

Rapid Ecological Assessment for Perrot State Park, Merrick State Park & Whitman Dam Wildlife Area

A Rapid Ecological Assessment Focusing on Rare Plants, Selected Rare Animals, and High-quality Natural Communities



Properties included in this report:

Buffalo County	Trempealeau County
Merrick State Park	Perrot State Park
Whitman Dam Wildlife Area	Trempealeau Mountain SNA
Whitman Bottoms Floodplain Forest SNA	Brady's Bluff Prairie SNA
	Great River Trail Prairies SNA (north unit only)

Wisconsin's Natural Heritage Inventory Program
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Cover Photos:

- Top: Perrot State Park. Photo by Eric Epstein.
- Bottom left: Chicken Breast Bluff, Perrot State Park. Photo by Andy Clark.
- Bottom right: Prothonotary Warbler. Photo by Len Blumin.



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PWMPG Property Group at a Glance

Exceptional Characteristics and Opportunities of the Study Area

- **Rare Animals and Plants.** The Perrot State Park, Whitman Dam Wildlife Area, and Merrick State Park Planning Group (PWMPG) supports numerous rare species. Forty-five rare animal species have been documented at PWMPG, including five State Endangered species, ten State Threatened species, 30 Special Concern species, and one rare animal assemblage. Ten rare plant species are also known from the PWMPG, including one State Threatened and nine Special Concern species.
- **Prairie and Oak Savanna Restoration.** Prairies and oak savannas were historically common in Wisconsin but are now rare throughout the state, thus their restoration is critical to the survival of many rare plants and animals that depend on them. Opportunities exist at Perrot State Park to restore and protect Dry Prairie, Oak Opening and Oak Woodland within a matrix of Southern Dry/Dry-mesic Forest, and at Great River Trail Prairies State Natural Area to protect Sand Prairie.
- **Floodplain Forest.** A major opportunity exists to manage for a large expanse of Floodplain Forest at Whitman Dam Wildlife Area. Not only could this Floodplain Forest serve as an important ecological reference site for this community type, but its restoration will benefit a number of rare forest interior birds, and will help maintain water quality in the backwaters, channels, and sloughs within the forest matrix that serve as important spawning, nursery, dwelling, and over-wintering areas for both sport fish and rare non-sport fish.
- **Herptile Conservation.** The variety of aquatic, wetland, and upland habitats of the PWMPG are well-suited to a number of herptile species, including snakes and lizards that utilize the prairies and oak savannas, and amphibians and turtles that utilize the aquatic resources and wetlands associated with the Mississippi River.
- **Invertebrate Conservation.** A significant opportunity for invertebrate conservation exists at Perrot State Park on the site's remnant Dry Prairies. At Brady's Bluff State Natural Area (SNA), three rare butterflies and moths have been identified, as well as a rare snail.

Site Specific Opportunities for Biodiversity Conservation

Two ecologically important sites were identified at PWMPG. 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.

- **Whitman Dam Wildlife Area.** This site comprises 2,373 acres of Floodplain Forest and Submergent/Emergent Marsh, providing important habitat for forest interior birds and for backwater fishes. Includes Whitman Bottoms Floodplain Forest SNA.
- **Perrot Forests and Prairies.** This site comprises 1,119 acres of Dry Prairie, Oak Woodland, and Southern Dry/Dry-mesic Forest, providing important habitat for breeding birds, herptiles, butterflies and moths, and terrestrial snails. Brady's Bluff SNA, Great River Trail Prairies SNA (north unit only), and Trempealeau Mountain SNA lie within the primary site.

Introduction

Purpose and Objectives

This report is intended to be used as a source of information for developing new master plans for the Perrot State Park, Whitman Dam Wildlife Area, and Merrick State Park Planning Group (herein “PWMPG ;” Figure 1). The regional ecological context for the PWMPG is also provided to assist in developing the Regional and Property Analysis that is part of the master plan.

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

Survey efforts for the PWMPG were limited to a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning although inventory efforts were reduced compared to similar projects conducted on much larger properties such as state forests. There will undoubtedly be gaps in our knowledge of the biota of these properties, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work.

Overview of Methods

The Wisconsin Natural Heritage Inventory (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 certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see www.NatureServe.org for more information), coordinates the network.

Natural heritage programs track certain elements of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The Natural Heritage Working List contains the elements tracked in Wisconsin. They include endangered, threatened, and special concern plants and animals, as well as the natural community types recognized by NHI. The Working List is periodically updated to reflect new information about the rarity and distribution of the state’s plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR website (*Wisconsin Natural Heritage Working List*).

The Wisconsin NHI program uses standard methods for biotic inventory to support master planning (Appendix A). Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, most NHI data for the PWMPG were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR’s Bureaus of Research and Endangered

Resources between 1969 and 1984 that focused on natural communities but include some surveys for rare plants and animals and 2) taxa specific surveys.

The most recent taxa-specific field surveys for the study area were conducted in 2008. Surveys were limited in scope and focused on documenting high quality natural communities, rare plants, breeding birds, and forest raptors. The collective results from all of these surveys were used, along with other information, to identify ecologically important areas (Primary Sites) at the PWMPG.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the PWMPG, key inventory considerations included the identification of high quality grasslands, oak savannas, upland forests, floodplain forests, and cliffs, as well as the location of habitats that had the potential to support rare species. Private lands (including easements) surrounding the PWMPG were not surveyed.

Within this report, scientific names have been used with first mention of species, thereafter the common name has been used. A list of all scientific names mentioned in the text is included at the end of this document.



Figure 1. Location of the PWMPG Study Area

Background on Past Efforts

A few large-scale research and planning efforts have identified the PWMPG as being ecologically significant. The following are examples of such projects and the significant features identified.

Wisconsin Wildlife Action Plan: Conservation Opportunity Areas

The Wisconsin Wildlife Action Plan (WAP; WDNR 2006a) identified multiple Conservation Opportunity Areas (COA) within the Western Coulee and Ridges Ecological Landscape. COAs are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective. Three COAs in this ecological landscape intersect the PWMPG:

1. Mississippi River
2. Trempealeau River
3. Mississippi Bluffs and Floodplains

For more details on these COAs, see "Management Opportunities and Considerations for Biodiversity Conservation" section of this report.

Legacy Places

The Land Legacy Report (WDNR 2006b) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The report identifies the Trempealeau River Delta, and its undeveloped uplands, as an excellent opportunity to establish a conservation corridor linking the Trempealeau National Wildlife Refuge and Perrot State Park to the Great River State Recreation Trail. Habitat conservation benefits include protection of sand dunes, pothole ponds, remnant prairie and wooded uplands on the sandy river terrace.

The Nature Conservancy (TNC): Prairie Forest Border Ecoregional Plan The Nature Conservancy (2001) identified important Ecologically Significant Areas and restoration areas that will ensure the long-term survival of all viable native species and ecological communities. Conservation targets for the Prairie-Forest Border include all native natural communities, globally rare species and other species for which experts feel the Prairie-Forest Border is an important part of their range. The Upper Mississippi River Ecologically Significant Areas intersects the PWMPG properties and is recognized for both terrestrial and aquatic features. This area is nearly 900,000 acres in size and is the region's preeminent river corridor encompassing open water, Emergent and Submergent Marsh, Sedge Meadow, Wet Prairie, and Floodplain Forest.

Driftless Area Initiative

The Wisconsin DNR is a partner in the Driftless Area Initiative, an effort to encourage multi-state collaboration to improve water quality and natural resources in the Driftless Area of the Upper Mississippi River Basin.

Special Management Designations

State Natural Areas

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

PWMPG properties are entirely WDNR owned and managed. The SNAs that are within the boundaries of the PWMPG properties are:

- **Whitman Bottoms Floodplain Forest SNA**
- **Brady's Bluff SNA**
- **Trempealeau Mountain SNA**
- **Great River Trail Prairies SNA (north unit only)¹**

Forest Certification

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

Important Bird Area

Important Bird Areas (IBA; WDNR 2007) are critical sites for the conservation and management of Wisconsin's birds. The **Upper Mississippi River Fish and Wildlife Refuge IBA** encompasses the Trempealeau National Wildlife Refuge and the Wisconsin portion of the Upper Mississippi Fish and Wildlife Refuge, covering eight counties in southwest Wisconsin. Habitats include large tracts of Floodplain Forest, forested wetlands, bluffs, braided channels, open water, riverine wetlands, and prairie (WDNR 2007). The Mississippi River is one of the great continental flyways along which birds migrate in spring and fall. Hundreds of thousands of waterfowl, songbirds, and raptors use the refuges as stopovers and migratory corridors, including half of the world's canvasbacks and twenty percent of the world's tundra swans (WDNR 2007). The forests, wetlands, and grasslands provide critical breeding habitat for many species, including American and least bittern (*Botaurus lentiginosus* and *Ixobrychus exilis*), great-blue herons (*Ardea herodias*), bald eagle (*Haliaeetus leucocephalus*), red-shouldered hawk (*Buteo lineatus*), yellow-billed cuckoo (*Coccyzus americanus*), Acadian flycatcher (*Empidonax vireescens*), prothonotary warbler (*Protonotaria citrea*), cerulean warbler (*Dendroica cerulea*), Louisiana waterthrush (*Seiurus motacilla*), lark sparrow (*Chondestes grammacus*), and eastern meadowlark (*Sturnella magna*) (WDNR 2007).

Wisconsin Wetland Association Wetland Gems

The PWMPG was recognized by the Wisconsin Wetland Association (WWA) as having an area recognized as a "wetland gem". These habitats are critically important to Wisconsin's biodiversity, provide nearby communities with valuable functions and services, and serve as recreational and educational opportunities (Wisconsin Wetlands Association 2009).

- Whitman Bottoms Wetland Gem, within the Whitman Dam Wildlife Area, comprises 6 miles of sloughs and backwaters stretching north from Merrick Park. The area features the best Floodplain Forest in the region and extensive marshes.

Public Lands

All lands in the study area are owned by the Wisconsin Department of Natural Resources Bureau of Wildlife Management and Parks & Recreation. The Upper Mississippi River Fish and Wildlife Refuge adjoins the study area properties, and is owned and managed by the U.S. Fish and Wildlife Service.

¹ The south unit of Great River Trail Prairies SNA lies in La Crosse County, and will be treated in a separate report.

Regional Ecological Context

Western Coulees & Ridges Ecological Landscapes

This section is largely reproduced from the Ecological Landscapes of Wisconsin Handbook (WDNR in prep. a).

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.

The PWMPG lies within the Western Coulees and Ridges Ecological Landscape (Figure 2). The Western Coulee and Ridges Ecological Landscape is the largest of the 16 Ecological Landscapes. It is located in southwestern and west central Wisconsin within the Driftless Area, a region that escaped glaciation during the last glacial period. The Driftless Area is noted for its steeply dissected terrain, extensive network of streams, and lack of glacial deposits (although glacial outwash materials do occur in river valleys). Several large rivers including the Wisconsin, Mississippi, Chippewa, Kickapoo and Black flow through or border this Ecological Landscape.



Figure 2. Ecological Landscapes of Wisconsin and the study area.

Historical vegetation consisted of southern hardwood forest, oak savanna, and prairie, along with wetlands (forested and open) along rivers and streams. With Euro-American settlement, most of the level land on ridgetops and in valley bottoms was cleared for agriculture. The untillable steep slopes between valley bottom and ridgetop either remained in forest or grew up into oak-dominated forests when early wildfire-suppression policies were instituted.

Current vegetation of the Western Coulee and Ridges Ecological Landscape is a mix of forest (40% of total cover), agriculture, and grassland, with wetlands mostly restricted to the river valleys. The primary forest cover is oak-hickory, while maple-basswood forests are common in cooler, moister areas. Bottomland hardwoods occur in the valley bottoms of major rivers. Relict conifer stands are rare, and are associated with steep-faced outcrops with cool microclimates. This Ecological Landscape has few natural lakes, though oxbows and ponds may be found with large river floodplains. Impoundments have been installed on a number of rivers to create man-made lakes.

Regional Biodiversity Needs and Opportunities

Opportunities for sustaining natural communities in the Western Coulees & Ridges Ecological Landscape were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007) and later focused on wildlife Species of Greatest Conservation Need and their habitat in the Wisconsin Wildlife Action Plan (WDNR 2006a). 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 the EMPT’s criteria, these are the most appropriate community types that could be considered for management activities within the Western Coulees & Ridges Ecological Landscape.

There are management opportunities for 45 natural communities in the Western Coulees & Ridges Ecological Landscape. Of these, 24 are considered “major” opportunities (Table 1).

Table 1. Major Natural Communities Management Opportunities in the Western Coulees & Ridges Ecological Landscape (EMPT 2007; WDNR 2006a). Communities that are present on the PWMPG are noted with an asterisk.

Algific Talus Slope	Oak Barrens
Bedrock Glade	Oak Opening*
Cedar Glade	Oak Woodland*
Coldwater streams	Pine Relict
Coolwater streams	Sand Prairie*
Dry Cliff	Shrub Carr*
Dry Prairie*	Southern Dry Forest*
Dry-mesic Prairie	Southern Dry-mesic Forest*
Emergent Marsh*	Southern Mesic Forest
Floodplain Forest*	Submergent Marsh*
Hemlock Relict	Surrogate Grasslands*
Moist Cliff *	Warmwater Streams*

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 additional 13 natural communities are considered “important” in the Western Coulees and Ridges Ecological Landscape. An “important” opportunity indicates that although the natural community does not occur extensively or commonly in the Ecological Landscape, one to several 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.

Rare Species of the Western Coulees & Ridges Ecological Landscape

Numerous rare species are known from the Western Coulees & Ridges Ecological Landscape. “Rare” species include all of those species that appear on the WDNR’s NHI Working List (*Wisconsin Natural Heritage Working List*) classified as “Endangered,” “Threatened,” or “Special Concern.” Table 2 lists the number of species known to occur in this landscape based on information stored in the NHI database as of February 21st 2012.

Table 2. Listing Status for rare species in the Western Coulees & Ridges Ecological Landscape as of 2012. Source is the NHI database. Listing Status is based on the Working List published June 2011.

Listing Status	Taxa					Total Fauna	Total Plants	Total Listed
	Mammals	Birds	Herptiles	Fishes	Invertebrates			
State Endangered	0	6	4	7	17	34	18	52
State Threatened	4	9	2	9	9	33	28	61
State Special Concern	5	13	11	10	80	119	68	187
Federally Endangered	0	0	0	0	3	3	0	3
Federally Threatened	0	0	0	0	0	0	2	2
Federal Candidate	0	0	1	0	2	3	0	3

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need (SGCN). Species of Greatest Conservation Need 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 may be:

- 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.
- Of unknown status in Wisconsin and suspected to be vulnerable.

There are 16 vertebrate SGCN significantly associated with the Western Coulees & Ridges Ecological Landscape (See Appendix E). This means that the species is (and/or historically was) significantly associated with the Ecological Landscape, and restoration of natural communities with which this species is associated in the Ecological Landscape would significantly improve conditions for the species.

Description of the Study Area

Location and Size

The PWMPG study area consists of three properties Whitman Dam Wildlife Area (2,372 acres), Merrick State Park (292 acres) and Perrot State Park (1,231 acres) in Buffalo and Trempealeau Counties (acreages derived using GIS property ownership from DNR SDE layer, accessed on May 1, 2012). The ten-acre north unit of Great River Trail Prairies State Natural Area is also included within this property group. All are owned by the Wisconsin DNR and managed by the Bureau of Wildlife Management and Parks and Recreation. See Figure 1 for a map of the study area.

Ecoregion

Landtype Associations

Nested hierarchically within each Ecological Landscape are NHFEU Subsections which are further divided into Landtype Associations (LTAs) (Cleland et al. 1997). These LTAs are finer scaled polygons (areas of 10,000 – 300,000 acres) that make up each subsection, and are characterized by repeating patterns of characteristic landforms, soil groups, regional climate, and potential vegetation; these are most relevant to this study. PWMPG properties fall within one LTA (also see Figure 3):

- **Mississippi River Valley Train-North (222Lc08).** The characteristic landform pattern is nearly level river islands and floodplains. Soils are poorly drained to excessively drained sand or loamy fine sand over non-calcareous sand alluvium or outwash.

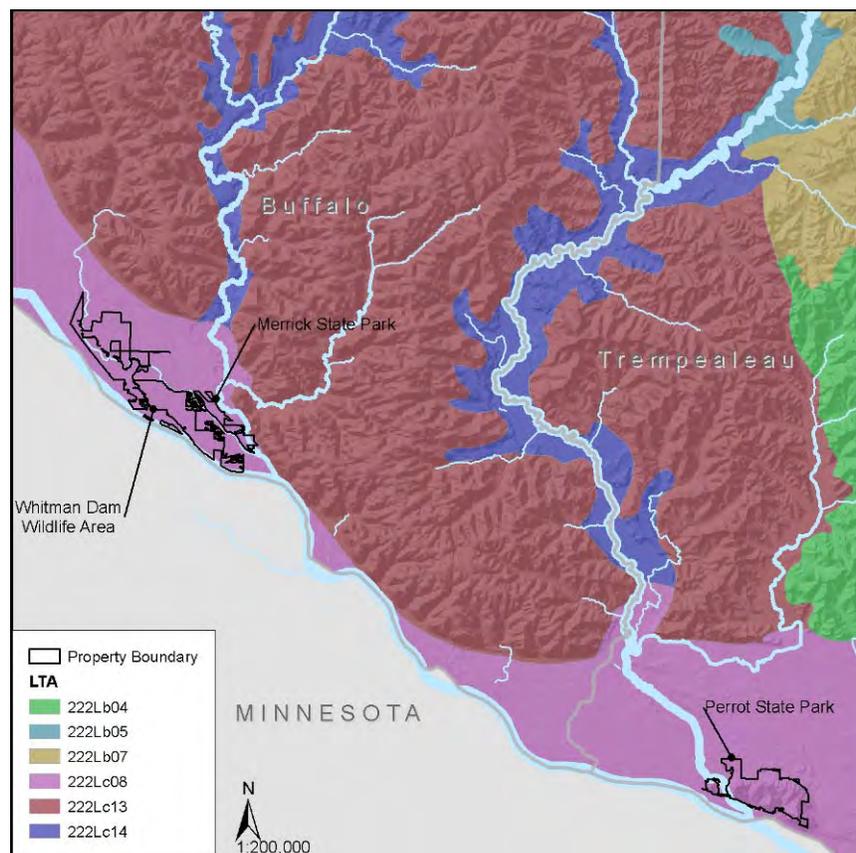


Figure 3. Landtype Associations for PWMPG.

Physical Environment

Geology and Landforms

The PWMPG property group lies in the Driftless Area of Wisconsin along the Mississippi River. The landforms of the area are a function of both bedrock geology and glacial influence. Although the area was not glaciated during the recent Wisconsinan glaciation, outwash from melting glaciers to the north and east dramatically shaped the region. Historically, the Mississippi River flowed through broad plains east and north of what is now Perrot State Park. Following the melting of the most recent glaciation, large outwash deposits filled the former floodplain and rerouted the river to its present course west and south of the park. Landforms of the lowest elevations of the property group were influenced by modern alluvial processes (periodic flooding and associated floodplain landforms), with slightly higher elevations associated with older alluvial terraces from glacial meltwater.

At higher elevations, such as Brady's Bluff and Trempealeau Mountain at Perrot State Park, landforms are of bedrock origin, with Cambrian-era sandstone exposed at lower outcrops, followed by Woneewoc sandstones, Lone Rock sandstones, St. Lawrence dolomite, Jordan sandstone, and at the highest elevation, Prairie du Chien dolomites of early Ordovician origin.

Soils

Alluvial deposits form the parent material of soils in river bottoms and are generally moderately well drained to poorly drained or seasonally inundated. Soils at slightly higher elevations are derived from glacial outwash parent material and are generally well-drained to moderately-well-drained silt loams, sandy loams, or loamy sands. Above the influence of glacial meltwater, soils are shallower and comprised of loess over weathered bedrock and include well-drained sandy loam, loamy fine sand, and silt loam on moderate to relatively steep slopes. Limestone and sometimes sandstone bedrock often lie close to the surface, resulting in shallow soils and occasionally exposed bedrock including cliffs and outcrops, particularly at Perrot State Park.

Hydrology

The PWMPG property group lies along the Mississippi River. Prior to Euro-American settlement, the river bottoms were subject to periodic inundation from flooding. While flooding still occurs, the timing and duration of floods has been modified by several major dams built in the 1930s that occur in and adjacent to the property group. These include:

- U.S. Army Corps of Engineers Lock and Dam #5 ("Whitman Dam;" across from Whitman Dam Wildlife Area; includes a large levee that forms the western edge of the wildlife area)
- U.S. Army Corps of Engineers Lock and Dam #5A (just upstream of Winona, Minnesota)
- U.S. Army Corps of Engineers Lock and Dam #6 (near Trempealeau, Wisconsin)

Three distinct zones are discernable between each dam (Dott and Attig 2004): 1) Immediately above each dam is a large, open reservoir; 2) Upstream from the reservoir is an extensive marsh with backwater sloughs; and 3) Between the marsh and the next dam upstream, a network of braided channels, sloughs, and small lakes course through a floodplain forest complex. Major named backwaters include Kieselhorse Bay, Fountain City Bay, and New Albin Area Backwaters.

The 1981 Whitman Dam Wildlife Area Management Plan describes in detail specific hydrological alterations that occurred at this site:

With the construction of the Whitman Dam, a dike was built to connect the dam with high ground on the Wisconsin shore. The dike prevented the lowland sloughs and backwaters from being completely flooded, but it also blocked many of the flowing water channels that supported fish populations. Water stagnation and increased sedimentation reduced the quality and quantity of fish and wildlife habitat.

In 1957, the U.S. Army Corps of Engineers placed an aeration culvert through the dike in a former natural inlet ("Hole-in-the-Wall") from the river into Fountain city Bay. Freshwater inflow improved fish habitat in the area, but was frequently blocked by debris in the culvert. In 1976, a partial closing dam was constructed by the Army Corps of Engineers at the mouth of a side channel ("Devil's Cut") opening into a large bay adjacent to Merrick State Park. The closing dam was built to prevent further deposition of main channel sand into slow water near the park.

In 1978, three aeration culverts were placed through the dike at the northwest corner of the wildlife property in order to allow fresh water to enter an existing slough originally blocked by the dike. Both projects were recommended by the Great River Environmental Action Team (GREAT) to alleviate water quality and sedimentation problems within the Whitman Dam Wildlife Area.

The PWMPG lies within or is adjacent to two local watersheds that adjoin the Mississippi River. Whitman Dam Wildlife Area and Merrick State Park lie in the Waumandee Creek Watershed. Waumandee Creek, which is joined by Eagle Creek just upstream of the wildlife area, empties into the Mississippi River just below Whitman Dam Wildlife Area and Merrick State Park. The upper portion of Eagle Creek is considered a Class III Trout Stream. Perrot State Park lies in the greater Trempealeau River watershed and sits just downstream from the confluence of the Trempealeau River and the Mississippi River.

Vegetation

Historical Vegetation

Data from the original Public Land Surveys are often used to infer forest composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American settlement. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Although data are limited to a specific snapshot in time, they provide valuable insights into Wisconsin's ecological capabilities. Maintaining or restoring some lands to more closely resemble historic systems and including some structural or compositional components of the historic landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In prep. a).

The early vegetation of Wisconsin was mapped by Robert Finley and published in 1976 (Finley 1976), and was based on notes and maps from the original Public Land Surveys. Finley's map indicates that historical vegetation of the PWMPG consisted of lowland hardwoods and wet marshes along the Mississippi River bottoms and prairie and savanna on higher elevation ridge tops (Figure 4). The Public Land surveyor described the Whitman Dam area in 1848 as follows: "The bottom land is subject to inundation from 4 to 10 feet and is about one fourth marsh and swamp. Alluvial bottom land is pretty well timbered with maple, elm, ash, birch, some fine bur oak and swamp oak. Not much undergrowth along the highest banks to the river and sloughs. Eagle Creek bottom is all marsh or swamp, no timber." In the same year, the same surveyor described the area where Perrot State Park now lies as rolling sandy prairie and black oak barrens, with some black oak witness trees noted as large as 24 inches in diameter.

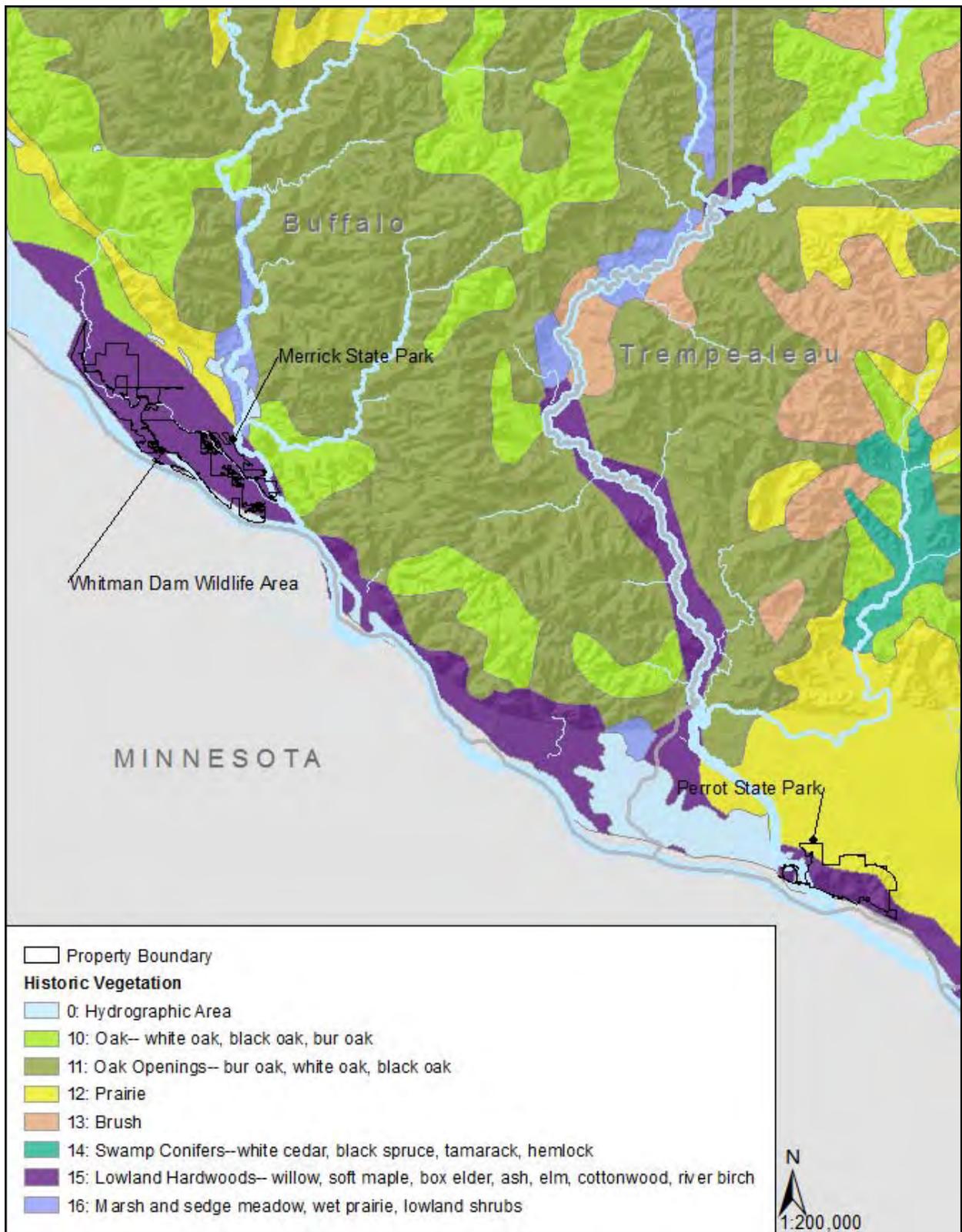


Figure 4. Vegetation of the PWMPG prior to Euro-American settlement (Finley 1976).

Current Vegetation

Many of the factors that historically impacted vegetation continue to impact the study area today, and include but are not limited to geology, soils, hydrology, and climate. These factors are superseded in many areas, however, by more recent human influences on the land, particularly conversion of bluff tops and valley bottoms to agriculture, logging, fire suppression, and the introduction and spread of non-native invasive species. Today, six general cover types comprise the PWMPG: wetland, grassland, deciduous forest, coniferous forest, and open water (Figure 5). These general cover types are further separated into unique natural communities based on species composition and other environmental characteristics and are described in greater detail after Figure 5.

Whitman Dam Wildlife Area. Approximately 80% of the area at Whitman Dam Wildlife Area is Floodplain Forest, with the remainder comprising open water and Emergent Marsh and Submergent Marsh.

Merrick State Park. Based on 2008 WDNR reconnaissance (WisFIRS) of the forested areas (155 acres) at Merrick State Park, about 60% is occupied by bottomland hardwoods (Floodplain Forest), about 32% by red pine (*Pinus resinosa*) plantations, and about 8% by upland forest. About 40 acres of Emergent/Submergent Marsh lies in the eastern part of the park. The remaining park areas are mostly developed, with scattered surrogate grassland/shrubland.

Perrot State Park. Approximately 85% of the area at Perrot State Park is upland forest, mostly consisting of Southern Dry/Dry-mesic Forest. Approximately ten percent is occupied by pine plantations, and about 5% is occupied by grasslands (mostly surrogate grassland, with some Dry Prairie). Extensive rock outcrops and cliffs occupy a significant amount of area here as well.



Figure 5. Landcover of PWMPG (WDNR Wiscland GIS coverage, [WDNR 1993])

Detailed descriptions of the natural community types that figure prominently on the PWMPG are provided below:

Floodplain Forest

This is a wetland hardwood forest community that occurs within the floodplain of large rivers. A good-quality example of this community type occurs at Whitman Dam Wildlife Area. Canopy dominants here include silver maple (*Acer saccharinum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), swamp white oak (*Quercus bicolor*), and eastern cottonwood (*Populus deltoides*). Dominant ground layer species include reed canary grass (*Phalaris arundinacea*), wood nettle (*Laportea canadensis*), white grass (*Leersia virginica*), and moneywort (*Lysimachia nummularia*), while poison ivy (*Toxicodendron radicans* var. *negundo*) and river bank grape (*Vitis riparia*) dominate the shrub layer. Floodplain Forest with similar structure and composition is also found at Merrick State Park.

Emergent Marsh

This open community has permanent standing water, and is dominated by robust emergent plants, especially cattails (*Typha* spp.), bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds (*Sparganium* spp.), giant reed (*Phragmites australis*), pickerel-weed (*Pontederia cordata*), water-plantains (*Alisma* spp.), arrowheads (*Sagittaria* spp.), and the larger species of spike-rush such as marsh spike-rush (*Eleocharis palustris*). Large areas of Emergent Marsh (intergrading with Submergent Marsh) lie in the northeastern part of Whitman Dam Wildlife Area (locally known as the "Big Marsh") and in the southeastern part at Merrick State Park. Water levels of the "Big Marsh" at Whitman Dam Wildlife Area were, at least historically, maintained by a series of beaver dams.

Submergent Marsh

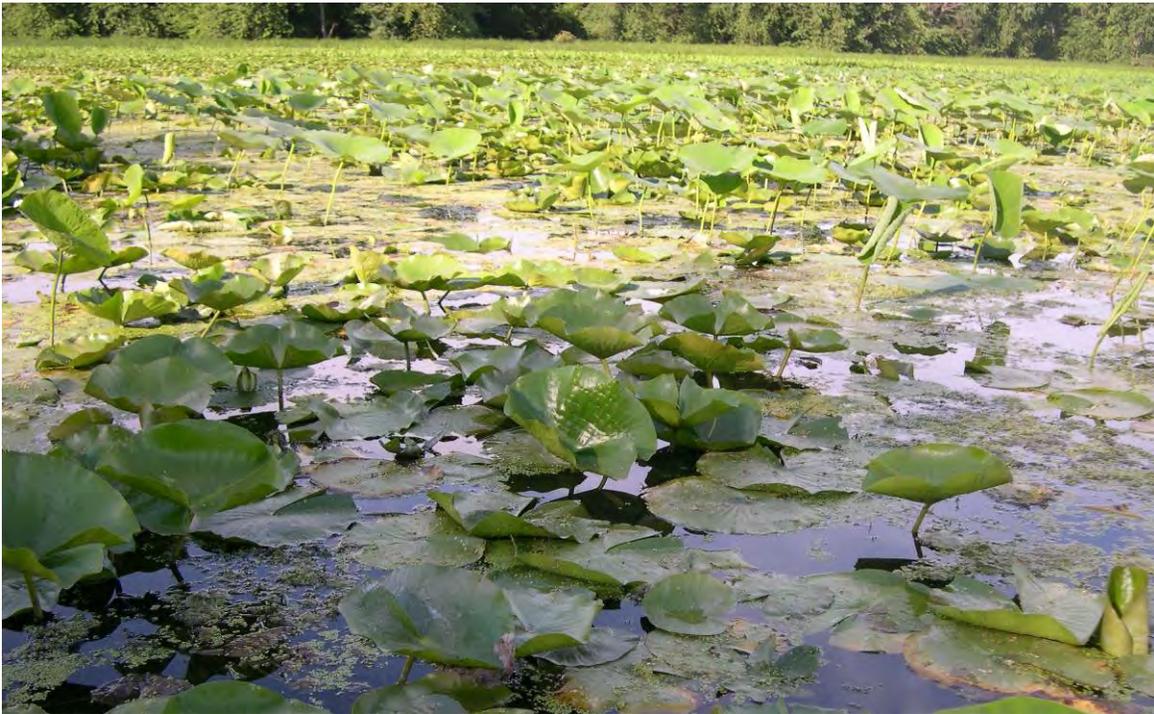
Submergent marsh plants often occur in deeper water than emergents, but there is considerable overlap. Typical dominants include various species of pondweeds (*Potamogeton* spp.), along with waterweed (*Elodea canadensis*), slender naiad (*Najas flexilis*), eelgrass (*Vallisneria americana*), and species of water-milfoil (*Myriophyllum* spp.) and bladderworts (*Utricularia* spp.). At Whitman Dam Wildlife Area, Submergent Marsh (intermixed with Emergent Marsh) creates a transition zone between the Floodplain Forest along the Mississippi River and the uplands to the east; this community type also lies within the Floodplain Forest matrix in channels and bays. An area of Submergent Marsh (intergrading with Emergent Marsh) lies in the southeastern part at Merrick State Park as well.

Moist Cliff

Cliff communities present environmental conditions that are unique on the landscape, allowing only specialized plants to grow. A series of shaded, sandstone cliffs are found at Perrot State Park, and support Moist Cliff specialists such as Sullivant's cool-wort (*Sullivantia renifolia*), slender cliff brake (*Cryptogramma stelleri*), bulblet fragile fern (*Cystopteris bulbifera*), and northern fragile fern (*C. fragilis*).



Floodplain Forest at Whitman Dam Wildlife Area. Photo by Eric Epstein



Submergent Marsh at Whitman Dam Wildlife Area. Photo by Andy Clark.

Southern Dry/Dry-mesic Forest

At Perrot State Park, Southern Dry Forest occupies the upper, drier slopes while Southern Dry-mesic Forest occupies the lower slopes where slightly deeper soils and/or cooler, moister conditions prevail. The dry forest canopy dominants are white oak (*Quercus alba*), black oak (*Q. velutina*) and northern red oak (*Q. rubra*), while those of the dry-mesic forest are northern red oak, basswood (*Tilia americana*), and yellowbud hickory (*Carya cordiformis*). Brambles (*Rubus* spp.), gray dogwood (*Cornus racemosa*), and American hazelnut (*Corylus americana*) create a robust shrub layer in the dry forests, but are much less pronounced in the dry-mesic forest. Ground layer species for both dry and dry-mesic forests overlap, and include wild geranium (*Geranium maculatum*), false Solomon's-seal (*Maianthemum racemosum*), hog-peanut (*Amphicarpaea bracteata*), and woodland sunflower (*Helianthus strumosus*). The highest quality dry-mesic forest lies below Brady's Bluff Prairie, mostly within the SNA boundary.

Oak Woodland/Oak Opening

Two types of oak savanna are present at Perrot State Park on higher, drier soils and/or aspects. There are areas where many of the white oaks have open-limb architecture, and there is wider spacing between the larger trees; such conditions are indicative of Oak Woodland. In other areas, Dry Prairie grades into Oak Opening, retaining some prairie ground layer plants, but only those that tolerate moderate shade from scattered, open-grown oaks. Most Oak Opening/Oak Woodland sites are highly degraded due to encroachment of native and exotic woody species in the absence of regular fire, resulting in a depauperate ground layer, or one that is more typical of dry/dry-mesic forest. A number of oak savanna indicator species have persisted in the ground layer at Perrot State Park, however, including starry campion (*Silene stellata*), poke milkweed (*Asclepias exaltata*), eastern shooting-star (*Dodecatheon meadia*), lion's-foot (*Prenanthes alba*), early horse-gentian (*Triosteum aurantiacum*), and bottlebrush grass (*Elymus hystrix*).

Dry Prairie

Dry Prairie remnants occur at Perrot State Park on shallow rocky soils, often on steep south- and west-facing slopes. Although the biomass of prairies is dominated by grasses, wildflowers (forbs) greatly outnumber grasses in terms of species richness. Small shrubs such as wild roses (*Rosa* spp.), New Jersey tea (*Ceanothus americana*), American hazelnut, and lead-plant (*Amorpha canescens*) complete the compositional picture. Dry Prairie can be identified by the presence of "indicator species" such as little bluestem (*Schizachyrium scoparium*), hairy grama (*Bouteloua hirsuta*), side-oats grama (*B. curtipendula*), American pasqueflower (*Anemone patens*), and old field goldenrod (*Solidago nemoralis*). An interesting feature of Perrot State Park's prairies is the presence of hairy four-o'clock (*Mirabilis albida*), prairie larkspur (*Delphinium carolinianum*), and plains muhly (*Muhlenbergia cuspidata*), all species of the Great Plains that are at or near their northeastern limit here. The largest and highest quality Dry Prairie in the study area is found at Brady's Bluff Prairie State Natural Area. At least three other small good-quality Dry Prairie remnants have been identified east of Brady's Bluff, and a moderate quality remnant is found on Trempealeau Mountain.

Sand Prairie

The Sand Prairie within the north unit of Great River Trail Prairies State Natural Area features grasses such as big blue-stem (*Andropogon gerardii*) and little blue-stem, and flowering plants including lead-plant, wild bergamot (*Monarda fistulosa*), hoary vervain (*Verbena stricta*), common spiderwort (*Tradescantia ohioensis*), hoary puccoon (*Lithospermum canescens*), prairie rose (*Rosa arkansana*), and white sage (*Artemisia leudoviciana*).



Southern Dry-mesic Forest on steep slope dominated by red oak, Perrot State Park. Photo by Andy Clark.



Dry Prairie on steep slope of Perrot Ridge at Perrot State Park. Photo by Andy Clark.

Rare Species and High Quality Natural Communities

Rare species and high-quality examples of native communities have been documented within the PWMPG. Table 3 shows the rare species and high-quality natural communities currently known from the PWMPG. Appendix C shows the rare species and high-quality natural communities currently known from PWMPG listed by property. See Appendix D for summary descriptions of the species and natural communities mentioned in this report.

Table 3. Documented rare species and high-quality natural communities of the PWMPG.

For explanation of state and global ranks, and state status, see Appendix A. State status, tracking status, and ranks based on June 1, 2011 working list.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Birds								
Bald eagle	<i>Haliaeetus leucocephalus</i>	2008	S4B,S4N	G5	SC/P		Y	Y
Black tern	<i>Chlidonias niger</i>	1984	S2B	G4	SC/M		Y	Y
Blue-winged warbler	<i>Vermivora pinus</i>	2007	S4B	G5	SC/M		Y	W
Brown thrasher	<i>Toxostoma rufum</i>	2007	S3S4B	G5	SC/M		Y	W
Cerulean warbler	<i>Dendroica cerulea</i>	2008	S2S3B	G4	THR		Y	Y
Field sparrow	<i>Spizella pusilla</i>	2007	S3S4B	G5	SC/M		Y	W
Great egret	<i>Ardea alba</i>	1984	S2B	G5	THR		Y	Y
Least bittern	<i>Ixobrychus exilis</i>	1984	S2S3B	G5	SC/M			Y
Peregrine falcon	<i>Falco peregrinus</i>	2011	S1S2B	G4	END		Y	Y
Prothonotary warbler	<i>Protonotaria citrea</i>	2010	S3B	G5	SC/M		Y	Y
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	2007	S3B	G5	SC/M		Y	W
Red-shouldered hawk	<i>Buteo lineatus</i>	2008	S3S4B,S1N	G5	THR		Y	Y
Wood thrush	<i>Hylocichla mustelina</i>	2007	S4B	G5	SC/M		Y	W
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	2007	S3B	G5	SC/M		Y	W
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	1984	S3	G5	SC/M			Y
Bird rookery	<i>Bird Rookery</i>	1984	SU	G5	SC			Y
Fish								
Black buffalo	<i>Ictiobus niger</i>	1998	S2	G5	THR		Y	Y
Blue sucker	<i>Cycleptus elongatus</i>	2010	S2	G3G4	THR		Y	Y
Crystal darter	<i>Crystallaria asprella</i>	2008	S1	G3	END		Y	Y
Goldeye	<i>Hiodon alosoides</i>	1995	S2	G5	END		Y	Y
Lake sturgeon	<i>Acipenser fulvescens</i>	2010	S3	G3G4	SC/H		Y	Y
Mud darter	<i>Etheostoma asprigene</i>	2002	S3	G4G5	SC/N			Y
Paddlefish	<i>Polyodon spathula</i>	2003	S2	G4	THR		Y	Y
Pallid shiner	<i>Notropis amnis</i>	2003	S1	G4	END		Y	Y
Pirate perch	<i>Aphredoderus sayanus</i>	1994	S3	G5	SC/N			Y
Pugnose minnow	<i>Opsopoeodus emiliae</i>	2006	S3	G5	SC/N			Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Fish (continued)								
River redhorse	<i>Moxostoma carinatum</i>	2006	S2	G4	THR		Y	Y
Silver chub	<i>Macrhybopsis storeriana</i>	2006	S3	G5	SC/N			Y
Weed shiner	<i>Notropis texanus</i>	2008	S3	G5	SC/N			Y
Western sand darter	<i>Ammocrypta clara</i>	2009	S3	G3	SC/N		Y	Y
Reptiles								
Blanding's turtle	<i>Emydoidea blandingii</i>	1992	S3S4	G4	THR		Y	Y
False map turtle	<i>Graptemys pseudogeographica</i>	1973	S3?	G5	SC/H			Y
North American racer	<i>Coluber constrictor</i>	2007	S2	G5	SC/P		Y	Y
Smooth softshell	<i>Apalone mutica</i>	1973	S3	G5	SC/H		Y	Y
Timber rattlesnake	<i>Crotalus horridus</i>	2009	S2S3	G4	SC/P		Y	Y
Amphibians								
Northern leopard frog	<i>Lithobates pipiens</i>	1984	S4?	G5	SC/H			W
Butterflies and Moths								
Columbine dusky wing	<i>Erynnis lucilius</i>	1977	S2S3	G4	SC/N		Y	Y
Juniper hairstreak	<i>Callophrys gryneus</i>	1987	S3	G5	SC/N			Y
Ottoe skipper	<i>Hesperia ottoe</i>	1991	S1	G3G4	SC/N		Y	Y
Dragonflies								
Russet-tipped Clubtail	<i>Stylurus plagiatus</i>	1992	S2	G5	SC/N			W
Mussels and Clams								
Fawnsfoot	<i>Truncilla donaciformis</i>	2002	S1S2	G5	SC/P		Y	Y
Flat floater	<i>Anodonta suborbiculata</i>	2008	S2S3	G5	SC/P		Y	Y
Higgins' eye	<i>Lampsilis higginsii</i>	2008	S1	G1	END	LE	Y	Y
Monkeyface	<i>Quadrula metanevra</i>	1981	S2	G4	THR		Y	Y
Washboard	<i>Megaloniaias nervosa</i>	1979	S3	G5	SC/P			Y
Terrestrial Snails								
Wing snaggletooth	<i>Gastrocopta procera</i>	1986	S3	G5	THR		Y	Y
Plants								
Butternut	<i>Juglans cinerea</i>	1980	S3?	G4	SC			W
Dragon wormwood	<i>Artemisia dracunculus</i>	1958	S2	G5	SC			Y
Heart-leaved skullcap	<i>Scutellaria ovata ssp. ovata</i>	1973	S3	G5T5	SC			Y
Jeweled shooting star	<i>Dodecatheon amethystinum</i>	1980	S1S2	G4	SC			Y
Prairie sagebrush	<i>Artemisia frigida</i>	1968	S2	G5	SC			Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Plants (continued)								
Shadowy Goldenrod	<i>Solidago sciaphila</i>	1958	S3	G3G4	SC			W
Silky prairie-clover	<i>Dalea villosa</i> var. <i>villosa</i>	1958	S2	G5	SC			Y
Small-flowered woolly bean	<i>Strophostyles leiosperma</i>	1927	S2	G5	SC			Y
Snowy campion	<i>Silene nivea</i>	1957	S2	G4?	THR			Y
White camas	<i>Zigadenus elegans</i> var. <i>glaucus</i>	2008	S2S3	G5T4T5	SC			Y
Natural Communities								
Dry prairie	Dry prairie	2008	S3	G3	NA			Y
Emergent marsh	Emergent marsh	1982	S4	G4	NA			Y
Floodplain forest	Floodplain forest	2008	S3	G3?	NA			Y
Lake-Shallow, Hard, Drainage	Lake--shallow, hard, drainage	1984	SU	GNR	NA			Y
Moist cliff	Moist cliff	1980	S4	GNR	NA			Y
Shrub-carr	Shrub-carr	1984	S4	G5	NA			Y
Southern dry-mesic forest	Southern dry-mesic forest	2008	S3	G4	NA			Y
Southern sedge meadow	Southern sedge meadow	1984	S3	G4?	NA			Y
Stream--Slow, Hard, Warm	Stream--slow, hard, warm	1981	SU	GNR	NA			Y
Submergent marsh	Submergent marsh	2008	S4	G5	NA			Y

Management Opportunities and Considerations for Biodiversity Conservation

Landscape Level Opportunities and Considerations

Wildlife Action Plan Conservation Opportunity Area (COA)

The Wisconsin Wildlife Action Plan (WDNR 2006a) identified multiple COAs in the Western Coulees and Ridges Ecological Landscape, three of which intersect the PWMPG. These three COAs fall within "Large River Corridors," an area identified as having continental significance for conservation (described below). For more details on COAs and the Wildlife Action Plan, see the "Background on Past Efforts" section of this report or the WDNR Endangered Resources web pages.

Large River Corridors – Continental Significance

Description: Large river systems including riparian communities including Warmwater Rivers, Floodplain Forest, Emergent Marsh, Submergent Aquatics, Wild Rice, and Impoundments. Also included are upland communities that range from bluff top to bluff top including Southern Dry Forest, Southern Dry-mesic Forest, Dry Prairie, Oak Woodland, Oak Opening, and Dry Cliff.

COAs within the PWMPG: Mississippi Bluffs & Floodplain, Mississippi River, Trempealeau River

Altered Ecological Processes

The vegetation that historically occurred on PWMPG properties developed within a complex environment comprised of both elements that are relatively static over ecological time (e.g., soils, underlying landforms) and dynamic ecological processes (e.g., hydrological cycles, nutrient cycles, wildfires). Some of the dynamic ecological processes that shaped these landscapes have been altered by humans.

When European settlers first arrived in the early 1800's, the Upper Mississippi River was a mosaic of braided channels and sandbars. Navigation in boats was difficult due to frequently shallow waters and unpredictable changes in water level. The settlers began to modify the river by dredging and clearing in the hopes of transforming it into a boating highway. By the 1900's, the free flowing river had been changed into a channelized version through the use of wing dams and closing dams. By 1930, the U.S. Army Corps of Engineers had built more than 1,000 wing dams on the river and had closed many of the side channels. A progression of 29 locks and dams were eventually completed to allow navigation from Minneapolis to St. Louis; ten locks and dams occur within the Upper Mississippi River. (*Information obtained from WDNR website "Information about the Upper Mississippi River System."*)

How this change in hydrology has impacted the plant and animal communities of the Mississippi River is not entirely known. In general, dams affect aquatic species and habitats by fragmenting them into disjunct segments, preventing the movements of some species between different stretches of the river. Increased water levels associated with dams can displace small mammals due to prolonged flooding and can restrict dispersal corridors and foraging areas of upland small mammals (Bautz 2010). In addition, natural hydrological fluctuations associated with free-flowing rivers and streams are integral to wetlands formed under fluctuating water levels and the many species that depend upon them, including amphibians that rely on a specific hydrological regime to complete certain life-stages (PARC 2002). Canopy tree dominants that may have used the natural hydrological fluctuations to obtain a niche on certain geomorphic surfaces (point bars, levees, swales) may have declined in dominance, while the importance of opportunistic species may have increased (Tingle et al. 2001).

Possibly the most significant impact of these hydrological manipulations is decreased variability of water levels, especially high-water and low-water extremes, and the commensurate alteration of floodplain landform development (sand bars, islands, slough channels, levees, etc.). Since diversity in landforms is correlated with plant species diversity (Crow et al. 2000), this change has the potential to have long-term impacts on plants and community composition. In addition, alterations to flooding regimes affect the inundation period of floodplain habitats. On the Lower Wisconsin River, Pfeiffer (2001) showed that the decrease in maximum flows has a significant impact on the frequency of complete inundation, resulting in a decrease in the amount of time the ridges and higher areas of the floodplain are fully saturated. Oxygen depletion of the root zone thus occurs less frequently, resulting in greater tree survival and possibly more closed-canopy forests. The decrease in flood severity and duration of flood periods may also impact lower-elevation floodplain habitats, as less scouring is occurring and anoxic conditions may not be long enough to favor species that can tolerate these conditions.

Fire is another example of a disturbance which historically played an important role in the landscape but has recently been altered by humans. Fires of varying size, frequency and intensity played a critical role in the development of the natural communities of Perrot State Park. Without regular fire, native woody species can invade and dominate these communities. By volatilizing elevated soil nitrogen, fire also indirectly influences nutrient cycling, shifting conditions to generally favor native plants and to disfavor non-natives. In woodlands, fire facilitates seedling establishment, controls tree species that are not adapted to fire, and prevents smothering of short-statured plants through the removal of leaf litter. In prairies, fire promotes growth, flowering, and overall diversity of native plants by removing excess thatch. Re-introducing fire into an area should be done with consideration of all of the species currently using the habitat and how the fire may impact the amount and quality of habitat available.

Non-Native Invasive Species

Many non-native terrestrial invasive plants, animals and pathogens are present on PWMPG properties and in the surrounding landscape. Non-native invasive species thrive in newly disturbed areas, but also may invade and compromise high-quality natural areas. They establish quickly, tolerate a wide range of conditions, are easily dispersed, and are free of the diseases, predators, and competitors that kept their populations in check in their native range. 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 invasive plants become dominant, they may even alter ecological processes by limiting one's ability to use prescribed fire, by modifying hydrology, and by limiting tree regeneration and ultimately impacting forest composition (WDNR In prep. b). In addition to the threats to native communities and native species diversity, invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading fish and wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters). For example, in bottomland forests, dense patches of reed canary grass can prevent regeneration of trees and a minor infestation can become dense if the canopy is opened beyond 80% cover (WDNR In prep. b).

In terrestrial settings, non-native invasive plants out-compete and even kill native plants by monopolizing light, water, and nutrients, by altering soil chemistry and, in the case of garlic mustard, by altering mycorrhizal relationships (Stinson et al. 2006, Wolfe et al. 2008). In situations where non-native invasive plants become dominant, they may even alter ecological processes by limiting one's ability to use prescribed fire, by modifying hydrology (e.g., reed canary grass can alter surface flow and clog culverts), and by limiting tree regeneration and ultimately forest composition (WDNR In prep. b). In addition to the threats on native communities and native species diversity, terrestrial non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters).

Similar to terrestrial invasives, aquatic invasives are successful because they originate in other regions or continents, thus lacking natural checks and balances. Early and abundant growth of aquatic plants not only overwhelms native plants, it may disrupt aquatic predator-prey relationships by fencing out larger fish, and may limit important aquatic food plants for waterfowl. The die-off of plants such as curly-leaf pondweed in summer can cause oxygen depletion in waterbodies, and decaying plants can contribute to nutrient loading and algal blooms. Aquatic invasive animals similarly present overwhelming competition to their native counterparts (e.g., rusty crayfish [*Orchonectes rusticus*] versus native crayfish). Three species of Asian carp, the silver carp (*Hypophthalmichthys molitrix*), bighead carp (*H. nobilis*), and grass carp (*Ctenopharyngodon idella*) are spreading through the Mississippi River system, posing a fundamental threat to fish assemblages. Another example is invasive mussels, which feed on plants, animals and debris that are suspended in the water, and can lead to increased water clarity and light penetration (fostering overgrowth of rooted aquatic plants), as well as a depleted food supply for native aquatic organisms. Zebra mussels (*Dreissena polymorpha*) not only monopolize resources and alter the aquatic environment, they literally smother native mussels by attaching to their shells in great masses. Apart from environmental impacts, aquatic invasives diminish aquatic recreational resources by inhibiting boat and swimming access, and by negatively affecting game fish populations.

The frequent usage of the PWMPG for recreation has contributed to the introduction and spread of non-native invasive species throughout the properties. Parking areas, trails, and other high-use areas are typical entry points for non-native invasive species that are introduced by visitors' footwear, clothing, vehicle tires, boats, and recreational equipment. Once established, these invasives may continue to spread along natural corridors (e.g., waterways) and along human-made corridors (e.g, trails and roads). They even have the potential to invade remote natural areas via vectors such as wind, water, and wildlife. Non-native invasive species may also be spread inadvertently through management activities such as timber operations and roadside mowing, especially if Best Management Practices aren't followed.

Non-native invasive species that are widespread in the PWMPG and pose the greatest immediate threat to native species diversity, rare species habitats, or high-quality natural communities are listed in Table 4. Although resources for complete control of widespread invasives may be lacking, containment (i.e., limiting further spread) may be considered as an alternative action.



Hydrilla (above) and wild chervil (right) are unknown in the PWMPG, but could appear there in the future. Photos by Elizabeth Czarapata.

Table 4. Non-native invasive species currently known at the PWMPG or in the Upper Mississippi River. Species known to occur along the Great River State Trail at or near Perrot State Park also included.. Chapter NR 40 classification codes in superscript: P = Prohibited, R = Restricted.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Plants							
Amur maple	<i>Acer ginnala</i>	X	X				Moderate but scattered throughout Perrot SP.
Autumn olive ^R	<i>Elaeagnus angustifolia</i>	X					Moderate at Perrot SP.
Common buckthorn ^R	<i>Rhamnus cathartica</i>	X	X	X	X		Common at Perrot SP.
Creeping bellflower ^R	<i>Campanula rapunculoides</i>	X	X				Moderate at Perrot SP.
Curly-leaf pondweed ^R	<i>Potamogeton crispus</i>					X	Common throughout Upper Mississippi.
Dame's rocket ^R	<i>Hesperis matronalis</i>	X	X	X	X		Moderate at Perrot & Merrick SP, extensive along Great River State Trail.
English ivy	<i>Hedera helix</i>	X	X				Present at Perrot SP.
Eurasian bush honeysuckles ^R	<i>Lonicera</i> spp.	X	X				Present at Brady's Bluff Prairie SNA.
Eurasian water milfoil ^R	<i>Myriophyllum spicatum</i>					X	Common throughout Upper Mississippi.
Garden forget-me-not	<i>Myosotis sylvatica</i>		X				Moderate at Perrot & Merrick SP.
Garlic mustard ^R	<i>Alliaria petiolata</i>		X		X		Common in campgrounds, moderate elsewhere.
Helleborine ^R	<i>Epipactis helleborine</i>		X				Present at Perrot SP.
Japanese barberry	<i>Berberis thunbergii</i>		X				Widespread at Perrot SP.
Knotweed sp (giant ^P or Japanese ^R)	<i>Polygonum sachalinense</i> or <i>P. cuspidatum</i>	X		X			In home garden on road between Trempealeau and Perrot SP, and along Great River State Trail.
Leafy spurge ^R	<i>Euphorbia esula</i>	X					Common at Brady's Bluff Prairie SNA.
Moneywort	<i>Lysimachia nummularia</i>			X	X	X	Common at Whitman Dam SWA, Whitman Bottoms SNA & Merrick SP, moderate at Perrot SP.
Multiflora rose ^R	<i>Rosa multiflora</i>	X	X				Moderate at Perrot & Merrick SP and along Great River State Trail.
Narrow-leaved cattail ^R	<i>Typha angustifolia</i>			X			At Whitman Dam SWA??

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Plants (continued)							
Oriental bittersweet ^R	<i>Celastrus orbiculatus</i>	X	X				Widespread at Perrot & Merrick SP and Great River State Trail.
Purple loosestrife ^R	<i>Lythrum salicaria</i>			X			Rare at Whitman Bottoms SNA. New infestation at Trempealeau Bay (Perrot SP) & Merrick SP.
Reed canary grass	<i>Phalaris arundinacea</i>			X	X		Common at Whitman Dam SWA.
Siberian elm	<i>Ulmus pumila</i>	X		X			Abundant in old fields at Merrick SP.
Spotted knapweed	<i>Centaurea biebersteinii</i>	X					Along Great River State Trail.
Water hyacinth	<i>Eichhornia crassipes</i>					X	Documented in Pool 5 in 2011.
Water lettuce	<i>Pistia stratiotes</i>					X	Documented in Pool 5 in 2011.
White mulberry	<i>Morus alba</i>	X	X				Present at Perrot SP.
White sweet clover	<i>Melilotus alba</i>	X					Present at Brady's Bluff Prairie SNA.
Yellow sweet clover	<i>Melilotus officinalis</i>	X					Present at Brady's Bluff Prairie SNA.
Animals							
Bighead carp ^P	<i>Hypophthalmichthys nobilis</i>					X	Documented in Pool 6 in 2012.
Emerald ash borer ^P	<i>Agrilus planipennis</i>		X		X		Nearest occurrences in LaCrosse, Vernon, & Crawford Counties.
European earthworms	Families of <i>Acanthodrilidae</i> , <i>Lumbricidae</i> , and <i>Megascolecidae</i>	X	X				Present in region.
Faucet snail ^P	<i>Bithynia tentaculata</i>					X	Present in Upper Mississippi River.
Grass carp ^P	<i>Ctenopharyngodon idella</i>					X	Documented in Pool 6 in 2012.
Quagga mussel ^P	<i>Dreissena bugensis</i>					X	Present in Upper Mississippi River.
Rusty crayfish ^R	<i>Orconectes rusticus</i>					X	Present in Upper Mississippi River.
Silver carp ^P	<i>Hypophthalmichthys molitrix</i>					X	Documented in Pool 6 in 2012.
Zebra mussel ^R	<i>Dreissena polymorpha</i>					X	Several thousand per square meter in some portions of the Upper Mississippi River.

Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010). A number of non-native invasive species are, in fact, new or are not yet widespread at PWMPG properties, or are known in the vicinity (Table 5); monitoring for these species and rapid response to small infestations represent high-impact actions.

Table 5. Non-native invasive species currently unknown at PWMPG, but could appear there in the future. Chapter NR 40 classification codes in superscript: P = Prohibited, R = Restricted.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Plants							
Amur honeysuckle ^P	<i>Lonicera maackii</i>	X	X				NR 40 Prohibited in Trempealeau & Buffalo Counties.
Black swallowwort ^P	<i>Vincetoxicum nigrum</i>	X	X				NR 40 Prohibited in Trempealeau & Buffalo Counties.
Blackberry lily	<i>Belamcanda chinensis</i>	X	X				Known in Grant & Crawford Counties.
Brazilian waterweed ^P	<i>Egeria densa</i>					X	Unknown in Wisconsin.
Canada thistle ^R	<i>Cirsium arvense</i>	X	X	X			Present in region.
Celandine	<i>Chelidonium majus</i>		X				Present in region.
Common tansy	<i>Tanacetum vulgare</i>	X					Present in region.
Crown vetch	<i>Coronilla varia</i>	X					Present in region.
Dame's rocket	<i>Hesperis matronalis</i>		X		X		Present in region.
Didymo	<i>Didymosphenia geminata</i>					X	Unknown in Wisconsin.
Giant manna grass ^P	<i>Glyceria maxima</i>			X	X		NR 40 Prohibited in Trempealeau & Buffalo Counties.
Hydrilla ^P	<i>Hydrilla verticillata</i>					X	Unknown in Wisconsin.
Japanese hedgeparsley	<i>Torilis japonica</i>	X	X				Present in region.
Japanese hops ^P	<i>Humulus japonicus</i>	X		X	X		NR 40 Prohibited in Trempealeau & Buffalo Counties.
Japanese knotweed ^R	<i>Polygonum cuspidatum</i>	X	X	X	X		Present in region.
Multiflora rose	<i>Rosa multiflora</i>	X	X				Present in region.
Oriental bittersweet	<i>Celastrus orbiculatus</i>	X	X				Present in region.
Phragmites ^R	<i>Phragmites australis</i>	X		X			Present in region.
Poison hemlock ^P	<i>Conium maculatum</i>	X		X			NR 40 Prohibited in Trempealeau & Buffalo Counties.
Spotted knapweed ^R	<i>Centaurea biebersteinii</i>	X					Present in region.
Teasel spp. ^R	<i>Dipsacus spp</i>	X					Present in region.
Water dropwort	<i>Oenanthe javonica</i>					X	Unknown in Wisconsin.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Animals (continued)							
Wild chervil ^P	<i>Anthriscus sylvestris</i>	X	X				NR 40 Prohibited in Trempealeau & Buffalo Counties.
Wild parsnip ^R	<i>Pastinaca sativa</i>	X		X			Present in region.
Yellow floating heart ^P	<i>Nymphoides peltata</i>					X	Unknown in Wisconsin.
Animals							
Asian clam ^P	<i>Corbicula fluminea</i>					X	Known in Mississippi River.
Banded mystery snail	<i>Viviparus georgianus</i>					X	
Chinese mystery snail ^R	<i>Cipangopaludina chinensis</i>					X	
Japanese mystery snail	<i>Cipangopaludina japonica</i>					X	
New Zealand mud snail ^P	<i>Potamopyraus antipodarum</i>					X	
Red swamp crayfish ^P	<i>Procambarus clarkii</i>			?	?	X	On Mississippi River, closest popn in northern Illinois.
Fungus & Other Pathogens							
Oak wilt	<i>Ceratocystis fagacearum</i>		X		X		Present in region.
Viral hemorrhagic septicemia						X	

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups. Also refer to invasive species Best Management Practices (BMPs) for forestry, recreation, urban forestry, and rights-of-way, which were developed by the Wisconsin Council on Forestry (<http://council.wisconsinforestry.org/>).

Wisconsin's Statewide Forest Strategy

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

All three of these documents include topics related to biological diversity in Wisconsin's forests, and provide information useful for department master planning and management activities. The following strategies, organized using their number in the Statewide Forest Strategy document, are particularly pertinent to the PWMPG planning efforts in terms of opportunities to maintain or enhance biological diversity (WDNR 2010b).

Strategy Number	Strategy
1	Encourage planting to enhance, protect, and connect larger tracts of forested land in appropriate locations consistent with ecological landscapes.
5	Pursue the conservation and protection of large, unfragmented blocks of forest lands.
11	Encourage the management of under-represented forest communities.
12	Improve all forested communities with a landscape management approach that considers the representation of all successional stages.
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.
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.
29	Attempt to improve the defenses of the forest and increase the resilience of natural systems to future climate change impacts.
30	Intentionally accommodate (climate) change and enable forest ecosystems to adaptively respond.

High Conservation Value Forests

The Wisconsin DNR manages 1.5 million acres that are certified by the Forest Stewardship Council (FSC) (Forest Stewardship Council 2009) and the Sustainable Forest Initiative (SFI). 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:

- 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.
- Rare, threatened, or endangered ecosystems.
- Basic services of nature in critical situations (e.g., watershed protection, erosion control).
- Fundamental meeting of basic needs of local communities (e.g., subsistence, health).

- Critical to local communities’ traditional cultural identity (areas of cultural, ecological, economic, or religious significance identified in cooperation with such local communities).

Community Level Opportunities and Considerations

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006a) identifies 37 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Western Coulees & Ridges** Ecological Landscapes. Fourteen of these natural communities are present on PWMPG properties:

<u>Major Opportunity</u>	<u>Important Opportunity</u>
Warmwater Rivers	Southern Sedge Meadow
Emergent Marsh	
Submergent Marsh	
Shrub-carr	
Floodplain Forest	
Moist Cliff	
Dry Prairie	
Oak Opening	
Oak Woodland	
Sand Prairie	
Southern Dry Forest	
Southern Dry-mesic Forest	
Surrogate Grassland	

Although all of the above communities have been identified on PWMPG, only some are high quality, or have medium to high restoration potential. These include:

Dry Prairie, Oak Opening, Oak Woodland

Perrot State Park and associated SNAs offer a major opportunity to restore Dry Prairie and two oak savanna types (Oak Opening and Oak Woodland) within a Southern Dry/Dry-mesic Forest matrix; restoration will also benefit the many rare plant and animal specialists that rely on these habitats. Restoring a complete continuum of light regimes and structural attributes (prairie-to-savanna-to-forest) will benefit the greatest number of species within this landscape. This goal is attainable at Perrot State Park, where a great variety of soil moisture regimes, slopes and aspects are represented.

Historically, Oak Openings were abundant in Wisconsin, covering approximately 5.5 million acres (Curtis 1959) south of the Tension Zone. Review of historic literature indicates that Oak Openings once supported an exceptionally diverse flora, about 25% of the entire native flora of Wisconsin (Leach and Givnish 1999). Of the about 75,000 acres (Hoffman 2009) of Oak Opening remaining in Wisconsin, many of these are highly degraded or have succeeded to closed-canopy oak forests. The few extant remnants are mostly on drier sites, with the mesic and wet-mesic Oak Openings almost totally destroyed by conversion to agricultural or residential uses and by the encroachment of other woody plants due to fire suppression. Small and degraded Oak Opening remnants are scattered throughout Perrot State Park.



Red-headed woodpecker is an oak savanna specialist. Photo by Dave Menke.

Oak Woodland is another savanna type that once occupied approximately 1.4 million acres (Curtis 1959) in Pre-European settlement Wisconsin; today, it is extraordinarily rare – only about 140,000 acres remain in the state (Hoffman 2009). Most of these remnants are highly degraded and have converted to closed-canopy oak forest; at Perrot State Park, many areas that are currently identified as "Southern Dry Forest" are in fact degraded Oak Woodland.

Prairie once occupied approximately 2.1 million acres in Wisconsin. Now, approximately 2,000 acres remain – less than 0.1% (Leach and Givnish 1999). Of these, only those prairies that occurred at the wet and dry ends of the soil spectrum survived. Virtually all deep-soil Mesic Prairies were converted to agricultural or residential uses. The surviving remnants are highly degraded due to fire suppression, over-grazing, and invasion of native woody species and non-native invasive species. Wisconsin has more Dry Prairies than any other state in the Great Lakes region 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 (WDNR 2006b). At Perrot State Park, numerous remnants are found on shallow rocky soils, often on steep south- and west-facing slopes. These prairie remnants range from fair quality (e.g., Trempealeau Mountain SNA) to excellent quality (Brady's Bluff Prairie SNA), have high restoration potential, and support numerous rare plants, reptiles, butterflies and moths, and a State-Threatened snail.

Typical oak savanna restorations in Wisconsin require aggressive and intensive management for a period of 15 or more years. This reflects the highly degraded state of most sites, and the time and effort required to effectively restore system structure and function. Be aware that limited short-term efforts could result in merely a structural restoration with limited ecosystem functionality (e.g., appropriate ground flora, nutrient pools, microbial communities, etc.), and may be considered wasteful. Also bear in mind that many former Oak Woodlands are now closed-canopy forests that provide critical habitat for numerous bird species. Ecological restoration that converts closed-canopy forests to Oak Woodland may benefit some savanna specialist species at the expense of other species. As with all ecological restoration opportunities, sufficient resources must be available to ensure success of the project before the difficult decision of limiting habitat for some species in favor of other species is made. Within the two State Natural Areas of Perrot State Park, reference to the "Oak Savanna Management Guide" in the WDNR State Natural Area Handbook should be made; this may also serve as a helpful reference for oak savanna management throughout the State Park.

Floodplain Forest

A major opportunity exists to manage for a large expanse of Floodplain Forest at Whitman Dam Wildlife Area. Floodplain Forests were uncommon historically, occupying only about 3% of the Western Coulee and Ridges Ecological Landscape and even smaller percentages of other Ecological Landscapes (Finley 1976). The acreage of Floodplain Forest in Wisconsin has been steadily increasing from 1% historically to about 9% of all forest land currently (WDNR 2010c). Not only could the Whitman/Merrick Floodplain Forest serve as an important ecological reference site for this community type, but its restoration will benefit a number of rare forest interior birds. Forest restoration will also help maintain water quality in the backwaters, channels, and sloughs within the forest matrix that serve as important spawning, nursery, dwelling, and over-wintering areas for both sport fish and rare non-sport fish.

Changes to the historical hydrological regimes of the Upper Mississippi River are described in the previous "Altered Ecological Processes" section above. Although these alterations have undoubtedly impacted the Floodplain Forest of Whitman Dam Wildlife Area, understanding precisely how they have changed the composition, structure, and age class distribution of this forest ecosystem is difficult. This and many other Floodplain Forests in Wisconsin may, in fact, be transitioning to novel ecosystems due to hydrological manipulation. Ecological restoration that aims to restore plant communities to reflect

undisturbed conditions may not be appropriate, at least in this setting, given the long history of hydrological modification and other disturbances here (Tingle et al. 2001). Given that many of the changes to these forests were made by factors that are likely to continue into the future, key management considerations involve determining how to maximize beneficial changes to these forests (e.g., habitat for rare and declining species) while reducing the less beneficial aspects (e.g., ecological simplification).

Species or Taxa Level Opportunities and Considerations

Wildlife Action Plan Priority Communities and Conservation Actions

The Wisconsin Wildlife Action Plan identifies ecological priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Appendix E highlights the Ecological Priorities for vertebrate SGCN of the PWMPG. Note that these Ecological Priorities include all of the natural communities that we have determined to provide the best opportunities for management at the PWMPG 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 the PWMPG. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006a) for the Western Coulees & Ridges Ecological Landscapes that apply to the PWMPG include:

- Focus management and restoration efforts in the sandstone-influenced Conservation Opportunity Areas to emphasize dry oak savanna, oak woodland and sand prairie communities with smaller embedded patches containing oak forest, pine relicts, dry prairie, open shrubby barrens, closed canopy oak forest, and rock outcrops.
- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide migratory bird stopover habitat, and provide suitable habitat for species that require large areas or are dependent upon a mosaic of interconnected habitats, including a full range of seral stages, for their long-term survival.
- Maintain and connect large blocks of older floodplain forest to provide habitat for the large number of SGCN that utilize this habitat while addressing the regeneration difficulties associated with dense stands of reed canary grass.
- Conduct large-scale planning efforts with state agencies and partners regarding the Upper Mississippi River and its adjacent bluffslands.
- Restore oak openings and woodlands and expand and enhance dry prairie and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
- Conduct inventories to better delineate Cerulean Warbler populations on public and private lands.
- Protect and restore appropriate habitat in the Mississippi and Lower Wisconsin Rivers for Shoal Chub (*Macrhybopsis aestivalis*).

Reptile and Amphibian Conservation

As noted previously, the study area falls within the Western Coulees and Ridges Ecological Landscape, an area offering the best opportunities in the state for herptile conservation. There are 17 herptile species significantly associated with this Ecological Landscape, more than in any other ecological landscape in Wisconsin (WDNR 2006a). The importance for herptiles in this region stems from the diversity of habitats present here, including undeveloped landscapes, and dry bluff prairies, large river systems and their associated wetlands. Good-quality examples of these habitats are found within the project area, and six rare reptiles have been documented from the study area. Remnants of prairies and Oak Opening/Woodland are all critically important habitats for snakes and lizards. Aquatic resources and wetlands associated with streams and rivers of the Driftless Area provide habitat for many amphibians and turtle species.

Habitat loss is a major threat to reptile populations. Perrot State Park offers significant opportunities for coordinated management of prairies and Oak Opening/Woodland, critical habitats for a suite of declining reptiles. By providing a continuum of these management dependant natural communities, the habitat needs for numerous wildlife species are maximized, and their safe movement from one location to the next is ensured. Birds are extremely mobile, but other animals like small mammals and herptiles need to have suitable habitat connections to enable them to repopulate areas and to fulfill their life history requirements. The Driftless Area historically provided large expanses of prairie and savanna with connections to limestone outcrops and Oak Opening/Woodland. These connections are significant for improving snake and lizard populations by enabling access to critical areas for basking and thermoregulation, overwintering, staging, nesting, and foraging. Management aimed at retaining or restoring open qualities of prairies, barrens, and savannas by controlling brush and invasive species would benefit many reptile species. Maintaining open prairie and savanna habitats for herptiles will also benefit many invertebrate species that rely on these habitat types as well.

Large river systems like the Mississippi River are significant repositories for biological diversity, harboring rare species assemblages not found in other parts of Wisconsin. Both the false map turtle (*Graptemys pseudogeographica*) and smooth softshell turtle (*Apalone mutica*) are restricted to large river systems in the state. These species are found solely on the Mississippi, Wisconsin, and Black Rivers. The PWMPG presents an important opportunity to conserve these range-restricted species. The extensive wetlands found at all three of the properties in the study area and associated with the Mississippi River floodplain are important habitats for rare species like Blanding's turtles (*Emydoidea blandingii*) and northern leopard frog (*Lithobates pipiens*), as well as common amphibians and turtles.

Bird Conservation

The Mississippi River, flowing 2,552 miles from its point of origin in Itasca State Park in Minnesota to the Gulf of Mexico, is the third longest river in North America. The river serves as the basis for the Mississippi Flyway, the longest migration route of any in the Western Hemisphere. Well-timbered and watered, the flyway affords ideal conditions to support large numbers of migrating birds. Forty percent of the nation's migratory waterfowl use the river corridor during their spring and fall migration, and 60% of North American birds (326 species) use the Mississippi River Basin as their migratory flyway (*Mississippi River Facts*). Within the Upper Mississippi River Basin, loss of migratory bird habitat was noted as one of three key issues impacting the area (UMFP 2008). Conservation of this important resource is of major ecological importance in the Western Coulees and Ridges Ecological Landscape and for this property group (WDNR In Prep.a).

The total land area for the Western Coulee and Ridges Ecological Landscape is approximately 6.2 million acres, of which 38% is classified as timberland, and only a small percentage (3%) is in protected public land ownership (WDNR In Prep.a). Important opportunities exist in the PWMPG to provide large blocks

of forest spanning from the mature Floodplain Forests in the valley bottoms to Southern Dry-mesic Forests on the steep slopes rising from the floodplain terrace. These areas provide important habitat for forest interior birds, many of which have had significant population declines in Wisconsin and throughout their range, further reinforcing the importance of these areas for providing habitat. For example, Breeding Bird Survey data show an annual decline of 4.4% for cerulean warblers in Wisconsin (Mossman 2006). Maintaining and expanding large blocks of contiguous, older forests in southwestern Wisconsin is critical for the future of many forest interior birds. The project area offers opportunities, within the landscape context of the Upper Mississippi River Fish and Wildlife Refuge, to provide habitat for these species. Both of the Primary Sites for this planning group offer excellent habitat and likely support source populations of forest interior birds.

Oak Opening and Oak Woodlands, in the context of large contiguous forest patches, can provide a 'soft edge' between other habitat types and a closed-canopy forest. Rare and declining savanna specialists that would benefit from a more open canopy include brown thrasher (*Toxostoma rufum*), field sparrow (*Spizella pusilla*) and red-headed woodpecker (*Erythrocephalus melanerpes*) -- all SGCN that are currently known at Perrot State Park. Oak Woodland restoration, within a large forested area, could promote understory growth and development of



Brown thrasher. Photo by Ken Thomas.

full-canopied oaks that produce horizontal limb structure for nesting that is favorable for cerulean warblers and other area-sensitive species such as Kentucky warbler (*Oporornis formosus*), hooded warbler (*Wilsonia citrina*), veery (*Catharus fuscescens*), and wood thrush. Creating a continuum of open bluff prairies grading to Oak Opening/Woodland and closed canopy forest should be explored at Perrot State Park to meet the needs of prairie reptiles and Lepidoptera along with forest birds.

Open wetland types including Emergent Marsh and Submergent Marsh are not common in the Western Coulees and Ridges Ecological Landscape, but examples are present within major river bottoms including the Mississippi River. There are several large, high-quality marsh complexes in the PWMPG supporting a unique assemblage of secretive marsh-dwelling birds. Uncommon marsh and wading birds known from the project area include least bittern (*Ixobrychus exilis*), black tern (*Chlidonias niger*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and great egret (*Ardea alba*).

Invertebrate Conservation

A significant opportunity for invertebrate conservation exists at Perrot State Park on the site's remnant Dry Prairies. Three rare butterflies and moths have been identified here, as well as a rare snail. Other Dry Prairie remnants within the park may also hold potential for supporting rare invertebrates.

Many butterflies and moths exclusively rely on one or a small number of plant species for larval feeding and adult nectaring, making them vulnerable to population losses if the habitats that support their host plants are lost or become degraded. Their eggs are deposited in proximity to larval host plants, presenting a challenge for property managers who wish to restore or maintain prairie habitat through the use of prescribed fire. Invasion of woody species and non-native invasive plants can degrade prairie habitat and thus diminish habitat for rare invertebrates.

We know that many invertebrates are remnant²-dependant (an estimated 2,000 in Wisconsin prairies [Panzer et al. 2010]), and that approximately one-third of these are sensitive to dormant-season fire. The challenge for managers lies in minimizing negative impacts to invertebrate populations while maintaining the long-term viability of populations and their habitat. Mark Martin and Randy Hoffman addressed this subject in "Managing Lepidoptera on State Natural Area Prairies" on the WDNR website:

The extensive fires that occurred in this landscape prior to European settlement killed billions of insects each and every time they occurred. However, these fires rarely burned the entire landscape. Patches of habitat were often left unburned and patterns of burn intensity varied enough to reduce the impacts on insects. Following these fires, the incredible fecundity (ability to reproduce) of most insects would permit rapid recolonization of their habitat.

In today's landscape, though, prairies are fragmented into smaller remnants, which often are separated by miles of unacceptable habitat for certain Lepidoptera (butterflies, skippers, and moths). Could our prescribed burning or other management eliminate a rare butterfly population?

Lepidoptera management is a subject area with much speculation and strongly held views. Endangered Resources staff have talked to butterfly experts and attended workshops on Lepidoptera management and have learned that prescribed burning must be done with care to avoid inadvertently stressing a species beyond recovery. Some Lepidoptera species are clearly sensitive to fire. For many, recolonization accelerates population recovery. Since it is difficult to say with certainty how a species will recover when burning an entire site, it is important that we take precautions to protect populations of these species when conducting burns. One way to preserve prairie insects is to divide the area to be burned into units and burn some, but not all, of those units in any one year. We incorporate this technique into the management plans for all of our State Natural Areas. First, we determine management goals for the entire natural area. In the case of prairie communities, a major goal usually includes improving the quality and size of the prairies through burning. Then we determine what species of concern are found on a particular area and which of these will be affected by our management. Larger prairie areas increase the likelihood that the affected species can be retained. The area is divided into burn units, and we devise a burning schedule that will allow those rare species to seek shelter in the unburned areas or build up a population large enough to recolonize the burned area, in case such backup is needed.

A State-Threatened snail is also found at Perrot State Park. This species is found only on good-quality Dry Prairie remnants with southern or western facing exposures. This species resides in areas of accumulated leaf litter adjacent to or on rock outcrops within an open prairie matrix. Since this snail is dependent on the accumulation of thatch, total destruction of all leaf litter at a site is detrimental. Similar to the rare butterflies and moths, snails may disappear from a site if their prairie home becomes overgrown with woody species.

² A remnant prairie has never been plowed, and has managed to persist in a relatively intact state since its original development. Prairie plantings (former agricultural lands that have been seeded with native prairie species) lack many of the ecosystem functions and conservative/rare plants and animals that are associated with original remnant prairies. Remnant-dependent invertebrates typically will not accept prairie plantings as a replacement for remnant habitat.

Fish Conservation

(This section developed from personal communications with John Lyons, WDNR and Dave Marshall, WDNR [retired].)

The backwaters, sloughs, channels and Emergent/Submergent Marsh areas of Whitman Dam Wildlife Area and Merrick State Park provide important habitat for a variety of sport fish, commercial fish, and non-sport fish species. A number of rare fish species rely exclusively on this type of backwater habitat, while others utilize backwater habitat for a brief but critical period of their lives, usually soon after hatching during the first summer of their lives. Many sport fish use the backwaters for nursery habitat, including northern pike (*Esox lucius*), white bass (*Morone chrysops*), sauger (*Sander canadensis*), and walleye (*Sander vitreus*). Some rare fishes that are primarily denizens of the main river channel may also visit backwater areas for feeding or to find refuge from high water flows.



Walleye. Photo by Eric Engbretson, U.S. Fish & Wildlife Service.

Key considerations for ensuring good backwater fish habitat are as follows: 1) To the extent possible, maintain natural hydrology and connectivity with the main river channel so that fish can move freely between the main channel and the backwaters as water levels rise and fall with the seasons – construction of dikes or berms for artificial water level manipulation may limit this; 2) Limit or reduce sedimentation from adjacent uplands, and promote and

maintain clean upland groundwater flow to the backwaters; 3) Minimize dredging and rip-rapping within the backwater areas except as necessary to maintain connectivity; 4) Limit introduction and spread of aquatic invasive species; and 5) Restore and maintain native aquatic plant communities (especially floating-leaved plants), and retain trees and tree roots that overhang the water.

Primary Sites: Site-specific Opportunities for Biodiversity Conservation

Two ecologically important sites were identified at the PWMPG (Figure 6). 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.

Descriptions for each of the Primary Sites can be found in Appendix G. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations. Appendix H lists the rare species and high-quality natural communities currently known from the PWMPG by Primary Site.

PWMPG Primary Sites

- CMPW01** Whitman Dam Wildlife Area
- CMPW02** Perrot Forests and Prairies



Figure 6. Primary Sites of the PWMPG.

Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for the PWMPG. Although the report should be considered 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 contained in the PWMPG.

- Continued non-native invasive species monitoring and control is needed. Public lands throughout Wisconsin are facing major management problems because of serious infestations of highly invasive non-native 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 the PWMPG, a comprehensive non-native invasive species monitoring and control plan will be needed for detecting and rapidly responding to new non-native invasive threats.
- Invertebrate (insect and terrestrial snail) surveys are recommended in the remnant Dry Prairie areas of Perrot State Park.
- Reptile surveys are recommended in the oak savanna and prairie habitats at Perrot State Park.
- Bat surveys are recommended at all PWMPG sites.
- Backwater fish surveys are recommended at Whitman Dam Wildlife Area.
- Rare plant surveys targeting old records of previously reported species are recommended.

Glossary

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.

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, bat hibernacula, and mussel beds. In short, an element is any biological or ecological entity upon which we wish to gather information for conservation purposes.

element occurrence - an Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historic) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., a single nest territory or long distance dispersers) or a group of nearby populations (e.g., metapopulation). For communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

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.

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

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

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

Species List

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

Animals	
Common Name	Scientific Name
bald eagle	<i>Haliaeetus leucocephalus</i>
bighead carp	<i>Hypophthalmichthys nobilis</i>
black buffalo	<i>Ictiobus niger</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
blue sucker	<i>Cycleptus elongatus</i>
brown thrasher	<i>Toxostoma rufum</i>
eastern meadowlark	<i>Sturnella magna</i>
false map turtle	<i>Graptemys pseudogeographica</i>
field sparrow	<i>Spizella pusilla</i>
grass carp	<i>Ctenopharyngodon idella</i>
great blue heron	<i>Ardea herodias</i>
hooded warbler	<i>Wilsonia citrina</i>
Kentucky warbler	<i>Oporornis formosus</i>
northern leopard frog	<i>Lithobates pipiens</i>
northern pike	<i>Esox lucius</i>
red-headed woodpecker	<i>Erythrocephalus melanerpes</i>
rusty crayfish	<i>Orchonectes rusticus</i>
sauger	<i>Sander canadensis</i>
silver carp	<i>Hypophthalmichthys molitrix</i>
veery	<i>Catharus fuscescens</i>
walleye	<i>Sander vitreus</i>
white bass	<i>Morone chrysops</i>
wood thrush	<i>Hylochila mustelina</i>
yellow-billed cuckoo	<i>Coccyzus americanus</i>
yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
zebra mussel	<i>Dreissena polymorpha</i>
Plants	
Common Name	Scientific Name
American hazelnut	<i>Corylus americana</i>
American pasque-flower	<i>Anemone patens</i>
arrowheads	<i>Sagittaria</i> spp.
basswood	<i>Tilia americana</i>
big bluestem	<i>Andropogon gerardii</i>
black oak	<i>Quercus velutina</i>
bladderworts	<i>Utricularia</i> spp.
bottlebrush grass	<i>Elymus hystrix</i>
brambles	<i>Rubus</i> spp.
bulblet fragile fern	<i>Cystopteris bulbifera</i>
bulrushes	<i>Scirpus acutus</i> , <i>S. fluviatilis</i> , and <i>S. validus</i>
cat-tails	<i>Typha</i> spp.
common spiderwort	<i>Tradescantia ohiensis</i>

Plants (continued)	
Common Name	Scientific Name
early horse-gentian	<i>Triosteum aurantiacum</i>
eastern cottonwood	<i>Populus deltoides</i>
eastern shooting-star	<i>Dodecatheon meadia</i>
eelgrass	<i>Vallisneria americana</i>
false Solomon's-seal	<i>Maianthemum racemosum</i>
giant reed	<i>Phragmites australis</i>
gray dogwood	<i>Cornus racemosa</i>
green ash	<i>Fraxinus pensylvanica</i>
hairy four-o'clock	<i>Mirabilis albida</i>
hairy grama	<i>Bouteloua hirsuta</i>
hoary puccoon	<i>Lithospermum canescens</i>
hog-peanut	<i>Amphicarpaea bracteata</i>
lead-plant	<i>Amorpha canescens</i>
lion's-foot	<i>Prenanthes alba</i>
little bluestem	<i>Schizachyrium scoparium</i>
marsh spike-rush	<i>Eleocharis palustris</i>
moneywort	<i>Lysimachia nummularia</i>
New Jersey tea	<i>Ceanothus americana</i>
northern fragile fern	<i>Cystopteris fragilis</i>
old field goldenrod	<i>Solidago nemoralis</i>
pickerel-weed	<i>Pontederia cordata</i>
plains muhly	<i>Muhlenbergia cuspidata</i>
poison ivy	<i>Toxicodendron radicans</i> var. <i>negundo</i>
poke milkweed	<i>Asclepias exaltata</i>
pondweeds	<i>Potamogeton</i> spp.
prairie larkspur	<i>Delphinium carolinianum</i>
prairie rose	<i>Rosa arkansana</i>
prairie sagebrush	<i>Artemisia frigida</i>
red oak	<i>Quercus rubra</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
river bank grape	<i>Vitis riparia</i>
river birch	<i>Betula nigra</i>
side-oats grama	<i>Bouteloua curtipendula</i>
silver maple	<i>Acer saccharinum</i>
slender cliff brake	<i>Cryptogramma stelleri</i>
slender naiad	<i>Najas flexilis</i>
starry campion	<i>Silene stellata</i>
Sullivant's cool-wort	<i>Sullivantia renifolia</i>
swamp white oak	<i>Quercus bicolor</i>
water-milfoil	<i>Myriophyllum</i> spp.
water-plantains	<i>Alisma</i> spp.
waterweed	<i>Elodea canadensis</i>
white camas	<i>Zigadenus elegans</i> var. <i>glaucus</i>
white grass	<i>Leersia virginica</i>
white oak	<i>Quercus alba</i>

Plants (continued)	
Common Name	Scientific Name
white sage	<i>Artemisia leudoviciana</i>
wild bergamot	<i>Monarda fistulosa</i>
wild geranium	<i>Geranium maculatum</i>
wild roses	<i>Rosa</i> spp.
wood nettle	<i>Laportea canadensis</i>
woodland sunflower	<i>Helianthus strumosus</i>
yellowbud hickory	<i>Carya cordiformis</i>

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Additional Resources

Numerous online resources are available for learning more about the rare species, natural communities, and ecological concepts contained within this report. These are just a few of the resources that we recommend. Use the WDNR search function to locate the appropriate and up-to-date WDNR web pages.

1. Bureau of Endangered Resources' Animals, Plants, and Communities Web Pages

Information for plants, animals, and natural communities on the Wisconsin Working List, as well as Species of Greatest Conservation Need from the Wisconsin Wildlife Action Plan. For reptiles and amphibians, information for more common species is also provided here. At this time, the level of detail available varies among species; some have detailed factsheets while others have only a short paragraph or a map. These pages will continue to evolve as more information becomes available and are the Bureau of Endangered Resources' main source of information for species and communities. *Go to the WDNR web pages and search "Endangered Resources" or "ER"*.

2. Wisconsin Natural Heritage Inventory Working List

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. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. *Go to the WDNR web pages and search "working list"*

3. Ecological Landscapes of Wisconsin Handbook

Wisconsin's 16 Ecological Landscapes have unique combinations of physical and biological characteristics such as climate, geology, soils, water, or vegetation. This handbook will contain a chapter for each of these landscapes with detailed information about their ecology, socioeconomics, and ecological management opportunities. An additional introductory chapter will compare the 16 landscapes in numerous ways, discuss Wisconsin's ecology on the statewide scale, and introduce important concepts related to ecosystem management in the state. The full handbook is in development as of this writing, and chapters will be made available online as they are published. Currently, a set of Web pages provide brief Ecological Landscape descriptions, numerous maps, and other useful information, including management opportunities for natural communities and Species of Greatest Conservation Need. *Go to the WDNR web pages and search "ecological landscape"*.

4. The Wisconsin Wildlife Action Plan

This plan is the result of a statewide effort to identify native Wisconsin animal species of greatest conservation need. The plan also presents priority conservation actions to protect the species and their habitats. The plan itself is available online, and there are several online tools to explore the data within the plan. The Web pages are closely integrated with the pages provided in items #1 and #3 above. The Wildlife Action Plan Web pages are quite numerous, so we recommend the following links as good starting points for accessing the information.

- the plan itself: dnr.wi.gov/org/land/er/wwap/
- explore Wildlife Action Plan data: dnr.wi.gov/org/land/er/wwap/explore/
- Wildlife Action Plan Implementation: dnr.wi.gov/org/land/er/wwap/implementation/

5. **Wisconsin's Biodiversity as a Management Issue - A Report to Department of Natural Resources Managers**

This now out-of-print report presents a department strategy for conserving biological diversity. It provides department employees with an overview of the issues associated with biodiversity and provides a common point of reference for incorporating the conservation of biodiversity into our management framework. The concepts presented in the report are closely related to the material provided in this report, as well as the other resources listed in this section.

dnr.wi.gov/org/es/science/publications/rs915_95.htm

6. **Wisconsin's Statewide Forest Strategy**

Wisconsin's Statewide Forest Strategy is a collection of many strategies and actions designed to address major issues and priority topics over the next five to ten years. It provides a long-term, comprehensive, coordinated approach for investing resources to address the management and landscape priorities identified in the Statewide Forest Assessment. Several of the strategies contain issues related to biodiversity and ecosystem management.

dnr.wi.gov/forestry/assessment/strategy/overview.htm

7. **2010 Wisconsin's Statewide Forest Assessment**

The goal of this project was to assess the "state of affairs" of Wisconsin's public and private forests and analyze the sustainability of our forested ecosystems. The Statewide Forest Assessment helps to explain trends, identify issues, and present an updated view of the status of forests in Wisconsin. The first chapter deals with biological diversity in Wisconsin's forests, and the major conclusions from this assessment were used to develop the strategies in # 6 above.

dnr.wi.gov/forestry/assessment/strategy/assess.htm

8. **Oak Savanna State Natural Area Management Guide (Oak Opening, Oak Woodland, Oak Barrens). Chapter 100.60 of WDNR State Natural Areas Handbook.**

This management guide contains the Wisconsin Department of Natural Resources' format for addressing actions on State Natural Areas where the primary feature is oak savanna (more specifically, Oak Opening, Oak Woodland and Oak Barrens). The guide was developed in consultation with Department of Natural Resources savanna management specialists and property managers, and further supported by an analysis of peer-reviewed literature, and leads the reader through the process of developing a detailed management plan. An overview of management techniques is provided, along with pertinent regulations.

9. **Upper Mississippi Valley / Great Lakes Waterbird Conservation Plan**

The Upper Mississippi Valley / Great Lakes (UMVGL) Waterbird Conservation Plan is one of 16 regional initiatives established to realize broad goals identified in the North American Waterbird Conservation Plan (NAWCP; Kushlan et al. 2002). Conservation priority for UMGVL waterbird species was assessed using NAWCP continental rankings, regional criteria including protection status, history of conservation activity, and population trends, as well as expert opinion. Threats to UMGVL waterbirds were identified and ranked using multiple criteria, including number of species affected, certainty of a negative impact, and pervasiveness of the problem throughout the region.

Appendix A

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.

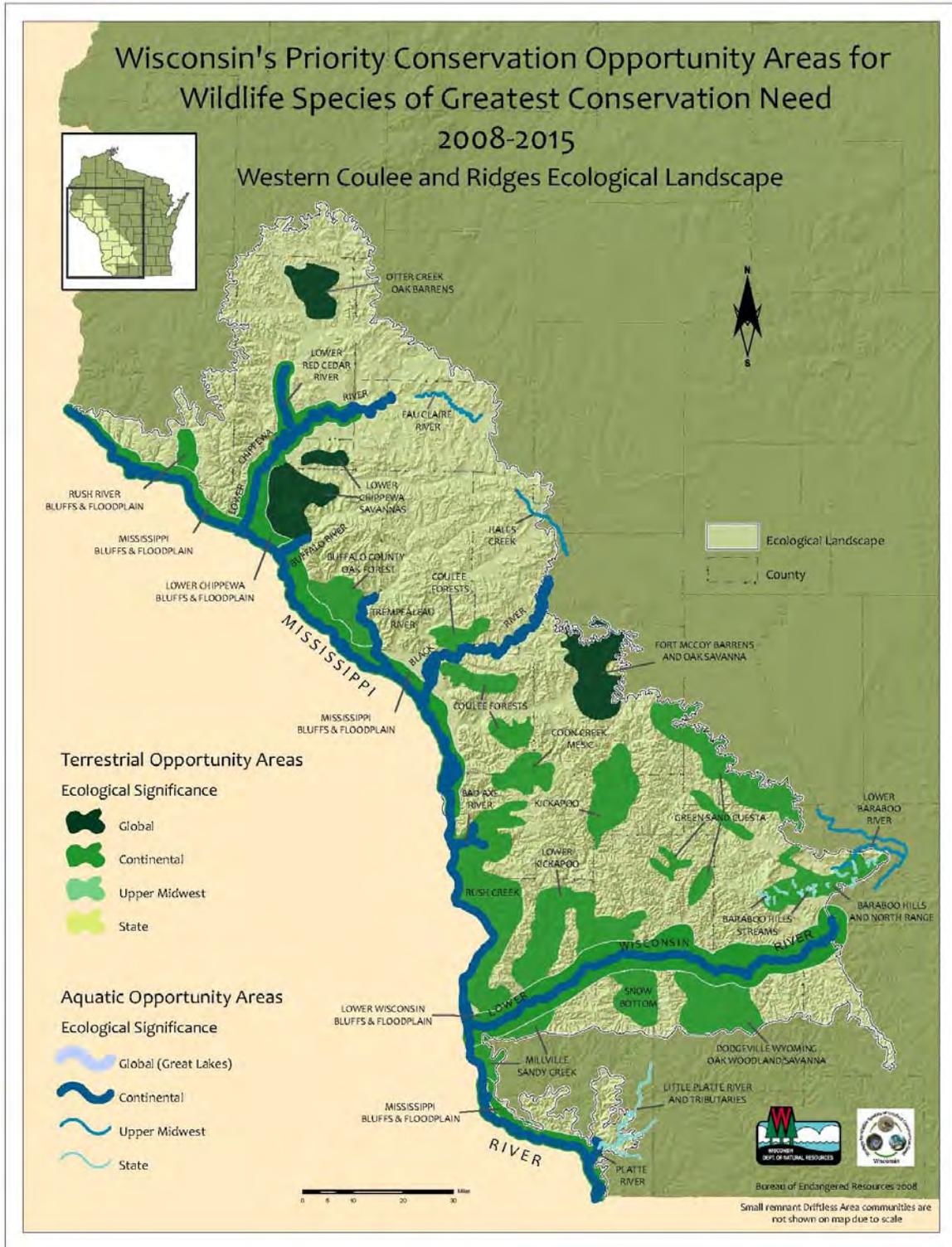
Interviews: Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield invaluable information.

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 B



Appendix C

Rare Species and High Quality Natural Communities of the PWMPG

Numerous rare species and high-quality examples of native communities have been documented at Whitman Dam Wildlife Area, Whitman Bottoms Floodplain Forest State Natural Area (SNA), Merrick State Park, Perrot State Park, Trempealeau Mountain SNA, Brady's Bluff SNA, and Great River Trail Prairies SNA Property Group (PWMPG). This table shows the rare species and high-quality natural communities currently known from the PWMPG and listed by property. For an explanation of state and global ranks, as well as state status, see Appendix A. State status, tracking status, and ranks are based on the working list published June 1, 2011. Species with a "W" in the "Tracked by NHI" column are on the Watch List (see Appendix F) and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list.

THIS INFORMATION

NOT AVAILABLE TO PUBLIC

DUE TO SENSITIVE

LOCATIONAL INFORMATION

ON RARE SPECIES

Appendix D

Summary Descriptions

The following paragraphs give brief summary descriptions for some of the rare species documented at Whitman Dam Wildlife Area, Whitman Bottoms Floodplain Forest State Natural Area (SNA), Merrick State Park, Perrot State Park, Trempealeau Mountain SNA, Brady's Bluff SNA, and Great River Trail Prairies SNA and mapped in the NHI Database. More information can be found on the Endangered Resources Web site (www.dnr.wi.gov/org/land/er/) for several of these species.

Rare Animals

Bald Eagle

Bald Eagle (*Haliaeetus leucocephalus*), a bird listed as Special Concern in Wisconsin and Federally protected by the Bald & Golden Eagle Protection Act, prefers large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. In southern Wisconsin, the recommended avoidance period extends from February 15 - July 1. In northern Wisconsin, the recommended avoidance period is from March 15 - August 1.

Black Buffalo

Black Buffalo (*Ictiobus niger*), a fish listed as Threatened in Wisconsin, prefers strong currents of large rivers, sloughs, backwaters and impoundments. Spawning occurs from April through mid-June.

Black Tern

Black Tern (*Chlidonias niger*), a bird listed as Special Concern, prefers large shallow marshes with abundant vegetation adjacent to open water. Nesting occurs from May 15 to July 31.

Blanding's Turtle

Blanding's turtles (*Emydoidea blandingii*) are listed as a Threatened 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 in 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 generally breed in spring, late summer or fall. Nesting occurs from about mid-May through June depending on spring temperatures. They strongly prefer to nest in sandy soils and may travel well over a mile to find suitable soils. This species appear to display nest site fidelity, returning to its natal site and then nesting in a similar location annually. Hatching occurs from early August through early September but hatchlings can successfully overwinter in the nest, emerging the following late April or May. This species takes 17 to 20 years or more to reach maturity.

Blue Sucker

Blue Sucker (*Cycleptus elongatus*), a fish listed as Threatened in Wisconsin, prefers large, deep rivers with moderate to strong currents over substrates of gravel or cobble. Spawning occurs from late April through early May.

Blue-winged Warbler

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.

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 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 recommended avoidance period is from May 1 - August 24.

Columbine Dusky Wing

Columbine dusky wing (*Erynnis lucilius*), a State Special Concern butterfly, This species is found in woodland habitat with wild columbine (*Aquilegia canadensis*); most often in rocky ravines, gullies, or woodland edge. Also found in prairie habitat edged with oak woods. This species is bivoltine, their flight periods are the first three weeks of May and mid July through early August. Larvae live in leaf nests on the hostplant and mature larvae overwinter in the litter at the base of the plant

Crystal Darter

Crystal darter (*Ammocrypta asprella*), a fish presently listed as a Special Concern species by the US Fish and Wildlife Service and currently listed as Endangered in Wisconsin. This species prefers clear to slightly turbid waters over sand substrates. The darter is most often found in moderate to strong currents in large rivers. They occupy sandy riffles, bars, and pools. Spawning occurs from mid May through mid-June

False Map Turtle

False map turtles (*Graptemys pseudogeographica*) are a Species of Special Concern in Wisconsin and prefer large rivers with sand, gravel and cobble substrates. They overwinter in deeper water behind structures that create an immediate downstream eddy where they singly or communally sit up on top of the substrate, which is almost always sand. False maps are active from April through mid-October, breed in spring or fall and nest in late May through early July. This species may double clutch during this period. Eggs hatch from early August to early September but can overwinter in nests.

Fawnsfoot

Fawnsfoot (*Truncilla donaciformis*) a State Special Concern Species, prefers large rivers or the lower reaches of medium-sized streams. It is most commonly found in sand or gravel. Once widespread and abundant, this species is rarely found in recent years. Known fish hosts are freshwater drum and sauger

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.

Flat Floater

Flat floater (*Anodonta suborbiculata*), a State Special Concern mussel, is strictly found in backwater areas with little or no current in large rivers of the western part of Wisconsin. The known hosts are a number of common fish species (shiners, catfish, sunfish, bass, and crappie)

Goldeye

Goldeye (*Hiodon alosoides*), a fish listed as Endangered in Wisconsin, prefers the quiet, turbid waters of large rivers and their connecting lakes ponds and marshes. Spawning occurs from May through early July.

Great Egret

Great Egret (*Casmerodius albus*), a bird listed as Threatened in Wisconsin, prefers freshwater wetlands, rivers and streams with waterside deciduous forest communities and willow thickets. The recommended avoidance period is from late April to mid-July.

Higgin's Eye

Higgin's eye (*Lampsilis higginsii*), a mussel listed as Endangered at the Federal and State level, is found in large rivers in the western part of the state. It is found in flowing waters with various stable substrate types but seems to prefer stable sand. Several common fish species have been recorded as its host, including drum, large and small mouth bass, walleye, and sauger.

Juniper Hairstreak

Juniper hairstreak (*Callophrys gryneus*), a Special Concern butterfly, has been found in small to medium-sized red cedars in old fields, barrens, and bluffs. Their flight period usually is in May

Lake Sturgeon

Lake Sturgeon (*Acipenser fulvescens*) is a Special Concern fish that prefers large rivers and lakes, especially the deepest mid-river areas and pools. Spawning occurs from late April through early June in cold, shallow fast water.

Least Bittern

Least Bittern (*Ixobrychus exilis*), a Special Concern bird in Wisconsin. This species prefers freshwater marshes where cattails and reeds predominate in swamps and marshes and dense emergent vegetation. The recommended avoidance period is from 25 Apr - 31 July.

Monkeyface

Monkeyface (*Quadrula metanevra*), a mussel listed as Threatened, is found in the western part of the state in swift, clean water in larger rivers in gravel or mixed sand and gravel. Three common host fishes have been reported: bluegill, green sunfish, and sauger

Mud Darter

Mud Darter (*Etheostoma asprigene*), a fish listed as Special Concern, prefers moderate currents in sloughs, overflow areas, riffles, and pools of large, low-gradient rivers over bottoms of mud, sand, gravel, clay, or bedrock. Spawning occurs from mid-May through June.

North American Racer

North American racer (*Coluber constrictor*) is a species of Special Concern and a Protected Wild Animal. Racers prefer moderate to dry sand prairies and bluff prairies. They are well adapted to open, sunny or savanna-like conditions. This species overwinters individually or communally with other snakes. Fractured limestone is often used to avoid freezing or desiccation during winter. The racer has declined in recent decades due to natural succession resulting from fire suppression and a lack of management to maintain open canopy conditions. Racers are active from April through early October. They breed in spring or fall and lay their eggs from mid-June to early July below the surface in sandy soils. Eggs hatch in 55-65 days, usually in August or early September.

Northern Leopard Frog

The Northern Leopard Frog (*Lithobates pipiens*), a State Special Concern species, breeds in a wide variety of wetlands, especially in those where fish are absent. They may forage far from water in old fields and prairies. Northern Leopard frogs breed from late March to early June, laying their eggs in clusters on submerged vegetation. Hatching occurs after 1 to 3 weeks, varying with water temperature, and metamorphosis occurs after 70 to 110 days as a tadpole.

Ottoe Skipper

Ottoe skipper (*Hesperia ottoe*), State Special Concern butterfly, has been found in mixed and tallgrass prairie. Sites are in dry prairie in Wisconsin. Bluestem grasses are its host plant and this species nectars on prickly pear, milkweeds, vetch, blazing star, leadplant, purple coneflower, compassplant and sunflowers. This species is univoltine, with adults flying in late June to early August. Peak is late June or early July. Overwintering occurs in the larval stage and pupation occurs in a loose cocoon amid debris.

Paddlefish

Paddlefish (*Polyodon spathula*), listed as a Threatened Species in Wisconsin, prefers large rivers and their lakes. They spawn over mud or gravel in early spring during high flows.

Pallid Shiner

Pallid Shiner (*Notropis amnis*), a fish listed as Endangered in Wisconsin, prefers the quiet to sluggish flows of large lowland rivers and their sloughs and impoundments, over substrates of sand or mud. Spawning occurs from late March into April at around 10 degrees Celsius with rising water levels.

Peregrine Falcon

Peregrine Falcon (*Falco peregrinus*), a bird listed as Endangered in Wisconsin, prefers relatively inaccessible rock ledges on the sides of steep bluffs and ledges on highrise buildings in urban areas. The recommended avoidance period is from early-April through late July.

Pirate Perch

Pirate perch (*Aphredoderus sayanus*), a fish listed as Special Concern, prefers the quiet waters of oxbows, overflow ponds, sloughs, marshes, ditches, and the pools of medium to large rivers. The bodies of water often traversed are sand covered or soft muck bottoms, with organic debris present. Spawning occurs during May.

Prothonotary Warbler

Prothonotary Warbler (*Protonotaria citrea*), a bird of Special Concern in Wisconsin. This species breeds in floodplain hardwoods in the southern 2/3 of the state, typically in truncated snags among flooded timber. The recommended avoidance period is from May 8 to September 1.

Pugnose Minnow

Pugnose Minnow (*Opsopoeodus (Notropis) emiliae*), a fish listed as Special Concern, prefers quiet, weedy lakes, sloughs, and low-gradient rivers over bottoms of mud, sand, rubble, silt, or clay. Spawning occurs from mid-June through mid-July.

Red-headed Woodpecker

The Red-headed Woodpecker (*Melanerpes erythrocephalus*) inhabits a wide variety of habitats, including deciduous woodlands (both upland and wetland), oak savanna, and other open upland sites with scattered trees. They typically nest in dead trees or dead limbs of live trees, but also use natural cavities. Preferred nest trees vary from 1-3 feet DBH (diameter at breast height). Nesting occurs from mid-May to early June.

Red-shouldered Hawk

Red-shouldered Hawk (*Buteo lineatus*), a bird listed as Threatened in Wisconsin. This species prefers larger stands of medium-aged to mature lowland deciduous forests, dry-mesic and mesic forest with small wetland pockets. The recommended avoidance period is from March 1 - July 31.

River Redhorse

River Redhorse (*Moxostoma carinatum*), a fish listed as Threatened in Wisconsin, prefers moderate to swift currents in large rivers systems, including impoundments and pools. River bottoms of clean gravel are preferred. Spawning occurs from mid May through June when water temperatures reach 68 to 74 degrees Fahrenheit.

Silver Chub

Silver Chub (*Macrhybopsis (Hybopsis) storeriana*), a fish listed as Special Concern, prefers large, low gradient rivers. This species is found in moderate to strong currents, riffles, pools and sloughs with or without vegetation over substrates of sand, mud, silt or gravel. Spawning occurs in June and July.

Smooth Softshell

Midland smooth softshells (*Apalone mutica*), a turtle species of Special Concern, are exclusively a large river species, and have a preference for clean water and sandy substrates. The Chippewa, Lower Black, Mississippi and the Lower Wisconsin rivers encompass its known range in WI. This species is active from April through September and overwinters by burrowing in sandy substrate in flowing water where freezing can be avoided. This species breeds in spring or fall and nests from early June to early July. Nesting often occurs close to the riverbank but individuals will move up to 100 meters from water on large exposed sandy areas to lay eggs. Smooth softshells nest in sand around four or more feet above normal river levels to achieve suitable nest temperatures and avoid inundation during periods of high water. This species lays a single clutch annually. Eggs hatch in 60-90 days depending on summer temperatures.

Timber Rattlesnake

Timber rattlesnakes (*Crotalus horridus*) are a species of Special Concern and a Protected Wild Animal. Adult males and non-gravid adult females prefer deciduous forests and woodland edges in an agricultural setting during the summer. Gravid females and juvenile timbers prefer to remain in open-canopy bluff prairies during the summer because of higher preferred body temperatures, but avoid overheating by taking advantage of various structures to provide shade, such as brush, trees or rock shelves. Timbers emerge from hibernation as early as mid-April but may continue to emerge well into June. They remain active until as late as mid-October, with the females that give birth in a given year remaining active

longer than other individuals. Timbers primarily breed in August and females give birth the following mid-August or mid-September. Individual females in WI usually produce young only once every three to four years.

Washboard

Washboard (*Megalonaias nervosa*), a State Special Concern mussel. This species is found in the western part of the state in large rivers with moderate current. Although it has been found in various substrate types, it seems to be most abundant in stable mud. A number of common fish species have been recorded as its host (eel, catfish, centrarchids, bowfin and bass)

Weed Shiner

Weed Shiner (*Notropis texanus*), a fish listed as Special Concern, prefers sloughs, lakes, and still to sluggish sections of medium streams to large rivers, over substrates of sand, mud, clay, silt, detritus, gravel or boulders. Spawning occurs from late June through July at approximately 18 degrees Celsius

Western Sand Darter

Western Sand Darter (*Etheostoma clarum*), a fish listed as Special Concern, prefers clear to slightly turbid waters with moderate to strong currents. They are often found in medium to large rivers over extensive sand flats. Spawning occurs from late June through July.

Wing Snaggletooth

Wing Snaggletooth (*Gastrocopta procera*) State Threatened, these terrestrial snails are 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

The Yellow-billed Cuckoo (*Coccyzus americanus*) is a Special Concern species that prefers forested uplands and wetlands, oak woodlands, Shrub-carr, shrubby woodland edges, and dense willow or dogwood thickets, often near streams or lakes. Nesting occurs from late May to early August.

Yellow-headed Blackbird

Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) is a Special Concern species that prefers emergent marsh habitats. Nesting occurs from mid-April to early August.

Bird Rookery

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

Rare Plants

Butternut

Butternut (*Juglans cinerea*) a "Watch" species in Wisconsin, is found in both lowland and upland forests. This tree is susceptible to butternut canker (*Sirococcus clavigignenti-juglandacearum*), a lethal fungal disease of unknown origin.

Dragon Wormwood

Dragon Wormwood (*Artemisia dracunculus*), a State Special Concern plant, is found in dry bluff prairies and on roadsides. Blooming occurs throughout July; fruiting occurs throughout August. The optimal identification period for this species is early July through late August.

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.

Prairie Sagebrush

Prairie Sagebrush (*Artemisia frigida*), a State Special Concern plant, is found in very dry dolomite bluff prairies and sand terraces along the upper Mississippi River; it is adventive elsewhere. Blooming occurs early August through late September; fruiting occurs throughout September. The optimal identification period for this species is early August through late September.

Shadowy Goldenrod

Shadowy goldenrod (*Solidago sciaphila*), a State Special Concern plant, is found on dry sandstone bluff edges, often under pines and Hill's oak. Blooming occurs late August through late September; fruiting occurs throughout September. The optimal identification period for this species is throughout September.

Silky Prairie-clover

Silky Prairie-clover (*Dalea villosa* var. *villosa*), a State Special Concern plant, is found on dry sandy river terraces and hillside prairies (often being invaded by red cedar) near the St. Croix and Mississippi Rivers. Blooming occurs late July through early September; fruiting occurs throughout September. The optimal identification period for this species is early August through late September.

Small-flowered Woolly Bean

Small-flowered Woolly Bean (*Strophostyles leiosperma*), a State Special Concern plant, is found in dry or moist sandy soil, upland woods, dunes and shores. . The optimal identification period for this species is late July through late August.

Snowy Campion

Snowy Campion (*Silene nivea*), a State Threatened plant, is found on alluvial deciduous forest margins and meadows. Blooming occurs late June through late July; fruiting occurs early July through late August. The optimal identification period for this species is late June through late July.

White Camas

White Camas (*Zigadenus elegans* var. *glaucus*), a State Special Concern plant, is found in oak openings, wet-mesic calcareous prairies, limestone-capped sandstone bluffs, cliffs, and outcrops, as well as stabilized dunes along Lake Michigan. Blooming occurs late May through late July; fruiting occurs mid August through early September. The optimal identification period for this species is late May through late July.

Appendix E

Species of Greatest Conservation Need of the PWMPG Property Group

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present at the PWMPG properties in the Western Coulees & Ridges Ecological Landscape. Only SGCN with a high or moderate probability of occurring in these Ecological Landscapes are shown. Communities shown here are limited to those identified as “Major” or “Important” management opportunities in the Wisconsin Wildlife Action Plan (WDNR M006b). Letters indicate the degree to which each species is associated with a particular habitat type (S=significant association, M=moderate association, and L=low association). Animal-community combinations shown here that are assigned as either “S” or “M” are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan (see dnr.wi.gov/org/land/er/WWAP/ for more information about these data). Shaded species have been documented (for birds, this means breeding evidence) on PWMPG properties.

	Dry Prairie	Emergent Marsh	Floodplain Forest	Moist Cliff	Oak Opening	Oak Woodland	Sand Prairie	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Southern Sedge Meadow
Species that are Significantly Associated with the Western Coulee and Ridges Landscape														
Acadian Flycatcher			M						L	S				
American Woodcock			L		L			S	L			L		
Bald Eagle			L								M		S	
Bell's Vireo	M				L		M	M				M		
Black Buffalo													M	
Black Rat Snake	S		M		M	S	L		S	S				
Black-billed Cuckoo			M		L			S						
Blanchard's Cricket Frog		S									S		S	S
Blanding's Turtle	S	S	M		S	M	S	M		M	S		M	M
Blue Sucker													S	
Blue-winged Teal	L	S	M				L				M	M	L	M
Blue-winged Warbler			M		M	M		M	M	M				
Bluntnose Darter													S	
Bobolink					L							S		M
Brown Thrasher	M				S		S					M		
Bullsnake	S				S	S	S		M	M				
Canvasback		L									S		S	
Cerulean Warbler			S			M			L	S				
Crystal Darter													S	
Dickcissel	L				L							S		
Eastern Massasauga Rattlesnake	S	S	S				S	S						S

	Dry Prairie	Emergent Marsh	Floodplain Forest	Moist Cliff	Oak Opening	Oak Woodland	Sand Prairie	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Southern Sedge Meadow
Eastern Meadowlark	M				M		M					S		M
Field Sparrow	S				S		S					M		
Four-toed Salamander		S	S	L				S						M
Goldeye													M	
Grasshopper Sparrow	S				L		S					S		
Great Egret		S	M								M		M	
Henslow's Sparrow					M							S		L
Hooded Warbler										S				
Kentucky Warbler			S							M				
Lake Sturgeon													S	
Lark Sparrow	M						S							
Least Flycatcher			M			L		L	L	L				
Lesser Scaup		L									S		M	
Louisiana Waterthrush										S				
Midland Smooth Softshell Turtle													S	
Northern Bobwhite	M				M	L	L					S		
Northern Harrier	M	L					L	L				S		M
Northern Long-eared Bat		M	M		L	M		M	M	M	M		M	M
Northern Prairie Skink	S				S	M	S		M	M				
Ornate Box Turtle	S				S	S	S		S	S				
Ozark Minnow														
Paddlefish													M	
Pallid Shiner													S	
Peregrine Falcon														
Pickerel Frog		S	M					M			S		S	S
Prairie Racerunner	S				S		S							
Prairie Ringneck Snake	S				S	M	M		M	M				
Prothonotary Warbler			S											
Red-headed Woodpecker			M		S	S			M	M				
Red-shouldered Hawk			S							M				
Redside Dace														
River Redhorse													M	
Rusty Blackbird		M	S					M						
Shoal Chub (Speckled Chub)													S	
Short-billed Dowitcher		S									L			
Starhead Topminnow													S	
Timber Rattlesnake	S		M		S	S	S		S	S				
Veery			M			L		S		M				
Vesper Sparrow	S				M		S					L		
Western Meadowlark	M						M					S		

	Dry Prairie	Emergent Marsh	Floodplain Forest	Moist Cliff	Oak Opening	Oak Woodland	Sand Prairie	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Southern Sedge Meadow
Western Sand Darter													M	
Western Slender Glass Lizard	S				M		S							
Western Worm Snake	S								M	M				
Whip-poor-will			L			S			S	S				
Willow Flycatcher	L		L		L		L	S				M		M
Wood Thrush			M			M			M	S				
Wood Turtle	S		S		M	M	S	S			S		S	M
Worm-eating Warbler									M	S				
Yellow-bellied Racer	S						S		M	M				
Yellow-billed Cuckoo			S			L		M	L	M				
Yellow-crowned Night-Heron		M	S					M			M		M	
Species that are Moderately Associated with the Western Coulee and Ridges Landscape														
American Golden Plover		M										M		L
Black Tern		S									M			L
Buff-breasted Sandpiper		M										M		
Eastern Red Bat		M	M		M	M		M	M	M			M	M
Franklin's Ground Squirrel	L				S	M	S					M		
Gilt Darter													S	
Hoary Bat		M	M		L	L		M	L	L	M		M	M
King Rail		S												M
Osprey											L		S	
Prairie Vole	S				M		S					M		
Short-eared Owl	M	L					L	M				S		M
Silver-haired Bat		M	M		L	L		M	L	L	M		M	M
Solitary Sandpiper		S	S					L						L
Upland Sandpiper	S				L		M					S		L
Whooping Crane		S									S			M
Woodland Vole			L		S	S			S	S				
Yellow-throated Warbler			S							M				

Appendix F

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/org/land/er/wlist/>).

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).

**Primary Inventory Sites of the Perrot State
Park/Whitman Dam Wildlife Area/Merrick State
Park Property Group**

THIS INFORMATION

NOT AVAILABLE TO PUBLIC

DUE TO SENSITIVE

LOCATIONAL INFORMATION

ON RARE SPECIES

Appendix H

Rare Species and High Quality Natural Communities of CMPW
Property Group Primary Sites

*THIS INFORMATION
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LOCATIONAL INFORMATION
ON RARE SPECIES*