acutiloba</i>
shooting star	<i>Dodecatheon meadia</i>
silver maple	<i>Acer saccharinum</i>
smooth-sheathed sedge	<i>Carex laevivaginata</i>
smooth sumac	<i>Rhus glabra</i>
showy lady's-slipper	<i>Cypripedium reginae</i>
sugar maple	<i>Acer saccharum</i>
tamarack	<i>Larix laricina</i>
tufted hairgrass	<i>Deschampsia cespitosa</i>
white ash	<i>Fraxinus americana</i>
white oak	<i>Quercus alba</i>
white pine	<i>Pinus strobus</i>
wild columbine	<i>Aquilegia canadensis</i>
wild geranium	<i>Geranium maculatum</i>
wild yam	<i>Dioscorea villosa</i>
willows	<i>Salix</i> spp
witch-hazel	<i>Hamamelis virginiana</i>

wood anemone
yellow birch

Anemone quinquefolia
Betula alleghaniensis

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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).

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) 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

Appendix D

Descriptions of Some of the Rare Species, High Quality Natural Communities, and Other Features Documented in the Townships Surrounding Blue Mound State Park

The following paragraphs provide brief summary descriptions for some of the rare species, high quality natural communities, and other features documented in the townships surrounding Blue Mound State Park, or for sensitive species, at the county level, and mapped in the NHI database. More information can be found on the Endangered Resources Web site (dnr.wi.gov, keyword “ER”) for several of these species. Not all species documented in the townships have descriptive paragraphs available.

Rare Animals

Acadian Flycatcher

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

Bell’s Vireo

Bell's Vireo (*Vireo bellii*), a bird listed as Threatened in Wisconsin, prefers dense, shrubby areas within an open prairie landscape.

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-billed Cuckoo

Black-billed cuckoo (*Coccyzus erythrophthalmus*) is a Special Concern species in Wisconsin. They typically nest in deciduous and mixed deciduous-coniferous woodlands near lakes or streams, and less often in coniferous forests. Their breeding season occurs from mid-May to late August.

Blanchard’s Cricket Frog

The Blanchard's cricket frog (*Acris crepitans*), an Endangered species in Wisconsin, prefers ponds, lakes, and a variety of habitats along and adjacent to streams and rivers including, marshes, fens, sedge meadows, low prairies, and exposed mud flats. The species tends to breed in quiet water (no or low flow) and may also move from streams and rivers to adjacent wetlands and ponds. Cricket frogs cannot tolerate freezing or complete inundation for more than 24 hours during the winter and seek a variety of microhabitats that provide suitable overwintering conditions, including crayfish burrows, small mammal burrows, rotted-out root channels, seepage areas where groundwater flow prevents freezing at the surface or spaces created by sloughing streambanks. Cricket frogs are active from late-March through November. Breeding occurs from mid-May through mid-August, with some larvae not transforming until late September.

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. Blanding's turtles generally breed in spring, late summer or fall. Nesting occurs from about mid-May through early July depending on spring temperatures. They strongly prefer to nest in sandy soils and may travel up to 900 feet from a wetland or waterbody to find suitable soils. This species appears to display nest site fidelity, returning to its natal site and then nesting in a similar location annually. Hatching occurs from early August through mid-October. This species takes 17 to 20 years or more to reach maturity.

Blue-winged Warbler (*Vermivora pinus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers early- to mid-successional habitats with dense vegetation, especially young trees, shrubs, and thickets. Its nesting season occurs from early May to mid-June.

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.

Brown Thrasher

Brown Thrasher (*Toxostoma rufum*) is a bird of Special Concern in Wisconsin. This species nests in hedgerows and in brushy edges of fields and forests. Breeding occurs from early May to mid-July.

Cerulean Warbler

Cerulean Warbler (*Dendroica cerulea*), a bird listed as Threatened and a Species of Greatest Conservation Need in Wisconsin, prefers lowland deciduous forests dominated by mature stands of American elm, cottonwood, and green ash and large upland blocks of mature dry-mesic to mesic forests. The breeding season extends from late April through mid-July.

Cherrystone Drop

Cherrystone Drop (*Hendersonia occulta*) State Threatened, these terrestrial snails have a thick 6-8mm wide shell that is wider than it is high, usually reddish or yellowish in color, and lacks an opening in the center of the base of the shell. Inhabitants of small areas of algific habitat or the similar cool, moist, shaded sites of cliffs where algific conditions occur without substantial talus or ice. The species is most often found on wooded alluvial-soil banks and bluffs.

Eastern Meadowlark (*Sturnella magna*) is a Special Concern species in Wisconsin. This species frequents pastures, idle grasslands, old fields, dry-mesic prairies and oak savannas, reflecting their preference for moderate density vegetation, a high litter layer, and few shrubs. Their breeding season occurs from early April to early August.

Eastern Pipistrelle

Eastern Pipistrelle, (*Perimyotis subflavus*, formerly *Pipistrellus subflavus*), a Threatened species in Wisconsin, is usually a yellowish color, but it may vary from dark brown, or pale yellow to almost orange. Its individual hairs are actually tri-colored. This species typically roosts in caves for hibernation, and does so singly or in small groups. While little is known for certain about their daytime and summer

roosts, they have been found roosting in trees and tree foliage. For foraging, eastern pipistrelles prefer habitat such as forest edges and waterways. Most mating occurs in the fall, with delayed fertilization and twin pups born in spring.

Eastern Red Bat

The eastern red bat (*Lasiurus borealis*) is a Special Concern species in Wisconsin. This species has brick-red to yellow-red fur that is tipped with white, giving the bat a frosted appearance. Eastern red bats are insectivorous and prefer to feed on moths. During the summer months, red bats are found in various forested habitats including deciduous woodlands with elms and maples. The bats may be found foraging near trails, fields and wetlands. In the fall, the eastern red bat migrates south to warmer climates where they may enter short bouts of torpor in leaf litter or hanging in deciduous trees. The eastern red bat mates during fall migration and females give birth in early June to one to four pups.

Field Sparrow

Field Sparrow (*Spizella pusilla*) is a Special Concern species in Wisconsin. This species prefers dry, moderately brushy or early successional upland habitats such as dry prairies and old fields, idle grasslands, pastures, areas that have recently been cut and burned, pine barrens, young plantations, and oak savannas. Their breeding season occurs from late April to late August.

Gophersnake

Gophersnake (*Pituophis catenifer*), a species of Special Concern and a Protected Wild Animal, prefer sand prairies, bluff prairies, oak savannas and pine and oak barrens. Overwintering can occur in sand prairies, where they often den singly by using mammal burrows or other structures to get below the frost line or they may den communally using deep rock fissures on southerly exposed bluff prairies. This species is active from late March through early October, breeds mid-April through May and lays its eggs in sand cavities they create or under large flat rocks in late June to early July. The eggs hatch in late August to early September.

Hoary Bat

The hoary bat (*Lasiurus cinereus*) is a Special Concern species in Wisconsin. Its fur varies from grey to chocolate-brown and is tipped with white, giving the bat a frosted appearance. This species is insectivorous. The hoary bat typically roosts in coniferous and mixed hardwood-conifer forests, but have also been found in trees along urban streets and city parks. In fall, the hoary bat migrates to southern states to spend the winter. Mating occurs during fall migration, and females store sperm until they return to summer habitat in spring. One to four pups are born in early June.

Henslow's Sparrow

Henslow's Sparrow (*Ammodramus henslowii*) a bird listed as Threatened in Wisconsin, prefers old fields, open grasslands, wet meadows, unmowed highway right-of-ways, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds.

Hooded Warbler

Hooded Warbler (*Wilsonia citrina*), a bird listed as Threatened in Wisconsin. This species is found in large upland forest tracts in southern Wisconsin, where they occur in pockets of dense understory near small or partial canopy openings.

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.

Lined Snake

Lined snakes (*Tropidoclonion lineatum*) are listed as a Special Concern species in Wisconsin. They are primarily found in open prairies and sparsely timbered areas featuring soft, moist soils. Lined snakes are semi-fossorial, spending a lot of time under rocks, leaf litter, logs or buried in the soil throughout the day. This nocturnal species can also be found above ground at night searching for earthworms, their preferred food. The lined snake breeds early in the fall. Females will then store sperm during hibernation throughout the winter. In the late summer this ovoviviparous snake will give birth to an average of seven or eight young.

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.

Louisiana Waterthrush

Louisiana Waterthrush (*Seiurus motacilla*), a bird of Special Concern in Wisconsin. This species breeds along rocky streams in relatively large, intact deciduous or mixed forest in the southern 2/3 of the state, and sometimes into floodplain forest where streams enter.

Northern Long-eared Bat

Northern Long-eared Bat, (*Myotis septentrionalis*), a both state and federally threatened species in Wisconsin, 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.

Ornate Box Turtle

Ornate box turtles (*Terrapene ornata*), listed as Endangered in Wisconsin, prefer dry and dry-mesic prairies, sand prairies, oak savannas, and open to semi-open woodlands. They overwinter in deep sand and/or well-drained soils in open canopy microhabitats supporting sparse vegetation and in areas of disturbed soils such as the edges of sand blows. Ornates are active from late-March or early April through mid-October. Nesting occurs from late-May through early July and hatching occurs in August or early September, although some hatchlings emerge the following spring.

Pickerel Frog

Pickerel frogs (*Lithobates palustris*) are a Species of Special Concern in Wisconsin. It has a rather complex habitat range as it prefers to overwinter in cold water streams, seepage pools or spring holes, often taking advantage of water cress for cover. It moves to warmer water ponds to breed and lay eggs from April through mid-June. Adults spend most of the active season foraging on land in riparian habitats along streams and rivers. This species is active from late March to early November but can remain semi-active in winter under water. Larvae metamorphose from mid-July to mid-August.

Prairie Vole

Prairie Vole (*Microtus ochrogaster*), a state Special Concern mammal This species is found in dry grassy areas along fence lines and in open fields; sandy prairies and slopes, especially if weed or grass grown;

abandoned farm fields; seldom in sparsely wooded areas. Preferred habitat seems to be native prairie sod, of which there is little left in the State. It avoids marshes and wet places. Semi-colonial, this species breeds throughout the year with a peak in July, August and September.

Red-tailed Prairie Leafhopper

Red-Tailed Leafhopper (*Aflexia rubranura*), a leafhopper Endangered in Wisconsin, inhabits dry to wet-mesic prairies with the host plant, prairie dropseed (*Sporobolus heterolepis*).

Upland Sandpiper

Upland Sandpiper (*Bartramia longicauda*), a bird listed as Threatened, prefers grasslands with low to moderate forb cover, < 5% woody cover, moderate grass cover, moderate litter cover, and little bare ground. Dominant breeding habitats in Wisconsin include lightly grazed pastures, old fields, idle upland grasslands, barrens, and hayfields for nesting; heavily grazed pasture, hayfields, fallow fields, and row crops are used for foraging.

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.

Willow Flycatcher

Willow Flycatcher (*Empidonax traillii*) is a Special Concern species that prefers shrubby wetlands and uplands. They commonly nest in elderberry, dogwood, honeysuckle, and willow, which are often placed over water. Nesting occurs from early June to early July.

Wing Snaggletooth

Wing Snaggletooth (*Gastrocopta procera*) is a State Threatened terrestrial snail that is distinguished by a pupa-shaped shell and several to many "teeth" or folds within the aperture. Shell size is approximately 2.2-3mm long. The somewhat glossy shell is cinnamon-brown in contrast to others of the genus which are white or transparent. This snail is a calciphile and occurs on hill or "goat" prairies with southern or western exposures in western Wisconsin. Populations may exist in an area of only a few square meters. The animals probably prefer to live under organic debris.

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.

Yellow-billed Cuckoo (*Coccyzus americanus*)

The Yellow-billed Cuckoo inhabits upland oak forests or woodlands, wooded bottomlands, grassland-shrub-carr, shrubs at woodland edges, hawthorns, and dense willow or dogwood thickets. In some areas of Wisconsin, e.g., the Baraboo Hills, Yellow-billed Cuckoos are found more often in the forest canopy than in shrubs. Elsewhere in Wisconsin it has been found in pine-oak barrens, northern swamps and bogs, northern mesic forests, southern dry forest, and even on the Apostle Islands. Nests are often near streams or edges of lakes. Most nests are within 1-6 meters of the ground, and on a horizontal branch or fork, usually 2-4 meters from the trunk of an oak, elm, dogwood, hawthorn, or ash.

Rare Plants

American Ginseng

Ginseng (*Panax quinquefolius*), a State Special Concern plant, is found in rich, hardwood forests throughout state. Blooming occurs June through July; fruiting occurs September through October. The optimal identification period for this species is June through October.

Clustered Poppy-mallow

Clustered Poppy-mallow (*Callirhoe triangulata*), a State Special Concern plant, is found in sand terrace prairies. Blooming occurs early July through late September; fruiting occurs early August through late September. The optimal identification period for this species is early July through late September.

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.

Heart-leaved Skullcap

Heart-leaved Skullcap (*Scutellaria ovata* ssp. *ovata*), a State Special Concern plant, is found in dry-mesic forests. Blooming occurs early June through late July; fruiting occurs late July through late August. The optimal identification period for this species is early June through late July.

Hill's Thistle

Hill's Thistle (*Cirsium hillii*), a State Threatened plant, is found in dry prairies and oak barrens; in neighboring states it is found in pine barrens. Blooming occurs mid-June through early August; fruiting occurs late July through late August. The optimal identification period for this species is mid-June through late August.

Lobed Spleenwort

Lobed Spleenwort (*Asplenium pinnatifidum*), a State Threatened plant, is found in crevices in dry sandstone cliffs. This species can be identified year-round.

Nodding Rattlesnake-root

Nodding Rattlesnake-root (*Prenanthes crepidinea*), a State Endangered plant, is found often in openings in mesic to dry-mesic hardwoods, particularly along creeks and in seepage areas. Blooming occurs early August through late September; fruiting occurs throughout September. The optimal identification period for this species is early August through late September.

One-flowered Broomrape

One-flowered Broomrape (*Orobanche uniflora*), a State Special Concern plant, is found in variety of habitats, including dry prairies, dunes, thickets, moist woods, and on streambanks. Blooming occurs from April through June. The optimal identification period for this species is mid-April through late June.

Prairie Bush Clover

Prairie Bush-clover (*Lespedeza leptostachya*), a State Endangered and Federally Threatened plant, is found in gravelly or sandy hillside prairies. Blooming occurs late July through late August; fruiting occurs early August through early September. The optimal identification period for this species is throughout August.

Prairie Indian-plantain

Prairie Indian-Plantain (*Arnoglossum plantagineum*), a State Special Concern plant, is found in a variety of deep-soiled prairies. Blooming occurs early May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late July.

Prairie Turnip

Prairie Turnip (*Pediomelum esculentum*), a State Special Concern plant, is found in dry prairies, especially on dolomitic hillsides near oak woodland margins. Blooming occurs late May through late July; fruiting occurs early July through late August. The optimal identification period for this species is early June through late August.

Purple Milkweed

Purple Milkweed (*Asclepias purpurascens*), a State Endangered plant, is found in open oak forests, forest margins, and roadsides. Blooming occurs early June through late July; fruiting occurs early July through late August. The optimal identification period for this species is late June through late July.

Smooth-sheath Sedge

Smooth-sheath Sedge (*Carex laevivaginata*), a State Endangered plant, is found in deciduous river bottoms, sloughs, and seeps with wet or inundated soils. It has also been found in sedge meadows, near seeps. Blooming occurs throughout June; fruiting occurs throughout July. The optimal identification period for this species is late June through early July.

Woolly Milkweed

Woolly Milkweed (*Asclepias lanuginosa*), a State Threatened plant, is found in dry, sandy or gravelly hillside prairies. 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.

Natural Communities

Dry Prairie

This dry grassland community usually occurs on steep south or west facing slopes or at the summits of river bluffs with sandstone or dolomite bedrock near the surface. Short to medium-sized prairie grasses such as little bluestem, side-oats grama, hairy grama, and prairie dropseed are the dominants in this community. Common shrubs and forbs include lead plant, silky aster, flowering spurge, purple prairie-clover, cylindrical blazing-star, and gray goldenrod.

Forested Seep

These are shaded seepage areas with active spring discharges in (usually) hardwood forests that may host a number of uncommon to rare species. The overstory dominant is frequently black ash, but yellow birch, American elm, and many other tree species may be present including conifers such as hemlock or white pine. Understory species include skunk cabbage, water-pennywort, marsh blue violet, swamp saxifrage, golden saxifrage, golden ragwort, silvery spleenwort and the rare sedges. Most documented occurrences are in the Driftless Area, or locally along major rivers flanked by steep bluffs.

Southern Dry-mesic Forest

Red oak is a common dominant tree of this upland forest community type. White oak, basswood, sugar and red maples, white ash, shagbark hickory, and black cherry are also important. The herbaceous understory flora is diverse and includes many species listed under southern dry forest plus jack-in-the-pulpit, enchanter's-nightshade, large-flowered bellwort, interrupted fern, lady fern, tick-trefoils, and hog peanut.

Southern dry-mesic forests occur on loamy soils of glacial till plains and moraines, and on erosional topography with a loess cap, south of the tension zone. This community type was common historically, although white oak was considerably more dominant than red oak, and the type is still common today. However, to the detriment of the oaks, mesophytic tree species are becoming increasingly important under current management practices and fire suppression policies. Oak forests are succeeding to more mesic species (e.g., central and northern hardwood forest types), or to brush.

Southern Mesic Forest

This upland forest community occurs on rich, well-drained loamy soils, mostly on glacial till plains or loess-capped sites south of the tension zone. The dominant tree species is sugar maple, but basswood, and near Lake Michigan, American beech may be co-dominant. Many other trees are found in these forests, including those of the walnut family, ironwood, red oak, red maple, white ash, and slippery elm. The understory is typically open, or sometimes brushy with species of gooseberry on sites with a history of grazing, and supports fine spring ephemeral displays. Characteristic herbs are spring-beauty, trout-lilies, trilliums, violets, bloodroot, blue cohosh, mayapple, and Virginia waterleaf.

Historically, southern mesic forests were quite common throughout southern Wisconsin. Most of these forests were cleared for agriculture, as the soils are very fertile.

Other

Bat Hibernaculum

A bat hibernaculum is a site where bats hibernate over the winter. These sites are most often caves or abandoned mines. They can include one or many species of bats and include both rare and non-rare species. It is important to protect these sites because bats will return year after year to the same hibernation site and can occur in very large numbers.

APPENDIX E

Primary Sites at Blue Mound State Park¹

Two ecologically important sites were identified at Blue Mound State Park. These “Primary Sites” were 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 the master planning process.

Information provided in the summary paragraphs includes location information, a brief summary 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 from Blue Mound State Park by Primary Site. Because Appendix F contains locational information on rare species, it is not for public distribution.

Primary Sites

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

BMSP01. PLEASURE VALLEY WOODS

Location

Property:	Blue Mound State Park
Counties:	Dane, Iowa
Landtype Association:	Hills and Valleys – Wisconsin River Drainage (222LC18); Military Ridge Prairie (222Le01)
Approximate Size (acres):	126

Description of Site

This primary site encompasses the entirety of Pleasure Valley within the park and is predominantly covered by high quality Southern Mesic Forest with inclusions of Southern Dry-mesic Forest. The site is also very close to the headwaters of Ryan Creek; there is a small, moderate quality Dry Prairie remnant and associated degraded Oak Woodland that is converting into mesic forest. Several rare species have been documented in or near the primary site. There is a network of recreational trails throughout the site.

The Southern Mesic Forest is dominated by sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and red oak (*Quercus rubra*) along with white oak (*Q. alba*) and hickories (*Carya* spp.) with average diameters of over 15 inches d.b.h (diameter at breast height). Some of the canopy trees exceed 20 inches d.b.h. Overall canopy closure is high, generally 80% or more, with scattered canopy gaps of various sizes and origination. The forest is bisected by Ryan Creek, and there is a network of recreational trails throughout. The shrub layer is variable in composition and coverage and is generally open to moderately open; sugar maple saplings are common. The ground flora is diverse and spring ephemerals are well-represented. Some areas, variable in size, are nearly monocultures of either sugar maple seedlings or of bellwort (*Uvularia* spp.). Rock outcrops and scattered rocks are common. The topography of the Pleasure Valley site is steep and small draws are common; aspects are various. Invasive species, especially garlic mustard (*Alliaria petiolata*), are associated with field roads, the trail network, and in the Ryan Creek corridor.

The Dry Prairie is small (less than one acre) and does not meet NHI mapping standards. Common species include little bluestem (*Schizachyrium scoparium*), bird's-foot violet (*Viola pedata*), bastard toadflax (*Comandra umbellata*), hoary puccoon (*Lithospermum canescens*), hairy rock-cress (*Arabis hirsutus*), and bee balm (*Monarda fistulosa*). The prairie is being encroached by woody plants including common juniper (*Juniperus communis*), ironwood (*Ostrya virginiana*), non-native bush honeysuckle (*Lonicera* spp.), and brambles (*Rubus* spp.). The oak woodland around the prairie is succeeding to closed canopy forest. The remnants in the immediate vicinity of the prairie have open grown bur oaks (*Quercus macrocarpa*) and some savanna indicator forbs such as shooting star (*Dodecatheon meadia*) and horse gentian (*Triosteum aurantiacum*). However, sugar maple and other, more mesic tree species are becoming more common.

There is low quality Shrub-carrs and small, open wetlands in places along Ryan Creek.

Significance of Site

Almost all of Pleasure Valley Woods, except for less than 10 acres, is in the Western Coulee and Ridges Ecological Landscape. The primary site is part of a larger block of variable quality forest that occurs on the park and the landscape to the north and east. The forest at Pleasure Valley extends to the north and east, and within 1.5 miles there is at least an additional 1200 acres of connected forest. Included in that extended area are additional public (Dane County Parks to the east) and private lands

with conservation easements. The forest types are likely a mixture of Southern Mesic and Dry-mesic Forest with degraded oak savannas. The juxtaposition of the moderate to good quality forest and Ryan Creek provides important habitat for a number of rare or declining forest interior birds, including two State Threatened species. This site also harbors one of the largest populations known in Wisconsin of another rare bird associated with forested stream corridor. There are also several other bird Species of Greatest Conservation Need (SGCN) at Pleasure Valley. Based on recent surveys, most of Wisconsin's bat species have been documented in Dane and Iowa counties. This primary site affords both foraging habitat and summer roosting places. One rare plant of mesic to dry-mesic forests and woodlands was also documented at the site. A full list of the rare species associated with this primary site can be found in Appendix F (not available for public distribution).

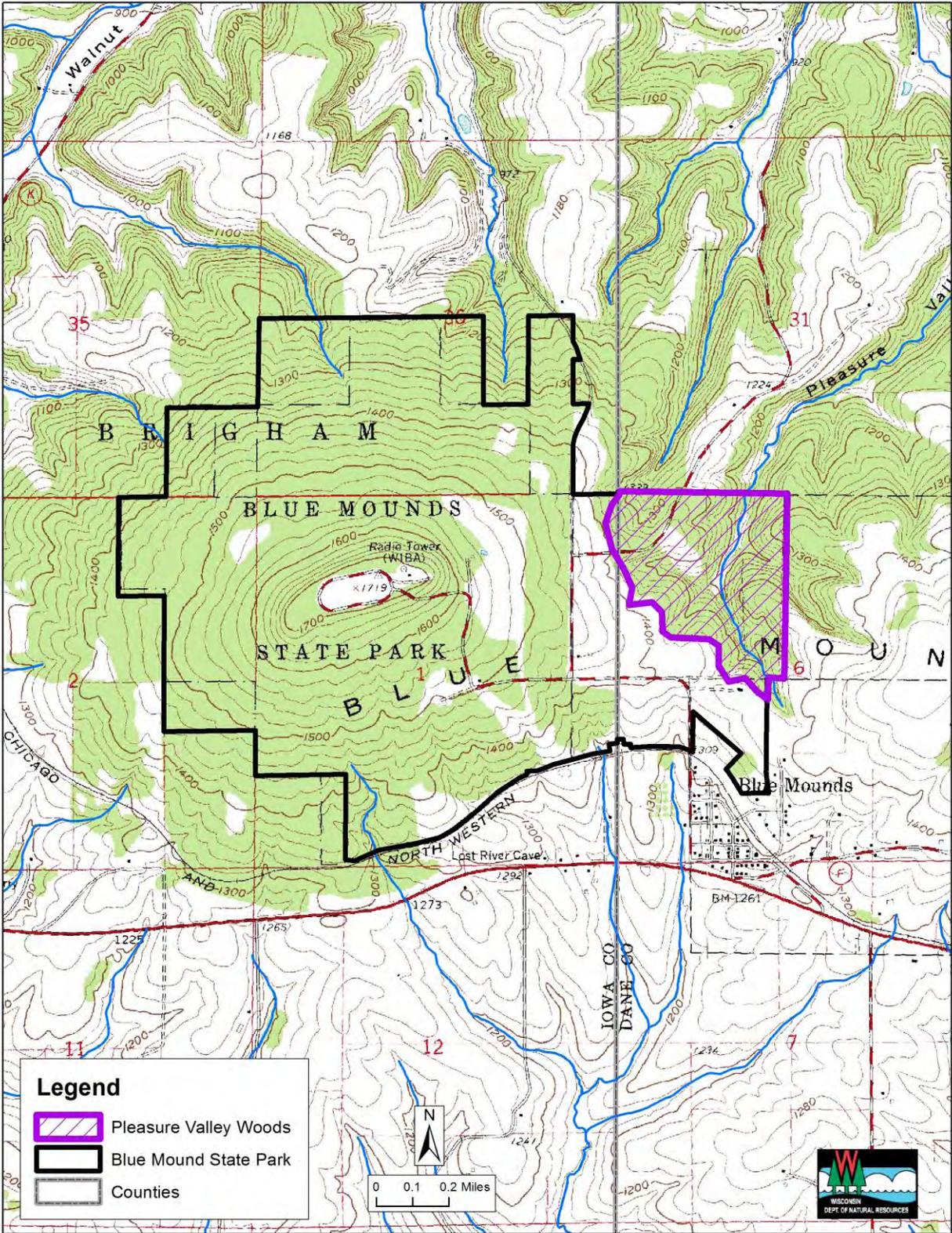
The Dry Prairie remnant has a global rank of G3 which means that it is either very rare and local throughout its world-wide range or found locally (even abundantly at some of its locations) in a restricted range and degraded. Because Dry Prairie occurs on sites that are not well-suited to other uses, it is better represented in today's landscape than any other prairie community. It is still a relatively rare natural community with a rank of S3 that is more abundant in Wisconsin than anywhere else. The Oak Woodland natural community type has not been ranked at a global scale but is critically imperiled (S1?) in Wisconsin because of extreme rarity. In the early to mid-19th century, the oak savanna, including Oak Woodland, as an ecosystem was thoroughly fragmented and nearly totally destroyed throughout its range. Most of its acreage suffered one of the following fates: (1) clearing and plowing, (2) overgrazing, or (3) invasion by dense shrub and tree growth due to lack of fire, lack of grazing, or both. Oak savanna now shares equal billing with tallgrass prairie as the most threatened plant community in the Midwest and among the most threatened in the world. Intact examples of oak savanna vegetation are now so rare that less than 500 acres are listed in the Natural Heritage Inventory as having a plant assemblage similar to the original oak savanna.

Management Considerations

Opportunities to manage older forest at a landscape level are very good at this site because of the large size of the Southern Mesic Forest and its adjacency to other large blocks of forest on public and private lands. Management should seek to maintain older forest in a large-sized block at this site and promote additional older forest on nearby lands. Other actions that reduce fragmentation such as allowing areas that are currently Surrogate Grasslands or shrublands to succeed to forest could be considered. Because trails can function as internal edge and can affect the abundance and distribution of bird species along the trail corridors, trail density and landscape position can be points of consideration in managing a range of recreational uses. While the Dry Prairie is small it does have a moderately diverse flora and is surrounded by low quality Oak Woodland. There is an opportunity to restore a rare, albeit small, fire-dependent prairie-woodland complex through the use of prescribed fire and some manual reduction of shrub and tree cover.

Invasive species, including garlic mustard, have been identified at the site, especially along trail corridors. In areas that are lightly infested with invasive species, control efforts are practical. 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. Common buckthorn (*Rhamnus cathartica*), Japanese barberry (*Berberis thunbergii*), and several other species appear to be scattered throughout the site and are still in the stage where they can be controlled. Areas with burdock (*Arctium minus*), especially along Ryan Creek, can be a hazard to foraging bats, and burdock management would benefit both the bats and surrounding plant community. It is recommended that the primary site be routinely monitored for all invasive plants (especially along trails) and new populations and species be controlled at an early stage.

BMSP01. Pleasure Valley Woods



BMSP02. BLUE MOUND WOODS

Location

Property:	Blue Mound State Park
County:	Iowa
Landtype Association:	Hills and Valleys – Wisconsin River Drainage (222LC18); Military Ridge Prairie (222Le01)
Approximate Size (acres):	745

Description of Site

Much of Blue Mound State Park west of Mounds Park Road is dominated by moderate to good quality Southern Dry-mesic Forest, with pockets of low quality forest. There is an area typed as Southern Mesic Forest in the northwestern corner of the park that continues onto adjacent private land. Ephemeral Ponds and Forested Seeps are scattered across the primary site. A number of ephemeral streams also originate in Blue Mound Woods.

The Southern Dry-mesic Forest is dominated by red and white oak with shagbark hickory (*Carya ovata*), basswood, sugar maple, ash (*Fraxinus* spp.), and black cherry (*Prunus serotina*). Canopy closure is high, generally over 80%, with scattered canopy gaps. There are occasional large, open to semi-open grown trees, especially oaks, as well as some savanna indicator herbs along trails and near former canopy gaps and openings. Some areas of embedded old fields have succeeded to younger dry-mesic forest. The shrub layer is variable, in some areas mostly lacking, in others areas, dense. Shrub species include dogwoods (*Cornus* spp.), American hazelnut (*Corylus americana*), American witch-hazel (*Hamamelis virginiana*), saplings of canopy trees, and some non-native bush honeysuckles (*Lonicera* spp.). Ground flora coverage is moderate overall and is variable in distribution and coverage. Species include several ferns, bedstraws (*Galium* spp.), Jack-in-the-pulpit (*Arisaema triphyllum*), and wild geranium (*Geranium maculatum*). Spring ephemerals, such as sharp-lobed hepatica (*Anemone acutiloba*) and cut-leaved toothwort (*Dentaria laciniata*), are present and often well-represented. Some areas are dominated by Pennsylvania sedge (*Carex pensylvanica*). Recreational trails and other developments are embedded within this natural community. Invasive species are patchily distributed and seem most closely associated with former openings (especially multi-flora rose (*Rosa multiflora*)) or along trails (such as garlic mustard). There is scattered common buckthorn and patches of non-native bush honeysuckle. Rock outcrops and loose rock are throughout the forest.

The vegetation of the Ephemeral Ponds varies. Plant species noted in the Forested Seeps include black ash (*Fraxinus nigra*), orange jewelweed (*Impatiens capensis*), Canadian clearweed (*Pilea pumila*), beggar's-ticks (*Bidens* spp.), and common fox sedge (*Carex vulpinoidea*).

Significance of Site

Blue Mound Woods is almost entirely in the Southwest Savanna Ecological Landscape (Military Ridge Prairie LTA). The primary site is part of a larger, older block of forest that occurs on the park and the landscape to the north and east on private lands; there are over 500 acres of more or less contiguous forest outside of the park. Within the park, the forest is generally moderate to good quality with pockets of low quality, often younger, forest. This large block of older forest provides important habitat for a number of rare or declining forest interior birds, including three State Threatened species. There are also several other bird Species of Greatest Conservation Need (SGCN) at Blue Mound Woods. Seven of the eight bat species of Wisconsin have been

documented in Dane and Iowa counties, and this primary site provides both foraging habitat and summer roosting places. Two rare terrestrial snails associated with forests have also been found in recent years at the site. A full list of the rare species associated with this primary site can be found in Appendix F (not available for public distribution).

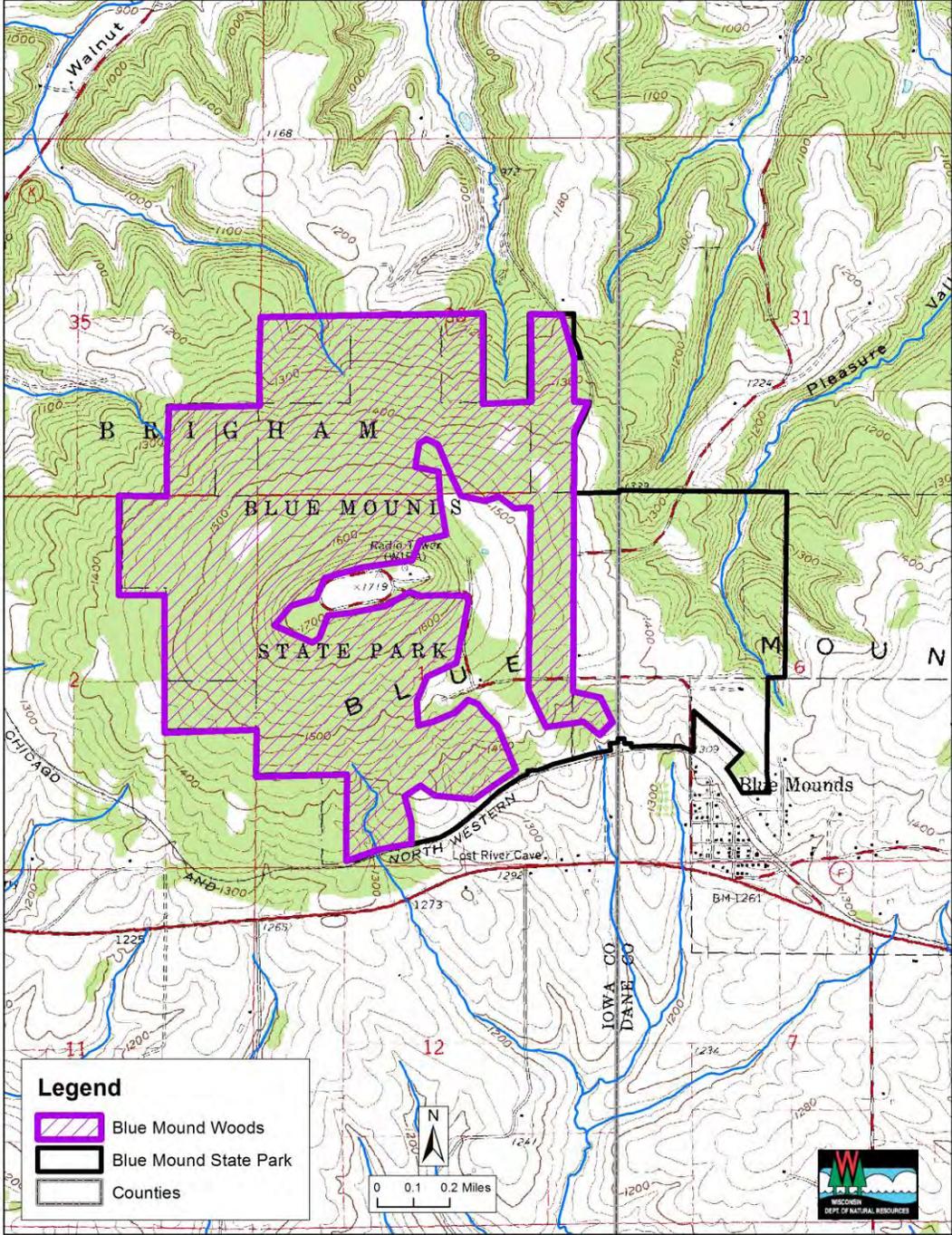
Management Considerations

Opportunities to manage older forest at a landscape level are high at this site because of the large size of the Southern Dry-mesic Forest and its adjacency to other large blocks of forest. Management should seek to maintain older forest in a large-sized block at this site and promote additional older forest on nearby lands. Because trails can function as internal edge and can affect the abundance and distribution of bird species along the trail corridors, trail density and landscape position can be points of consideration in managing a range of recreational uses.

Any Ephemeral Ponds and Forested Seeps offer management opportunities to promote habitat for rare or specialized species. Best Management Practices for Water Quality should be followed in the vicinity of these natural community types (dnr.wi.gov, keyword “BMP water quality”).

Invasive species, including garlic mustard, have been identified at the site, especially along trail corridors. In areas that are lightly infested, control efforts are practical. In other areas it may be more a matter of containment and reducing or eliminating the spread of the target invasive species. Common buckthorn appears to be scattered throughout the site and still in the stage where it can be controlled, thus representing a high priority for management. Bush honeysuckle is more common south of the family campground. Within former openings embedded in the forest, multi-flora rose and other invasive species can be locally common. Areas with burdock can be a hazard to foraging bats, and burdock management would benefit both the bats and surrounding plant community. It is recommended that the primary site be routinely monitored for all invasive plants and new populations and species be controlled at an early stage.

BMSP02. Blue Mound Woods



SPECIES LIST

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

Common Name	Scientific Name
American hazelnut	<i>Corylus americana</i>
ash	<i>Fraxinus</i> spp
American witch hazel	<i>Hamamelis virginiana</i>
basswood	<i>Tilia americana</i>
bastard toadflax	<i>Comandra umbellata</i>
bedstraw	<i>Galium</i> spp
beebalm	<i>Monarda fistulosa</i>
beggar's-ticks	<i>Bidens</i> spp
bellworts	<i>Uvularia</i> spp
bird's-foot violet	<i>Viola pedata</i>
black ash	<i>Fraxinus nigra</i>
black cherry	<i>Prunus serotina</i>
brambles	<i>Rubus</i> spp
burdock	<i>Arctium minus</i>
bur oak	<i>Quercus macrocarpa</i>
Canadian clearweed	<i>Pilea pumila</i>
common buckthorn	<i>Rhamnus cathartica</i>
common fox sedge	<i>Carex vulpinoidea</i>
common juniper	<i>Juniperus communis</i>
cut-leaved toothwort	<i>Dentaria laciniata</i>
dogwoods	<i>Cornus</i> spp
garlic mustard	<i>Alliaria petiolata</i>
hairy rock cress	<i>Arabis hirsute</i>
hickories	<i>Carya</i> spp
hoary puccoon	<i>Lithospermum canescens</i>
horse gentian	<i>Triosteum aurantiacum</i>
ironwood	<i>Ostrya virginiana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
Japanese barberry	<i>Berberis thunbergii</i>
little bluestem	<i>Schizachyrium scoparium</i>
multi-flora rose	<i>Rosa multiflora</i>
non-native bush honeysuckles	<i>Lonicera</i> spp
orange jewelweed	<i>Impatiens capensis</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
red oak	<i>Quercus rubra</i>
shagbark hickory	<i>Carya ovata</i>
shooting star	<i>Dodecatheon meadia</i>
sugar maple	<i>Acer saccharum</i>
white oak	<i>Quercus alba</i>
wild geranium	<i>Geranium maculatum</i>