DRAFT

Regional & Property Analysis:

Sauk Prairie Recreation Area

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For your convenience, this document is also available on the Internet:
dnr.wi.gov; search Sauk Prairie Recreation Area

Cover photo:

Surrogate Grassland within the Sauk Prairie Recreation Area Prairie and Savanna Primary Site. Photo by Christina Isenring.

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COMMONLY USED ABBREVIATIONS

BAAP – Badger Army Ammunition Plant
BHG – Badger History Group
BIG – Badger Intergovernmental Group
DFRC – Dairy Forage Research Center
DOA – Department of Administration
GSA – General Services Administration
HCN – HoChunk Nation
NPS – National Park Service
NRB – Natural Resources Board
RPA – Regional and Property Analysis
SCORP – Statewide Comprehensive Outdoor Recreation Plan
SPRA – Sauk Prairie Recreation Area
TSPCA – The Sauk Prairie Conservation Alliance
USDA – United States Department of Agriculture
WAP – Wildlife Action Plan

INTRODUCTION AND OVERVIEW

PURPOSE OF A REGIONAL AND PROPERTY ANALYSIS

A regional and property analysis (RPA) is required by Chapter NR 44, Wisconsin Administrative Code, when developing a master plan, plan revision, or plan amendment. The regional and property analysis forms the foundation of the master plan, providing the baseline information on the property as well as information on how the property fits into or relates to its larger ecological and social context. Functionally, it identifies the most suitable potential future roles or niches for the property and highlights those elements of the property's regional context that are most important to consider when planning the property.

The **Regional Analysis** component of this document describes the broader biological/ecological, cultural, economic, and recreational environment that affects the property and its use. It identifies significant ecological and recreational needs within the property's region. It also defines existing and potential social demands or constraints that affect the property that should be considered during the planning process.

The **Property Analysis** component of this document describes the property's existing resources, uses, management opportunities, limitations, and needs. This section also describes surrounding and adjacent lands, indicating how the character of these lands may affect the property or its use.

The **Findings and Conclusions** component is the most important section of the RPA. Based on all the regional and property data in the body of the document, the Findings and Conclusions section outlines the best probable future role or niche for the property. It helps focus the planning process and becomes the foundation for building the plan's vision and goals, and action strategies.

INTRODUCTION TO THE PROPERTY

The Sauk Prairie Recreation Area, located in southeastern Sauk County, consists of the decommissioned 7,354-acre Badger Army Ammunition Plant (BAAP). The property has a natural and human history that is significant on local, regional and national scales. Knowing the history of this property is crucial to understanding its significance. The *Badger History Group, Inc.* is a non-profit group committed to collecting, preserving and sharing the history of the BAAP. The group and its work are the source for much of the historical information in this report.

SAUK PRAIRE-BAAP CHRONOLOGY

11-12,000 years ago	Wisconsin glaciation;
	Thousands of years prior to the arrival of Euro-American settlers, Sauk, HoChunk and earlier Native Americans lived, hunted, gathered, and made ceremonial use of this tract.
1766	Jonathan Carver makes contact with the "great town of the Saukies" (at current Sauk City)
1832-1833	Black Hawk conflict; the war gave the impetus to the US policy of Indian removal, in which Native American tribes were pressured to sell their lands and move west of the Mississippi River.
1837	Federal treaty to displace the Ho-Chunk Nation.
1838	The first land claims (within the BAAP boundaries) are made.
1842	Sauk Prairie surveyed
1840s-1870s	The pioneer period saw settlers occupy the land and establish the basics of rural community life, including town government, public schools, and churches.
1910-1942	The modern period of farm community development was characterized by the introduction of new crops; the use of gasoline engines; the purchase of gasoline powered tractors, autos and trucks; the telephone; improved rural roads; and electricity for light and water pumping.
1941	The Federal government announced plans for a $65,000,000 powder plant in the Merrimac area.
Dec. 7, 1941	Pearl Harbor
March 1942	Eviction of owners of lands condemned for the Badger Ordnance Works (comprising 138 tracts, 10,565 acres)
January 1943	First propellant products produced at Badger
October 1945	Badger operations cease.
1951-1957	Korean War operations.
1966-1975	Vietnam War operations.

1997	US Defense Department decommissions Badger Army Ammunition Plant
Summer 1998	GSA releases "Preliminary Highest and Best Use Analysis" for BAAP property – including manufacturing, light industry, agriculture, recreation.
1999	Citizen coalition holds public forums on Badger reuse.
July 2000	Sauk County creates 21-member Badger Reuse Committee. Committee meets 16 times.
March 2001	Badger Reuse Plan finalized and endorsed.
May 2001	Sauk County Board endorses Badger Reuse plan calling for Agriculture, Conservation and Education and little or no industrial use of BAAP.
June 2001	State of Wisconsin formally expresses interest in BAAP lands.
September 2001	Badger Intergovernmental Group (BIG) convenes to work out ownership agreements with GSA.
December 2002	NRB establishes Sauk Prairie Recreation Area and land transfers with Ho-Chunk.
March 2003	GSA releases final EIS for BAAP disposition.
June 2004	DNR formally requests NPS to receive surplus lands and convey them to state for park and recreation purposes. NPS approves request February, 2005.
September 2004	2,000 acres transferred to Dairy Forage Research Center.
March 2005	(Interim) Badger Oversight and Management Commission created.
June 2010	Quitclaim Deed recorded: 1,853.90 acres conveyed to DNR
April 2011	Quitclaim Deed recorded: 370.52 acres conveyed to DNR

The photo above was taken by an official project photographer in May 1942 of the north half of the world's largest ammunition plant, under construction in Sauk County, Wisconsin. The Badger Ordnance Works is built on the terminal moraine and outwash plain of the glacier that stopped here about 12,000 years ago. This outwash plain is known as the Sauk Prairie named for the Sauk Indians that had a village of 90 homes where Sauk City is located today.
http://www.badgerordnancehistory.org/

OVERVIEW OF THE SAUK PRAIRIE RECREATION AREA

In 2002, the Natural Resources Board approved establishing the Sauk Prairie Recreation Area as part of the decommission activities of the approximately 7,300-acre Badger Army Ammunition Plant (BAAP) in Sauk County. The property is located on the open plain extending south from the Baraboo Range, directly adjacent to Devil's Lake State Park, and links that internationally renowned resource with Lake Wisconsin and the Wisconsin River. ***Refer to Map A.***

The former BAAP property has a number of story lines highlighting its significance: the complex geological history given its juncture at three major landforms; the human history including Native Americans, Euro-Americans, and the construction of the Badger Ordnance Plant; and the process of salvage and reuse. During the master planning process, the Department has the opportunity to preserve and interpret many aspects of the property's natural and human history that are highly significant on local, regional and nation scales.

View of the Sauk Prairie Recreation Area from overlook near cement retention ponds. *Photo by Christina Isenring*.

History of BAAP

The former Badger Army Ammunition Plant (BAAP) occupies approximately 7,300 acres in the predominantly rural countryside of Sauk County, Wisconsin. The Badger Plant was constructed in 1942 following the nation's entry into World War II. At the time of its construction, 80 farm families were removed from the area. ***Refer to Map B.*** The Plant provided ammunition propellant for the duration of the war effort, and was again operative during the Korean and Vietnam Wars. At its peak use of the facility, BAAP contained 1,427 buildings, 130 miles of roads, 26 miles of rail, and countless miles of steam and power lines. It had been in standby (idle) status since 1975. The BAAP was decommissioned in 1997 and clean-up of buildings and other material continues.

Badger Reuse Committee

In late 1997, the US Army determined that the BAAP facility was no longer needed to meet the nation's defense needs. Subsequent efforts to define a future for the Badger property proved challenging due to the site's unusually rich natural and cultural history, the wide range of potential reuse options, and the complexity of local, state, national, and tribal interests involved.

In early 2000, the Sauk County Board of Supervisors acted to establish a locally driven reuse planning process. With the assistance of US Congresswoman Tammy Baldwin and funds provided by the US Department of Labor, the Badger Reuse Committee (BRC) was convened. The 21-member BRC included representatives from neighboring communities, local, state, and federal governments, and the Ho-Chunk Nation. In its mission statement, the BRC charged itself with the task of developing "a common vision for the reuse of the Badger property that can be meaningfully considered and realistically implemented by the appropriate local, state, and federal agencies." Between July 2000 and March 2001, the BRC met 16 times with additional subcommittee meetings also held in this period.

Key Values
to guide consideration of future uses

Badger Army Ammunition Plant Reuse Plan, March 2001

Value 1 stresses the need to manage the Badger property **collaboratively,** and as a **single unit**.

Value 2 directs the federal government to complete the **highest quality cleanup** of the Badger property in a timely manner.

Value 3 pertains to maintenance of buildings and infrastructure that are **historically significant** or are needed to support cleanup activities and other approved uses.

Value 4 emphasizes the desire to reuse the Badger property in a way that contributes to **reconciliation** and the **resolution** of past conflicts.

Value 5 recognizes the **great potential** of the Badger property to provide **educational, research,** and **recreational** opportunities.

Value 6 focuses on the role that **sustainable agriculture** opportunities can and should play in the resue of the Badger property.

Value 7 addresses the **protection** and **enhancement** of the Badger property's **natural features,** and the critical role of the Badger lands within the broader landscape.

Value 8 recognizes the importance of the Badger property in providing **open space** and protecting the characteristic **rural landscape** of our area.

The results of BRC's deliberations are documented in the *Badger Army Ammunition Plant Reuse Plan*, which was endorsed by committee members and the Sauk County Board in May 2001. Early BRC meetings were devoted to gathering and reviewing basic information about the Badger property and its role – past, present, and future – in Sauk County's landscape, community and economy. Based on this information, the BRC defined nine key values to guide consideration of future uses. The committee's final reuse plan was agreed to by all parties and serves as the primary guidance document for future use planning and property management. The complete report and related documents and information about the reuse process can be found at: **http://www.co.sauk.wi.us** ; search "Badger Reuse Plan".

Landowners

In September 2001, Badger Intergovernmental Group (BIG) convened to work out ownership agreements with General Services Administration (GSA) for the Badger property. The BIG includes representatives from GSA, DNR, DOA, Governor's Office, Ho-Chunk Nation, USDA Dairy Forage Research Center, Towns of Sumpter and Merrimac, Sauk County, and Army. This

GSA-led group of future landowners and local government officials focused on parcel footprints and future planning and operations. As a result of these meetings, BAAP would be primarily owned by three parties: Ho-Chunk Nation (1,553.04 ac), USDA-DFRC (2,106.72 ac), and DNR (3,387.41 ac). Bluffview Sanitary District (163.86 ac), DOT (81.21 ac) and Town of Sumpter (3.59 ac) are also landowners. ***Refer to Map C.***

In December 2002, the Natural Resources Board approved establishing the Sauk Prairie Recreation Area with a Department acreage goal of 3,800 acres. As part of the NRB approval request, Department managers familiar with the resources at BAAP recognized the future property transfer of nearly 7,300 acres as an opportunity for a significant prairie and savanna restoration project coupled with diverse public recreation. Three key management goals were identified:

- Maximize the potential for grassland and oak savanna restoration and public recreation.
- Preserve and enhance the transition zone between the Baraboo Hills and the Badger prairie lands.
- Preserve and enhance the ecological corridor from the Baraboo Hills to the Wisconsin River.

DNR applied to the National Park Service (NPS) in 2004 to obtain lands at BAAP for public park and recreation use. NPS will receive the lands from GSA and convey them to DNR; the property must be used for public park purposes in perpetuity and cannot be sold or leased without NPS approval. DNR is subject to numerous federal regulations such as the Americans with Disabilities Act and the National Historic Preservation Act.

On April 7, 2010, DNR and GSA entered into a formal agreement concerning reversionary rights at BAAP. In part, the agreement states that upon request by DNR, GSA will accept reversion of property for which DNR does not receive sufficient federal funds to remediate and remove any unwanted infrastructure located thereon. To date, approximately 2,200 acres have been conveyed to the DNR.

Additionally, the Ho-Chunk Nation completed a management plan for their portion of BAAP. The plan notes the BAAP land has very important historic and cultural significance to the Ho-Chunk people as it lies within the Ho-Chunk's aboriginal territory and includes a number of historic and pre-historic sites of significance to Native people. As stated in the "Goals and Objectives", the management of the BAAP shall:

- Protect the aesthetic, cultural, scenic and wild qualities as well as the native wildlife and plant communities. Special emphasis will be placed on designated federal and state-listed species, species of special concern, and other unique biotic features.
- Protect, conserve, and maintain all significant cultural sites.
- Provide for and manage the use and enjoyment by visitors and maintain a diversity of low-impact recreational opportunities for people of all abilities.

- Utilize sound natural resource and agriculture management practices to improve water quality, maintain soil productivity, and protect wildlife habitat.
- Develop a bison program to support HCN nutritional programs and provide educational opportunities.
- Strive to operate a self-supporting project through grants, donations, bequests, and fee-based recreation that is consistent with the overriding commitment to preserve Badger's natural, historical and cultural features.
- Ultimately, establish and maintain a visitor's center that includes information and exhibits on Badger's geologic and natural uniqueness, bison management, cultural significance and history of the ammunition plant. The center would also provide information and exhibits on the history of Native Americans and Euro-American habitation of the Sauk Prairie as well as an educational classroom.

DFRC, the other primary landowner, has as its mission, "…to develop and apply science that enhances the use of forages by dairy cattle." Types of research that support DFRC's mission include: more persistent pasture grasses and legumes; maximizing grasses and legumes through grazing management; more digestible forage cell walls; losing fewer nutrients when ensiling; more consistent methods for measuring forage nutrients; and considering, how do changes in plants affect digestion and nutrient utilization?

ANALYSIS OF THE REGIONAL CONTEXT

BIOLOGICAL RESOURCES AND ECOLOGICAL CAPABILITY

Defining the Region

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). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers. This analysis of biological resources will use the **Western Coulee and Ridges and Central Sand Hills Ecological Landscapes** as the "region". *The following section is largely reproduced from the Ecological Landscapes of Wisconsin Handbook (WDNR 2012, in press).*

Western Coulee and Ridges and Central Sand Hills Ecological Landscapes

Figure 1 illustrates the Sauk Prairie Recreation Area's location in both the Western Coulee and Ridges and Central Sand Hills Ecological Landscapes. The **Western Coulee and Ridges Ecological Landscape** extends over 9,642 square miles, representing 17.2% of the land area of the State of Wisconsin. It is the largest Ecological Landscape in the State.

The Western Coulee and Ridges Ecological Landscape in southwestern and west central Wisconsin is characterized by its lack of glaciation. It is part of the region called the "Driftless Area" because it lacks glacial deposits (although glacial outwash materials do occur in river valleys). The topography here is unique in Wisconsin due to the long period of erosion, with dissected ridges, steep-sided valleys, and extensive networks of streams. The Western Coulee and Ridges is still relatively heavily forested as compared with the rest of southern Wisconsin.

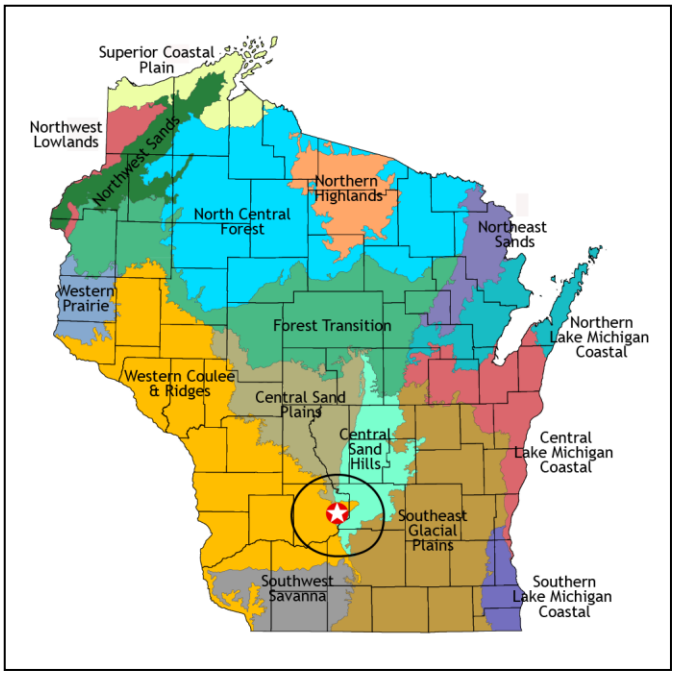

Figure 1: Ecological Landscapes of Wisconsin and the Sauk Prairie Recreation Area.

The Baraboo Range, formed primarily of the Precambrian Baraboo Quartzite, is located in the eastern part of the Ecological Landscape. Several large rivers including the Wisconsin, Mississippi, Chippewa, Kickapoo and Black, flow through or border the Ecological Landscape.

Historical vegetation for the Western Coulee and Ridges Ecological Landscape consisted of southern hardwood forests, oak savanna, scattered prairies, and Floodplain Forests and marshes along the major rivers. As a result of widespread Euro-American settlement, most of the relatively flat land on ridgetops and valley bottoms was cleared of oak savanna, prairie, and forest for agriculture. The steep slopes between valley bottom and ridgetop, unsuitable for raising crops, grew into oak-dominated forests after the pre-settlement wildfires were suppressed.

The **Central Sand Hills Ecological Landscape** is located in central Wisconsin at the eastern edge of what was once Glacial Lake Wisconsin. The landforms in this ecological landscape are a series of glacial moraines that were later partially covered by glacial outwash. The area is characterized by a mixture of farmland, woodlots, wetlands, small kettle lakes, and cold water streams, all on sandy soils. The mosaic of glacial moraine and pitted outwash throughout this ecological landscape has given rise to extensive wetlands in the outwash areas, and the headwaters of coldwater streams that originate in glacial moraines.

Historical upland vegetation consisted of oak forest, oak savanna, and tallgrass prairie. Fens were common in this ecological landscape and occurred along with wet-mesic prairie, wet prairie, and rare coastal plain marshes. Current vegetation is composed of more than one-third agricultural crops, and almost 20% grasslands with smaller amounts of open wetland, open water, shrubs, barren, and urban areas. The major forested type is oak-hickory, with smaller amounts of white-red-jack pine, maple-basswood, lowland hardwoods, aspen-birch, and spruce-fir.

Regional Biodiversity Needs and Opportunities

Opportunities for sustaining natural communities in the Western Coulee and Ridges and Central Sand Hills Ecological Landscapes were developed in 2005 by the Ecosystem Management Planning Team and—based on wildlife Species of Greatest Conservation Need and their habitats—by the Wisconsin Wildlife Action Plan. 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 of opportunities 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

A "major" opportunity indicates that the natural communities can be sustained in the Ecological Landscape, either because many significant occurrences of the natural community have been recorded in the landscape or major restoration activities are likely to be successful in maintaining the community's composition, structure, and ecological function over a longer period of time.

An "important" opportunity indicates that although the natural community does not occur extensively or commonly in the Ecological Landscape, one to several occurrences do occur 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.

of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within the Western Coulee and Ridges and Central Sand Hills Ecological Landscapes.

There are management opportunities for 45 natural communities in the **Western Coulee and Ridges Ecological Landscape**. Management opportunities vary within the Ecological Landscape and each area should be evaluated to determine if management and restoration is appropriate for that natural community. Of these, 24 are considered "major" opportunities; an additional 13 natural communities are considered "important" in this landscape. The 10 bolded natural communities offer restoration opportunities at Sauk Prairie Recreation Area.

Table 1. Major Natural Community Management Opportunities in the Western Coulee and Ridges Ecological Landscape.

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

There are management opportunities for 46 natural communities in the **Central Sand Hills Ecological Landscape**. Of these, 14 are considered "major" opportunities; an additional 19 natural communities are considered "important" in this landscape. The two bolded natural communities offer restoration opportunities at SPRA.

Table 2. Major Natural Communities Management Opportunities in the Central Sand Hills Ecological Landscape.

Calcareous Fen	**Impoundments/Reservoirs**	Southern Sedge Meadow
Central Sands Pine - Oak Forest	Inland lakes	Submergent Marsh
Coastal Plain Marsh	Northern Wet Forest	Warmwater rivers
Coldwater streams	Shrub Carr	Wet-mesic Prairie
Emergent Marsh	**Southern Dry Forest**	

Rare Species of the Western Coulee and Ridges and Central Sand Hills Ecological Landscape

Numerous rare species are known from the Western Coulee and Ridges and Central Sand Hills Ecological Landscapes. "Rare" species include all of those species on the WDNR's NHI Working List (*Wisconsin Natural Heritage Inventory*) that are classified as "Endangered," "Threatened," or "Special Concern." **Table 3** lists the number of species known to occur in the Western Coulee and Ridges Ecological Landscape and **Table 4** lists the number of species known to occur in the Central Sand Hills Ecological Landscape based on information stored in the NHI database as of October 2011.

Table 3. Listing Status for rare species in the Western Coulee and Ridges Ecological Landscape as of October 2011.

	Taxa Groups					Total	Vascular	Total
Listing Status	**Mammals**	**Birds**	**Herptile**	**Fishes**	**Invertebrates**	**Fauna**	**Plants**	**Listed**
Federally Endangered	1	0	0	0	3	4	0	4
Federally Threatened	0	0	0	0	0	0	2	2
Federal Candidate	0	0	1	0	2	3	0	3
State Endangered	0	6	5	7	17	35	18	53
State Threatened	2	9	2	9	10	32	26	58
State Special Concern	4	13	11	10	74	112	62	174

Table 4. Listing Status for rare species in the Central Sand Hill Ecological Landscape as of October 2011.

	Taxa Groups					Total	Vascular	Total
Listing Status	**Mammals**	**Birds**	**Herptile**	**Fishes**	**Invertebrates**	**Fauna**	**Plants**	**Listed**
Federally Endangered	1	0	0	0	1	2	0	2
Federally Threatened	0	0	0	0	0	0	2	2
Federal Candidate	0	0	1	0	1	2	0	2
State Endangered	0	6	5	1	6	18	9	27
State Threatened	5	7	2	7	7	28	14	42
State Special Concern	2	13	6	9	35	65	30	95

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need (SGCN), which are animals that have low and/or declining populations that are in need of conservation action. They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g. dragonflies, butterflies, and freshwater mussels) that 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.

SGCN status is independent of State Listing Status and the NHI Working List. Most but not all SGCNs are on the NHI Working List (published June 2011); in addition, the NHI Working List also includes rare species that are not designated as SGCN. There are 72 vertebrate SGCN significantly associated with the Western Coulee and Ridges Ecological Landscape and 42

vertebrate SGCN significantly associated with the Central Sand Hills Ecological Landscape. This means that these species are (and/or historically were) significantly associated with the Ecological Landscape, and that restoration of natural communities with which they are associated would significantly improve conditions for their survival. ***Refer to the Rapid Ecological Assessment for a complete list (DNR 2011).***

Significant Conservation Areas

Twenty-six **State Natural Areas** are listed in Sauk County. State Natural Areas (SNAs) protect outstanding examples of Wisconsin's native landscape of natural communities, significant geological formations and archaeological sites. They harbor natural features essentially unaltered by human-caused disturbances or that have substantially recovered from disturbance over time. SNAs also provide the last refuges in Wisconsin for rare plants and animals. In fact, more than 90% of the plants and 75% of the animals on Wisconsin's list of endangered and threatened species are protected on SNAs. Several of the SNAs nearest the Sauk Prairie Recreation Area include Parfrey's Glen (No. 1), South Bluff/Devil's Nose (No. 97) and Devil's Lake Oak Forest (No. 27) within Devil's Lake SP, and Baxter's Hollow (No. 82).

Both Devil's Lake State Park and Baxter's Hollow are within the **Baraboo Hills**, and larger Baraboo Range. In 1974, the National Park Service designated the Southern Range of the Baraboo Hills as a *National Natural Landmark*. The Nature Conservancy has designated the Baraboo Range as one of their *Last Great Places*, one of only 77 in the world. The Baraboo Hills are also a noted *Land Legacy* place for conservation significance and recreation potential.

The Baraboo Hills support one of the largest contiguous upland hardwood forests in the Midwest, and harbor an incredible diversity of species, including more than 1,800 different kinds of plants and animals. Of particular note are the many rare birds that nest in the Hills, including both northern and southern species. The Baraboo Hills are all that remain of a very old quartzite mountain range that is now characterized by steep slopes and shallow, stony soils. Scenic vistas, waterfalls, interesting rock formations, deep forests and wildlife are all part of the attractions. The Ice Age National Scenic Trail also winds its way through this area.

Sauk County contains seven *Land Legacy Areas* – places determined to be critical in meeting Wisconsin's conservation and recreation needs over the next 50 years. Three of these areas are the Baraboo Hills, located on the northern boundary of the BAAP, the Middle Wisconsin River, located on the eastern boundary of the BAAP, and the Badger Army Ammunition Plant itself. As noted in the report, the entire BAAP property contains a mix of grasslands with small remnants of native prairie, scattered oak woodlands, farm fields, and idle buildings. It currently hosts some of largest populations of grassland birds in southern Wisconsin (103 bird species have been recorded here, of which 21 have critical status in WI). With the Baraboo Hills adjacent to the north, BAAP provides a rare continuum of grassland to oak forest. Sauk County's other *Land Legacy Areas* include Badlands, Baraboo River, Lower Wisconsin River, and Spring Green Prairie (Pohlman 2006).

LAND USE AND SOCIO-ECONOMIC CHARACTERISTICS

Defining the Region

The Sauk Prairie Recreation Area is located entirely in Sauk County. Since nearly all population, economic, and land use information that is currently available is organized and presented by county, the "region" for this part of the analysis will focus on Sauk County.

Additionally, Sauk County is included in the *Regional Profile: Region 9* (Winkler 2010), which describes socio-economic characteristics of a nine county area. The other counties include: Dane, Dodge, Columbia, Green, Iowa, Jefferson, Lafayette, and Rock.

Land Use Perspective

The following is a summary of land use perspectives for Region 9 (Winkler 2010):
Due to the region's economic vitality and population growth, Region 9 is also subject to intense development pressure. Land values are very high in this region; second only the Milwaukee area in the state. Land values continued to increase in the early 2000s, especially for forested and agricultural acreage.

Although it remains dominated by agricultural land uses (which constitute 68% of the region's land area), farmland has been rapidly converted to urban uses, with the acreage in agriculture declining by almost 4% between 2000 and 2008. Columbia and Jefferson counties experienced the largest declines in agricultural use acreage, with rates of decline approaching 10%. Many of the agricultural lands that remain have been subdivided into smaller parcels, which could pose challenges to regional conservation and/or recreational management. Even among larger agricultural holdings, owners may include speculators or others who intend to maximize profits from the sale of their land by repurposing the land for development.

Although it constitutes a much smaller share of the region's land cover than agriculture, forested land may also be of particular importance to recreational users. In Region 9 about 18% of the acreage is forested with the largest concentrations lying in the northwest. All of those counties with significant amounts of forest cover (Iowa, Sauk, Columbia and Dane) saw declines in forested acreage, except for Columbia County which posted an increase of nearly 15%.

In the face of development pressure and growing population, there is also relatively little public conservation land in the region. The region has a much smaller share of its land dedicated to conservation that the state on the whole (4.3% versus 17.1%), thus limiting access to certain kinds of outdoor recreation activities for the area's large population. Opportunities for future land acquisition for the purpose of recreational use may be narrowing due to the area's high land values and propensity toward parcelization.

Population

Based on 2010 census data, the population of Sauk County is 61,976. The current population represents a 12.2% increase from the 2000 census, compared to a 6% increase statewide during the same time period. Sauk County is considered one of the ten fastest growing counties in Wisconsin. The projected population for 2030 is 77,968.

Sauk County is approximately 840 square miles in size and includes three cities, 14 villages and 22 towns. The population centers are the communities of Baraboo (county seat), Reedsburg, Prairie du Sac, Sauk City, and Lake Delton. Sauk County has an estimated 74.6 persons per square mile compared to 105 persons per square miles statewide (US Census Bureau 2010). **Table 5** lists the ten most populous municipalities in Sauk County.

Table 5: Sauk County's Ten Most Populous Municipalities.

	April 1, 2000 Census	Jan 1, 2008 Estimate	Numeric Change	Proportional Change
United States	281,421,906	303,352,376	21,930,470	7.8%
Wisconsin	5,363,715	5,675,156	311,441	5.8%
Sauk County	55,225	61,086	5,861	10.6%
Baraboo, City	10,711	11,755	1,044	9.7%
Reedsburg, City	7,827	9,118	1,291	16.5%
Prairie du Sac, Village	3,231	3,735	504	15.6%
Sauk City, Village	3,109	3,300	191	6.1%
Lake Delton, Village	1,982	2,770	788	39.8%
Delton, Town	2,024	2,238	214	10.6%
Baraboo, Town	1,828	1,966	138	7.5%
Spring Green, Town	1,585	1,771	186	11.7%
Excelsior, Town	1,410	1,578	168	11.9%
Dellona, Town	1,199	1,536	337	28.1%

Source: WI Dept. of Administration, Demographic Services, Population Est., July 2009

Sauk County is located in south central Wisconsin 20 miles northwest of Madison, 100 miles northwest of Milwaukee, 173 miles northwest of Chicago, and approximately 250 miles southeast of Minneapolis-St. Paul.

Madison, population 233,209, is Wisconsin's second largest city after Milwaukee (598,833). It is the state's capitol and home to the University of Wisconsin-Madison, with an enrollment of roughly 41,000 students. Madison is consistently ranked among the best places to "live, work and play" in the United States, and along with its surrounding communities, offers many opportunities for visitors.

Another important population center to note is Wisconsin Dells in Columbia County. Wisconsin Dells, population 2,678, is located adjacent to and across the Wisconsin River from Lake Delton. Often referred to as the "Waterpark Capitol of the World", Wisconsin Dells is a popular vacation destination. While not a significant resident population, estimates indicate an average per day non-resident population at 15,000 from June through August. The largest increase in non-

resident population is seen in the months from September through May, demonstrating the change from a purely season tourist destination (Sauk County 2010).

Transportation Network

US Highway 12 parallels the western border of the property. This four-lane divided highway runs the length of eastern Sauk County connecting Sauk City, north through Baraboo to Lake Delton where it connects with Interstate 90/94. Additionally, State Highway 78 runs along the southeastern border of the property.

Highway 12 is a principal east-west connector route across south central Wisconsin connecting Dane and Sauk Counties to the interstate system. This section of US Highway 12 serves as a prime tourism center with the various natural areas including Devil's Lake and Mirror Lake State Parks, the many attractions in Lake Delton, Baraboo, and Wisconsin Dells, and the Ho-Chunk Nation Casino.

Redevelopment of the Dane County segment between Madison and Sauk City is complete. The segment of Highway 12 bordering the property is scheduled for redevelopment in the near future.

Economic Context

The following is a summary of the economic context for Region 9 (Winkler 2010): Manufacturing, health care and social assistance, retail trade, and educational services are the industries that employ the most people in Region 9. Manufacturing and retail trade have experienced significant declines in employment between 2000 and 2008. Manufacturing employment decline has been especially stark in Dodge, Jefferson, and Rock counties. At the same time health care and social assistance job growth was well over 10% in every county in Region 9 except for Green and Jefferson. At the regional level these changes suggests a shift away from more manufacturing-oriented job growth. Tourism and recreation industries were among those that experienced significant gains during this interval.

Tourism and recreation are an important part of economic vitality across Wisconsin. At the state level outdoor recreation, specifically, contributes over $9.7 billion annually to the Wisconsin economy in spending from both state residents and guests. Camping alone accounts for nearly $4 billion in expenditures. Within Region 9, industries related to tourism and recreation (including arts, entertainment, recreation, accommodation, and food services) employ over 50,000 workers accounting for 9.3% of all jobs. The share of Region 9 workers employed in these industries is very similar to that of the state as a whole. The region's employment in these sectors increased by nearly 6,000 jobs between 2000 and 2008 owing, almost exclusively, to increases in Columbia and Dane counties. Tourism and recreation are particularly important to the economies in Columbia County (employing 26.4% of workers), Sauk County (14.6%), and to a lesser extent in Rock (9.1%) and Dane (8.3%) counties.

Extractive industries (including agriculture, forestry, fishing, hunting, and mining) are of particular significance to outdoor recreation planning because of the historical role they have

played in shaping land use and the natural environment. Today, the extractive industries only employ about 4.4% of workers in Region 9, almost entirely in agriculture. Between 1997 and 2007, employment in extractive industries declined by about 5,000 workers (about 18%). This decline was almost entirely due to reductions in the number of hired agricultural workers. Despite having relatively few employees and a declining significance in the region's overall economy, agriculture continues to account for a large share of land use in the region as described further in Section 3.

In summary, the economy in Region 9 experienced declines in what were in 2000 the top two industries of employment: manufacturing and retail trade. Health care and social assistance industries, which were already significant employers in 2000, grew by 22%, making them the second largest category in terms of the region's employment by 2008. In the transition toward a more services oriented economy, tourism and recreation have produced highly varied outcomes among counties, but overall gains for the region.

RECREATION RESOURCES, USE AND DEMAND

Defining the Region

For analysis of the recreation resources, the "region" will first be described with regard to the Statewide Comprehensive Outdoor Recreation Plan (SCORP), and then will focus on the recreation opportunities offered in Sauk County.

SCORP

The primary source of information on outdoor recreation in Wisconsin is the Statewide Comprehensive Outdoor Recreation Plan (WDNR 2006). The Department revises the plans periodically to determine status, trends and needs for outdoor recreation in the State. The current plan is for the period of 2005-2010. Information for the document is obtained through public surveys, listening sessions and interviews.

For purposes of evaluation, the State is broken into eight regions of similar size. Sauk Prairie Recreation Area lies within the **Southern Gateways Region**, which is located in the south-central part of the state and encompasses Sauk, Columbia, Dane, Dodge, Green, Iowa, Jefferson, Lafayette, Richland and Rock Counties.

Below is an excerpt from the SCORP report describing the region's profile:

> From the rolling green hills of the southern parts of the region, to the centrally-located Wisconsin River, and the marshy areas of eastern portions, this region contains a variety of environments, the combination of which provide a wide array of recreational opportunities. The Southern Gateways also has a number of important geologic features.

Devil's Lake State Park, a craggy glacial lake surrounded by high cliffs and scenic overlooks, is one of the most popular recreation areas in the region. The Baraboo Hills, located in one of the few portions of the state that remained unglaciated in the past Ice Age, is a spectacular geologic resource with many unique rock formations, cliffs, waterfalls, and a high diversity of plant and animal species. The central presence of Madison impacts much of the Southern Gateways Region. Rapid suburban development within the greater Madison metropolitan area has made areas of Dane County among the fastest growing in the state. As urban populations increase, so too does the demand for traditionally urban-based recreation, such as dog parks and developed sports facilities. These resources will continue to impact future recreation supply and demand.

SCORP also considers recreation participation rates to identify recreational demands among the regions. The activities with the highest recreation participation rates in Southern Gateways include: walking for pleasure, family gathering, driving for pleasure, picnicking and bicycling.

Recreation patterns across the state indicate a recreation supply that is diverse and varied across regions; each region is unique and offers different types of recreational opportunities according to its specific natural and built amenities. Upon examining these trends further, larger patterns spanning multiple regions begin to emerge. Motorized recreation, for example, is popular across all northern regions, while urban activities such as visiting a dog park are popular in the urbanized southern and eastern portions of the state. A common factor across all regions is the popularity of water-based activities supported by the state's abundance of water resources.

Table 6: WI SCORP Regional Recreation Supply Shortages-Southern Gateways.

Nature-based	Developed Settings
▪ Backcountry/walk-in camping ▪ Boat launches – carry-in ▪ Natural areas ▪ Parks ▪ Public water access ▪ Trails – hiking ▪ Trails – horseback riding	▪ Boat launches – trailerable ▪ Camps – educational ▪ Dog parks ▪ Ice skating rinks ▪ Nature centers ▪ Picnic areas ▪ Sailboat clubs/rentals ▪ Tennis courts/programs ▪ Trails - bicycle

Sauk County CORP

Sauk County has also completed a Comprehensive Outdoor Recreation Plan (2008), which is the information source for many of the activities listed below. The county offers national, state, county and municipal trails, open space areas, and parks, which support a range of activities including bicycling, hiking, hunting, fishing, camping and nature enjoyment.

***CORP Vision Statement**:*

Sauk County's citizens and visitors will enjoy a broad range of affordable and accessible recreational opportunities that reflect a diversity of outdoor interests and experiences, which are enhanced by a network of regional connections between natural, agricultural and cultural resources. Outdoor recreational opportunities will be characterized by robust pubic and private partnerships that embrace careful stewardship of parks, forests, open spaces, cultural features and natural areas to enhance Sauk County's position as a destination for eco-tourism in Wisconsin and beyond.

Sauk County CORP 2008

Camping

Sauk County offers a range of camping opportunities at its approximate 31 public and private campgrounds. Most of the campgrounds offer electricity; many include shelters, beaches and hiking trails and other amenities. Several of the more popular public campgrounds include: Devil's Lake State Park, Mirror Lake State Park, Rocky Arbor State Park, and White Mound County Park.

At approximately 9,500 acres, **Devil's Lake State Park** is Wisconsin's largest and most visited state park, with more than 1.2 million visitors each year. It offers magnificent views from 500-foot quartzite bluffs overlooking a 360-acre lake. Devil's Lake State Park has three regular campgrounds with a total of 407 sites. Of the sites, 353 are reservable and the rest are first-come, first-served. There are nine group campsites that can accommodate a total of 240 campers. The park offers 29 miles of trails ranging from easy strolls along a paved pathway along the lakeshore, to a rocky hiking ascent up the south face of the East Bluff. The park also has 1.5 miles of trail that are accessible for people with disabilities. Eight miles of off-road bike trails are posted open to bikers; a two mile paved bicycle trail extends from the park's north shore entrance to the City of Baraboo. Others visit the park for rock climbing, picnicking, swimming, boating, SCUBA diving, fishing, hunting, and cross-country skiing.

Mirror Lake State Park's 2,200 acres include 151 family campsites in three separate campgrounds, plus seven group sites with each accommodating 20 campers. A range of amenities are provided including showers, both flush and pit toilets, electricity, and a hiking trail connecting one of the campgrounds with the beach area. Mirror Lake also offers "Cabin in the Woods", an accessible cabin for people with disabilities, and the Seth Peterson Cottage, a Frank Lloyd Wright-designed house available for rent. Approximately 20 miles of trails are available for hiking, off-road biking, and cross-country skiing.

The 244-acre **Rocky Arbor State Park** is within 1.5 miles of the popular Wisconsin Dells vacation community. The park includes 89 wooded campsites with showers, flush toilets and electricity, and a 1-mile self-guided nature trail. The rock forming Rocky Arbor's gorge is sandstone which geologists have aged at about 500 million years. Its sand grains are thought to have been deposited by rivers draining into shallow seas. The seas receded and the sand compacted into sandstone. Eons later, the Wisconsin River cut a gorge through this stone and thus formed the park's picturesque rock walls and ledges.

At 1,100 acres, **White Mound County Park** is Sauk County's largest park. The park gets its name from a vanished village located just south of the park. The village was named for the white look of the mounds of limestone found in the area. White Mound includes the 104-acre White Mound Lake with a boat landing (trolling motors only), and a family campground with 70 sites, 30 of which have electrical hookups. White Mound also offers a horse campground located at the north end of the park. Facilities include restrooms, picnic tables, hitching posts, horse trails, trailer parking, pump water and fire rings.

Trails

The **Ice Age Trail** is a thousand-mile footpath highlighting Wisconsin's Ice Age heritage and scenic beauty. Four segments are located in Sauk County: Baraboo Segment (4.8 miles), Devil's Lake Segment (10 miles), Sauk Point Segment (4.2 miles), and Merrimac Segment (4.4 miles).

As described by the Ice Age Trail Alliance (2012), the route of the Ice Age Trail generally follows the last outline of Wisconsin's most recent glacier, which retreated from the state more than 10,000 years ago. It diverges in some places to include other features of the glacial landscape as well as parts of the "Driftless Area". Walking, hiking, backpacking and snowshoeing are popular on the Ice Age Trail; many segments support cross-country skiing, too. Biking is allowed only on a few segments of the Ice Age Trail where it coincides with state bike trails. Horseback riding is not permitted. Snowmobile and ATV use is not permitted, with the exception of a few segments that share state multi-use trails.

Approximately 14 miles of the 22-mile **400 Trail** are located in the northwest corner of Sauk County. This includes a seven mile segment between Reedsburg and La Valle, and a seven mile segment between La Valle and Wonewoc. The 400 State Trail was developed on an abandoned Chicago-Northwestern Railroad line and was named for the Chicago-Northwestern passenger train that traveled the 400 miles between Chicago and Minneapolis/St. Paul in 400 minutes. Packed limestone screenings and bridges with planked floors provide a smooth bike riding surface; the entire length of the trail follows along the river valley. The trail allows a variety of recreational activities including hiking, biking and snowmobiling.

Another feature is a seven mile horse trail that parallels the 400 Trail between La Valle and Wonewoc. This stretch and the riding trails and horse campground at White Mound County Park are the County's two public horseback riding areas. Private facilities provide additional horseback riding opportunities.

The 400 Trail is also part of the larger "**Bike4Trails**". This state trail system connects 101 miles of state trails between Reedsburg and Trempealeau. The Bike4Trails links the 400 Trail with Elroy-Sparta Trail (32 miles), the LaCrosse River Trail (22 miles), and Great River Trail (25 miles). The trail system links together unique natural ecosystems, Native American cultural sites, railroad depots and tunnels, and communities which have evolved from railroad towns to tourist destinations.

Sauk County's snowmobile trail system includes 220 miles of trails. The majority of trails are established by volunteer club members on private lands through the generosity of landowners allowing permission for trails to cross their properties. The Association of Sauk County Snowmobile Clubs is active in supporting the trails and goals of the Wisconsin Snowmobile Association. Sauk County has ten miles of ATV trails on private lands; access requires club membership.

Wildlife Viewing and Outdoor Education

Sauk County has many parks and open spaces that offer wildlife viewing opportunities. Below are a few of the more popular locations:

The **Devil's Lake State Park Nature Center** is located at the park's north shore entrance road. The nature center is home to a three-dimensional landform model of the park that brings the park terrain into sight from a bird's eye view. Hands-on items include various bones, furs, shells, and rocks. Downstairs are many historic photographs dating from the late 1800s will into the 20th century. Program themes include snakes, skulls, worms, stories, rocks, spiders, Indian mounds, beetles, bird watching, bats, plants, and geology.

The **Baraboo Hills**, long recognized as ecologically unique and valuable, are a noted Important Bird Area in Wisconsin (Steele 2007). The Baraboo Hills are the remains of a Precambrian rock formation known as Baraboo Quartzite, one of the most ancient rock outcroppings in North America. This area contains the largest block of southern forest in Wisconsin and one of the largest in the Midwest. The Baraboo Hills support some 135 species of breeding birds, including important populations of several high-priority species. The site is considered a Cerulean Warbler core habitat, with up to 30,000 acres of suitable habitat available for this species. The area is a concentration area for migratory landbirds in both spring and fall, supporting an estimated 10,000 migrants per season. Greater than 25% of the state's Turkey Vultures congregate here in the fall. The area continues to be an important avian research and monitoring sites, especially regarding the habitat needs of forest area-sensitive species, and is the site of many educational field trips and workshops annually.

As noted on the website (http://www.aldoleopold.org), the **Aldo Leopold Foundation** is a 501c3 not-for-profit, member-supported organization based as the Aldo Leopold Legacy Center east of Baraboo in the Town of Fairfield. The foundation's mission is to inspire an ethical relationship between people and land through the legacy of Aldo Leopold. The foundation's programs create

opportunities for rich, diverse, and productive dialogue with members and others about humanity's relationships to land, allowing the idea of a land ethic to unfold in myriad ways. The Aldo Leopold Foundation offers educational and outreach programs with many of the opportunities hosted at the Leopold Center and at the original Leopold Shack, where forests, wetlands and prairies serve as an outdoor classroom for exploring ecological relationships.

The **International Crane Foundation (ICF)**, located between Baraboo and Wisconsin Dells, works worldwide to conserve cranes and the wetland and grassland ecosystems on which they depend (http://www.savingcranes.org). To accomplish its mission, ICF relies on a wide range of education and conservation activities directed toward the many countries where cranes occur. ICF programs stress the interdependence between wildlife and their habitats and the relationships that exist between wildlife, habitat and people. ICF believes that cranes can serve as a symbol inspiring people from many nations to trust each other and to work together to conserve these magnificent birds.

In January and February 2012, Sauk Prairie hosted the 25th **Bald Eagle Watching Days**. Each winter, bald eagles gather in the Sauk Prairie area due to a unique combination of factors. For winter survival, eagles need open water for fishing, undeveloped shoreline with large trees for perching, and sheltered valleys for night time roosting. All these factors come together along the Wisconsin River near Sauk City and Prairie du Sac. The Ferry Bluff Eagle Council is a local, grassroots organization working to protect, enhance and maintain bald eagle habitat in the Sauk Prairie area through education, research and management activities. Additional information regarding habitat, education, and upcoming events can be found at their website: http://www.ferrybluffeaglecouncil.org.

Hunting, Trapping and Shooting

As noted in Sauk County's CORP (2008), privately owned lands provide nearly all of the hunting opportunities in Sauk County. **Table 7** lists some of the public hunting opportunities in Sauk County. (Some areas are not open for all types of hunting.) The Nature Conservancy offers a few restricted access hunting opportunities.

Table 7: Public Hunting Opportunities in Sauk County.

Property	Size (acres)
Devil's Lake State Park	5,872
Mirror Lake State Park	1,025
Bear Creek Fishery Area	775
Hulbert Creek Fishery Area	623
Lower WI State Riverway-Bakken's Unit	2,678
LWSR – Cassel Prairie Unit	1,379
LWSR – Spring Green Unit	610
Dell Creek Wildlife Area	2,557
White Mound County Park	1,092
Pine Island Wildlife Area	5,165
Total	**21,776**

There are no free public shooting ranges (rifle or shotgun) in Sauk County or any of the surrounding counties. The nearest public range is in LaFayette County on Yellowstone Lake Wildlife Area. This range receives heavy use by shooters and hunters from Madison and the surrounding area. Sauk Prairie Trap and Skeet Club in Prairie du Sac, which is open to the public, is one of the largest

shotgun shooting clubs in the Badger state with eight trap and skeet fields. The Club provides opportunities for trap and skeet practice, youth and adult competition, leagues, and shotgun and hunter safety instruction.

Water-based Activities

Sauk County contains 25 named lakes and sloughs, along with 50 named and 6 unnamed streams. Both public and private lakes exist and are used for a number of recreational activities including fishing, boating, tow sports, and swimming. Devil's Lake and many floodplain lakes associated with the Wisconsin River are natural lakes that provide unique recreational opportunities. Other lakes that offer excellent recreational opportunities are man-made impoundments with dams. Examples of these are found at White Mound Park, Mirror Lake, Lake Wisconsin, Lake Delton, Lake Virginia, Dutch Hollow, and Lake Redstone.

The streams and rivers in Sauk County are often navigable and contain one or more different species of fish. The Wisconsin and Baraboo Rivers are the two major recreational waterways in the county. The Wisconsin River, along the northeast and southern border of the county, is one of the most ecologically diverse rivers in the nation and is home to over 100 different kinds of fish, and offers a wide variety of recreational activities. The Baraboo River, a tributary to the Wisconsin River, flows over 45 miles in Sauk County. It is one of the longest restored free flowing rivers east of the Mississippi River, and is host to many rare and endangered plants and animals.

The Department manages two fishery areas in Sauk County: Bear Creek and Hulbert Creek. Bear Creek Fishery Area is managed to protect the important and heavily used Class I trout fishery. It provides public access for fishing and hunting opportunities, and accommodates other compatible outdoor recreational use. Hulbert Creek Fishery Area includes a Class I and Class II brook trout stream, and is considered an Exceptional Resource Water. The property includes significant wetland areas, some upland southern hardwood and natural area. In addition to fishing, the lands may be used for hunting, trapping, hiking, wildlife viewing, and berry picking.

ANALYSIS OF THE PROPERTY

PHYSICAL ENVIRONMENT

Topography

Sauk Prairie Recreation Area sits at the terminal moraine of a glacier that stopped in the area during the Wisconsin Glaciation, approximately 12,000 years ago. As a result, this site contains several important glacial and unglaciated geological formations including "driftless" unglaciated land and outwash plain over western portions of the property, an elevated north-south glacial moraine over eastern portions, and Baraboo Hills to the north. This convergence of multiple geological formations makes the Sauk Prairie Recreation Area property a unique location for glacial interpretation.

Outwash areas of the property are characterized by flat topography underlain by extensive deposits of sand and gravel that were deposited ahead of the glacial advance. The moraine running along the eastern portion of the property consists of an elevated glacial moraine with an extensive area of gently rolling collapsed moraine extending to the western boundary. The Baraboo Hills to the north are characterized by exposed quartzite bedrock overlain by deposits of rounded quartzite boulders and cobbles, some mixed with windblown silt to form an apron of loose rock and soil at the base of the slopes.

Geology and Geography

The SPRA lies immediately south of, and includes a very small area of, the Baraboo Hills, an ancient Precambrian mountain chain comprised primarily of erosion-resistant Baraboo quartzite, rhyolite, granite and diorite (Luthin 1999). The soils at the SPRA were deposited during the last part of the Wisconsin Glaciation between 15,000 and 10,000 years ago as the Green Bay Lobe retreated.

Approximately the eastern half of the SPRA was covered by glacial ice that left a layer of till. At the edge of the glacier the Johnstown moraine developed and is currently visible as a low ridge. As the glacier remained stagnant at the Johnstown moraine an outwash plain of sand and gravel developed, in some places exceeding 300 feet thick.

Soils

This section is taken from the Rapid Ecological Assessment largely based on Gundlach 1980 (with later interpretation by Thompson and Welsh 1993) and Luthin 1999.

The SPRA has three distinct topographic zones, resulting from distinct geological histories that correspond with soil differences. Within and east of the Johnstown moraine, in the glaciated area,

soils are a mosaic of silty and sandy medium-textured loams (McHenry, St. Charles, Richwood, Ringwood, and Wyocena) on gentle slopes. This undulating terrain contains several kettle ponds. These mostly well-drained soils are underlain by glacial till.

West of the Johnstown moraine, on the relatively flat outwash plain, soils are comprised predominantly of deep and rich Richwood and Toddville silt loams over sandy glacial outwash. Pockets of Plainfield loamy sand occur in the southern third of the SPRA.

The north edge of the SPRA lies at the base of and includes a small area within the unglaciated Baraboo Hills. The soils here are less well-drained silt loams and stony silt loams over Baraboo quartzite.

Most of the surface and subsurface soils at the SPRA have been disturbed. Virtually all of the SPRA had been cultivated and/or grazed for much of the 100 years prior to the construction of the BAAP. Construction and industrial activities resulted in roads and rail lines being built, ditches and ponds dug, and fill material moved from source to construction sites. Remedial action activities on the property have caused additional disturbances. ***Refer to Map D.***

WATER RESOURCES AND AQUATIC HABITATS

Groundwater

Groundwater at the former BAAP generally flows from northwest to southeast across the property at all depths, from the topographic high of the Baraboo Hills to the Wisconsin River depression. However, the dominant southeast flow is shifted to the south and southwest over the southern third of the property by inflowing groundwater from the Wisconsin River. This inflow is the result of an approximate 50-foot head of water that exists at the Prairie du Sac dam at the base of Lake Wisconsin. Except for localized areas, groundwater flows more or less horizontally across the property, without a significant upward or downward flow component. The numerous wetlands and ponds that exist on the eastside of SPRA result mostly from perched groundwater in glacial kettle depressions.

As reported in the Department's Environmental Assessment requesting additional landfill space (January 2011), three releases caused by previous dumping or spills are known to have caused groundwater contamination at the property. The four areas include the Propellant Burning Ground (PBG), Deterrent Burning Ground (DBG), Rocket Paste Area/Central Plume, and the fuel oil release near the powerhouse.

Propellant Burning Ground (PBG)

The PBG is located in the west-central part of the Badger plant. Deterrent was dumped into three pits during the Korean and Vietnam active periods. The contaminants include DNT, carbon tetrachloride, trichloroethylene (TCE) and chloroform. Army has taken the following remedial actions at this site: excavation, bioremediation, cap, and pump and treat.

Deterrent Burning Ground (DBG)

The DBG is located in the northeast section of the Badger plant. This area was initially used as a soil borrow pit. Located immediately adjacent and to the west of the DBG is a coal ash disposal site. There were three pits into which waste deterrent was dumped during the Vietnam active period. Deterrent is an organic liquid mixture of benzene, di-nitro toluene (DNT) and chlorinated compounds.

Soil samples collected from beneath the DBG show high levels of DNT remaining in the subsurface. Groundwater monitoring data indicates that the contaminants DNT, and some chlorinated compounds such as trichloroethane, are present beneath and adjacent to the DBG. Army has taken the following remedial actions at this site: excavation, bioremediation, and cap.

Rocket Paste Area/Central Plume

Army has documented a third contaminated groundwater plume, the central plume. The central plume source area is near the Rocket Paste Area. The contaminant is DNT. Process wastewater from the Rocket Paste Area and the Nitroglycerin Area was conveyed in open ditches from the north-central to the south side of the installation where it subsequently flowed through the settling ponds and eventually to the Wisconsin River. It is believed that this broad production area may have caused the groundwater impacts. To address DNT soil contamination in the ditches, Army excavated the ditches in this area.

Fuel oil release at the powerhouse

Powerhouse #1 is located in the western part of the Badger plant, just east and a little north of the main gate. Located adjacent to this power plant is a large above-ground fuel oil tank. In the mid-1990s it was discovered that a transfer line between the tank and the power plant had leaked, releasing fuel oil to the soil and groundwater. Data from monitoring wells indicated that free-product fuel oil was present on the water table. This site was remediated and received closure from DNR.

Other Contaminant Findings

The sediment in **Grubers Grove Bay** is contaminated with metals including mercury, lead, copper, and zinc which were contained in the process wastewater discharged from BAAP to the bay. As a result, the bay is included on the federal 303d list of impaired waters. Army has dredged the bay twice, in 2001 and 2006, attempting to remove the contaminated sediment. Contamination remains; it is not a direct contact hazard to humans, but it is detrimental to benthic organisms. DNR has notified Army that further remedial action is needed. DNR recommends an integrated bottom treatment of sand spread over the entire dredged area of the bay. This method will mitigate areas with mercury contaminations above the remediation goal and will provide a more hospitable physical environment for inhabitation by macroinvertebrates

Hydrology

Most of the surface water that drains off the SPRA flows west to Otter Creek or south and east to the Wisconsin River. Small kettle ponds are sparsely scattered throughout the study area. These kettle ponds are of natural origin, while other ponds originated as borrow pits, reservoirs, or farm ponds. Small streams originate in the Baraboo Hills just north of the SPRA and flow south into the SPRA, and then are channeled west into two shallow scraped ponds and Otter Creek.

Small seeps have been located at the base of the Baraboo Hills. These seeps vary in quality due to previous land use surrounding the seeps or because their source water has been re-directed. Most of the northeast part of the SPRA drains into what was formerly an intermittent creek but is now a series of channels and ditches. These empty into a wetland area connected to the Wisconsin River.

Aquatic Habitat Restoration

As discussed in the Rapid Ecological Assessment (WDNR 2011), coldwater streams are a major natural community management opportunity in the Western Coulee and Ridges Ecological Landscape; a Conservation Opportunity Area north of the SPRA was designated because the bedrock influenced headwater streams in the Baraboo Hills harbor many SGCN invertebrates. Surveys of aquatic fauna and evaluation of water quality were conducted in 1993 (*Thompson and Walsh 1993, Hilsenhoff 1993),* 1998 *(Dodson et al. 1998),* and 2011 *(Unmuth 2011 and Schmude 2011)* on a subset of sites. Results from these surveys indicate that cool to coldwater streams, including an unnamed stream flowing out of Pine Glen, are present and represent a management opportunity.

The unnamed stream flowing out of Pine Glen begins within the Baraboo Hills, in Devil's Lake State Park, and flows mainly in a southerly and slightly westerly direction into the SPRA. Historically, the stream flowed out of the bluffs in a southerly, and slightly easterly direction, ending at the southern border of section 35. During the development of the BAAP, the stream was ditched at the base of the bluffs and channeled westward across BAAP lands, and under STH. 12, where it emptied into an unnamed tributary of Otter Creek to the west of BAAP land. More recently, the stream was rerouted to flow in a westerly direction into the Ballistics Pond.

Both coldwater and intermittent stream indexes of biotic integrity (IBI) were calculated (Unmuth 2011), and scores of zero, and 60 respectively indicate that the stream is in poor to fair condition, and stream restoration is the recommended approach to management. Poor fish diversity is also likely due to an abundance of panfishes running out of the Ballistics Pond and up into the stream for both better water quality and to prey on small stream fishes.

Disconnecting the stream from the pond, restoring stream meanders and general direction, and retrofitting perched culverts to properly pass baseflow would improve water quality and fish habitat. Further baseline monitoring of the stream is necessary to determine if the waterway should be listed as impaired.

Surveys of the Ballistics Pond highlight the need for restoration to improve water quality. During 2011 surveys (Unmuth 2011), blue-green algae was abundant. Blue-green algae are capable of making a range of toxins which can have minor to serious effects on wildlife, livestock, pets, and humans. The pH level was extremely high (10.2), which is as alkaline as ammonia and does not meet the criteria the DNR has established for fish and aquatic life waters (NR 102, Adm. Code). Fish surveys detected small panfish with the majority having bulging eyes and some had loss of eyesight. This disease is likely due to a combination of gas bubble disease resulting from oxygen super saturation of the water with the nitrogen gas and ammonia toxicity.

There are several ephemeral and permanent kettle ponds on the SPRA varying in quality and biological diversity. There are two western ponds that are relatively amphibian poor, with two species of amphibians and two species of fish (sticklebacks and *Pimophales* sp.) These two ponds are heavily silted in. In contrast, there are two ponds in better condition on the far northeast portion of the site, likely because they are ephemeral, seemingly lacking fish and have relatively little silt. They are serving as important amphibian breeding areas.

The East Reservoir, located atop the bluff, is the site of a population of neotenic tiger salamanders. These salamanders cannot escape the pond and have adapted to a fully aquatic life, complete with feathery gills, wide jaws, and tail fins.

The far eastern edge of the SPRA (Parcel N) borders a segment of shoreline at Weigands Bay South, Lake Wisconsin. This area provides good habitat for a variety of fish, aquatic plants, frogs, turtles, aquatic insects, waterfowl, and shorebirds. It also is an extremely popular site for water-based recreation like boating, bird watching and angling.

Restoration of aquatic habitats at the SPRA would improve fish and wildlife habitat and is necessary in some locations before any recreational or human uses of the property are considered.

Pond within the Magazine Area that supports tiger salamanders. *Photo by Christina Isenring*.

VEGETATION

Historical Vegetation

Data from the original Public Land Surveys are often used to infer vegetation composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American

settlement. For the area comprising the SPRA the Public Land Surveys were conducted between 1841 and 1845. 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 historical systems and including some structural or compositional components of the historical landscape within actively managed lands can help conserve important elements of biological diversity (WDNR2012, in press). ***Refer to Map E.***

The broad outwash plain that comprises the western half of the SPRA and areas to the south and west was prairie at the time of European settlement. This 14,000-acre grassland was called the Sauk Prairie (Lange 1990), named after the Sauk (Sac) Indian inhabitants that had settled in what is today Sauk City during the 1700s. The northeastern and eastern portion of the SPRA, within the glaciated area, was oak savanna/oak opening. The small portion of the Baraboo Hills within the SPRA was historically oak forest, with a small marsh where a stream exits the hills.

Current Vegetation

By the mid-1800s much of the Sauk Prairie had been converted to agriculture. Review of 1937 aerial photos show that extensive cultivation and some pasture dominated the landscape with little to no tree cover prior to the construction of the BAAP. The large scale soil disturbance that continued with the development of BAAP and the other uses of the land such as cultivation, grazing, management for forestry and wildlife, and lack of management has greatly influenced the current vegetation. **Table 8** below illustrates the extent of grassland, agriculture and shrub acreage. ***Refer to Map F.***

Table 8: Cover type data for the Sauk Prairie Recreation Area.

Cover Type	WI DNR	Ho-Chunk	USDA-DFRC	Bluffview	WI DOT	TOTAL
Agriculture	40.6	216	1,229	20	--	*1,505.6*
Central Hardwoods	20	--	9.5	--	--	*29.5*
Developed	17	17	23	--	60	*117*
Grassland	1,736	1,206	491	95	--	*3,528*
Oak	0.3	--	33	--	--	*33.3*
Rock Outcrops	--	0.8	--	--	--	*0.8*
Shrub	787	5.6	220	29	--	*1,041.6*
Swamp Conifer	--	17	--	--	--	*17*
Upland Conifer	116	14	9.6	--	--	*139.6*
Upland Hardwood	664	46	64	18	--	*792*
Water	12.6	1.04	1.04	0.14	--	*14.82*
Wetland Non-forested	30.7	4.5	3.3	0.5	--	*39*
TOTAL	***3,424.2***	***1,527.94***	***2,083.4***	***162.64***	***60***	***7258***

Source: WisFIRS for DNR current ownership 2010-2011; other data from Army.

Former agricultural fields and road edges have developed into old fields dominated primarily by smooth brome grass, reed canary grass, and quackgrass. Some row-crop agriculture continues on the property.

Many areas that received heavy disturbance during construction of the BAAP, but which were later abandoned, have grown up into brush and woody thickets of eastern cottonwood, quaking aspen, box elder, black cherry, black locust, and other tree species. Autumn olive and multiflora rose, both planted on the property, are abundant in many of these areas. Other planted species include red and white pine, white spruce, northern white cedar, and black walnut.

In the northwest part of the property, the area around the Ballistics Pond was scraped of soil at the time the pond was developed. The altered hydrology allowed wet-adapted species to invade, and this area currently resembles a low quality Southern Hardwood Swamp.

Prairie plantings are present and vary in plant species diversity and shrub cover. Many of the prairie plantings are dominated by Canada goldenrod, smooth brome, big bluestem, Kentucky bluegrass, and Canada thistle. Shrubs include honeysuckle, common buckthorn, and autumn olive.

Planted prairie at the SPRA. *Photo by Christina Isenring*.

Although much of the vegetation at the SPRA has developed since the original soil disturbance events, some areas retain remnants of original vegetation.

Remnant prairie vegetation at SPRA is very rare, with only three prairies having been located totaling less than six acres. The largest remnant (four acres) is located on a west-facing hill on the western side of the Magazine Area. This low-diversity Dry to Dry-mesic Prairie is dominated by grasses, especially big bluestem, yellow Indian grass, side-oats grama, hairy grama and Kentucky bluegrass. Tree and shrub encroachment (mostly black cherry, autumn olive, honeysuckle, and prickly ash) is common along the edge of the prairie, while problem species such as wild parsnip, Queen Anne's lace, and smooth brome occur within.

Oak Opening (oak savanna), a globally rare natural community, is represented by only one remnant example at the SPRA. This area has semi-open grown bur oaks; 15-30 inch diameter at breast height [dbh]) in the canopy and black cherry (10 dbh) in the subcanopy over a very dense layer of brambles, common burdock, honeysuckle, and smooth brome.

Much of the forest on the SPRA has either developed on open old field or from existing Oak Woodland communities. Grazing had maintained the open canopy of the Oak Woodlands, which have developed a closed canopy since grazing has discontinued. These forests, which today resemble Southern Dry and Dry-mesic Forest communities, occur on the south-facing slope of the Baraboo Bluffs (northern edge of the SPRA). They are characterized by various oak species (white, black, and red) as well as shagbark hickory, black cherry, red maple, and ironwood. Thickets of brush, including many non-native invasive species, now dominate the understory in many areas. Forests on open field typically developed from farmstead plantings and hedegrows (especially green ash, American elm, cottonwood and box elder), and forestry plantings of white and red pines, white spruce, and black walnut. A dense shrub cover of multiflora rose, honeysuckle, buckthorn, autumn olive, and crabapples that invaded from wildlife plantings and off-site sources is also present.

Conifer plantations (white pine, red pine, spruce and white cedar) have been planted in 1954, 1957, 1960, 1972, 1989, and 1990 at several locations across BAAAP. In 1999 and 2000, plantations of commercial value were harvested, with the proceeds given to the Sauk County School District. Spruce and white cedar were planted as wildlife habitat and these plantations have little or no commercial value.

Black walnut plantations were extensively planted between 1975 and 1978 as part of the forestry management plan for BAAP. Black walnut is generally harvested after 60-to-80 years of growth. Some stands are doing well and others are feeble due to types of soils. A 2003 survey of some walnut plantations revealed poor stand results and none with commercial value in the near future.

Two areas have been identified on the SPRA that are degraded Bedrock Glades. Bedrock Glades are found in scattered locations on unglaciated quartzite throughout the Baraboo Hills. Glacial erratics and 30-foot-tall outcrops are present. The glades intergrade with the surrounding forested communities and have thick canopy cover. Canopy trees are slightly stunted white oak over a subcanopy of shagbark hickory and bur oak. The sapling layer is sparse with prickly-ash. Ground flora is similar to the surrounding forest and dominated by Pennsylvania sedge with shooting star and wild-coffee. Rock outcrops have brambles, common ragweed, and garlic mustard and other non-native invasive species.

Pine Relicts are unique to the Driftless Area of southwestern Wisconsin and one example is present at SPRA. White pine and black oak dominate the overstory. Early low blueberry and partridgeberry occur in the understory.

Detailed vegetation summaries are available in the *Preliminary Ecological Restoration Plan for 1300 Acres of the Badger Army Ammunition Plant, Baraboo, Wisconsin* (Luthin 1999).

Invasive Species

As stated in the Rapid Ecological Assessment (WDNR 2011), the unique land use history of the Sauk Prairie Recreation Area has contributed to the diversity and abundance of non-native invasive plants present. Some of these non-native invasive plant species have come in on their own (e.g., garlic mustard, Japanese hedge parsley, common buckthorn, black locust) while 52 others have been deliberately planted into the area or are a result of historic farming activities (e.g., reed canary grass, smooth brome grass, autumn olive, multiflora rose, honeysuckle). Some of the old farmsteads contain various exotic species probably planted for ornamentation (e.g., Japanese barberry, Norway spruce) (Luthin 1999).

Non-native invasive plants out-compete and even kill native plants by monopolizing light, water, and nutrients, and by altering soil chemistry and, in the case of garlic mustard, mycorrhizal relationships. In situations where invasive plants become dominant, they may even alter ecological processes by limiting one's ability to use prescribed fire (e.g. common buckthorn), by modifying hydrology (e.g., reed canary grass can alter surface flow and clog culverts), and by limiting tree regeneration and ultimately forest composition [e.g. honeysuckle (Gorchov and Trisel 2003)]. In addition to the threats on native communities and native species diversity, terrestrial 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).

While eliminating non-native invasive species at the SPRA may not be a realistic goal, land managers may want to consider how to limit spread of these invasives to other sites and to limit their negative impacts on achieving wildlife habitat goals.

Wisconsin's Statewide Forest Strategy

Wisconsin's Statewide Forest Assessment was based on Wisconsin's Forest Sustainability Framework ("Wisconsin Forest Sustainability Framework") 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 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 SPRA planning efforts in regard to opportunities to maintain or enhance biological diversity. These strategies may not be applicable to all areas of the SPRA.

Strategy Number	Strategy
1	Encourage planting to enhance, protect, and connect larger tracts of forested land in appropriate locations consistent with ecological landscapes.
6	Strengthen collaborative and large scale planning at the town, county, state and federal levels
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
24	Control and management of existing (non-native 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
Source: Wisconsin Department of Natural Resources. 2010. Wisconsin's Statewide Forest Strategy. http://dnr.wi.gov/forestry/assessment/strategy/overview.htm.	

High Conservation Value Forests

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

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

Primary Sites, high quality natural communities, and rare species habitat are typically the best HCVF opportunities. Based on the current draft criteria for defining HCVFs (Forest Stewardship Council 2009) opportunities for HCVF on the SPRA are limited, although ecological restoration may elevate these areas to meet HCVF criteria.

WILDLIFE RESOURCES

Prior to European settlement, the Sauk Prairie supported a rich diversity of wildlife, including moose, elk, bear, bison, prairie chicken, and sharptail grouse. Today common game species may include whitetail deer, turkey, squirrels, waterfowl, geese, coyote, bear, woodcock, mink, beaver, fox, rabbit, raccoon, pheasants, doves, crow, muskrat and otter.

Grassland and Shrubland Birds

Biologists and birders are concerned about population declines of many grassland bird species. Since the North American Breeding Bird Survey (BBS) began in 1966, grassland birds have declined more steeply than any other group of birds in North America as well as the Midwest (Sample and Mossman 1997; Askins et al. 2007). Badger Army Ammunition Plant was recognized as a Priority Landscape for Grassland Bird Management (Sample and Mossman 1997) because of the grassland bird habitat present including idle warm season grass/forb (short, medium, and tall), oak savanna, and dry old field. Grassland and shrubland bird habitat management is a major component of the Natural Resources Management Plan for the former BAAP (Luthin 1999), the ecological restoration plan for 1,300 acres of the former BAAP (Luthin 1999), and is addressed in the need to restore prairie and savanna habitat at the former BAAP in Value 7, Criterion 7.2 in the BAAP Reuse Plan (2001).

The SPRA provides extensive surrogate grassland, shrubland, and savanna habitat for 97 confirmed or probable breeding bird species, of which 21 are grassland and shrubland dependent (Mossman 2003). This is an impressive list for an area the size of the SPRA, especially the number and diversity of grassland and shrubland birds (**Table 9**). Surrogate grassland/shrubland habitat at the SPRA is made up of a mix of planted prairies, pasture, oak savanna, and old fields ranging from open to densely shrubby.

Table 9: Grassland and shrubland birds known from the Sauk Prairie Recreation Area.

Common Name	Scientific Name	State Status
Bell's vireo	*Vireo bellii*	THR
blue-winged warbler	*Vermivora pinus*	SC/M
bobolink	*Dolichonyx oryzivorus*	SC/M
brown thrasher	*Toxostoma rufum*	SC/M
clay-colored sparrow	*Spizella pallida*	NA
common nighthawk	*Chordeiles minor*	SC/M
dickcissel	*Spiza americana*	SC/M
eastern bluebird	*Sialia sialis*	NA
eastern meadowlark	*Sturnella magna*	SC/M
field sparrow	*Spizella pusilla*	SC/M
grasshopper sparrow	*Ammodramus savannarum*	SC/M
Henslow's Sparrow	*Ammodramus henslowii*	THR
northern bobwhite	*Colinus virginianus*	SC/M
orchard oriole	*Icterus spurius*	NA
savannah sparrow	*Passerculus sandwichensis*	NA
sedge wren	*Cistothorus platensis*	NA
upland sandpiper	*Bartramia longicauda*	SC/M
vesper sparrow	*Pooecetes gramineus*	SC/M
western meadowlark	*Sturnella neglecta*	SC/M
whip-poor-will	*Caprimulgus vociferous*	SC/M
yellow-breasted chat	*Icteria virens*	SC/M

Listing status is based on the NHI Working List published June 2011.

Grassland and shrubland birds, a group of species of critical conservation need in Wisconsin, would benefit from a diversity of grassland habitat in large unfragmented tracts. Grassland bird habitat is most effectively maintained as large landscapes of continuous grassland, uninterrupted by hedgerows, with the cover of woody plants less than 5% (Sample and Mossman 1997). Hedgerows fragment grasslands and provide habitat/movement corridors for predators of grassland birds. Structural diversity within the grassland, including scattered patches of shrubs, short and tall grass, amount of residual herbaceous duff, a mix of grasses and forbs, and a management rotation of type, intensity, and frequency, is also important. Currently the high level of shrub and tree encroachment in the grasslands of the SPRA threatens the diverse grassland bird community.

Breeding bird surveys in 1998 and 2011 indicate that invasive shrub growth has greatly increased and has changed the breeding bird composition. Species that have benefited from the increase of shrubs in old fields and the shrub invasion in forests include Bell's vireo, field sparrow, hooded warbler, American redstart, rose-breasted grosbeak, and gray catbird. The shrub increase has been too much for some species and caused a shift of clay-colored sparrow from areas that have

become too shrubby to support them, to areas that were once too open and grassy but are now invaded with their preferred scattering or moderately dense shrubs.

In the more open grassland areas that were formerly characterized by scattered buildings and pasture, there has been a decrease in species that formerly used the buildings and utility poles for nesting, e.g., European starling and red-headed woodpecker. The removal of cattle has probably led to decreases in European starling and brown-headed cowbird. The replacement of pasture with thick tall grass is probably responsible for a big increase in Henslow's sparrow, a decrease in upland sandpiper and disappearance of Western meadowlark.

Activities that create an urbanized environment (clean pavement, mowed grass, maintained buildings, and ornamental landscaping) are predicted to produce a bird community dominated by a few non-native and common native bird species (Mossman 2003). Knowledge of the current distribution of critical bird communities at the SPRA suggests that if urbanized environments are to occur, they should be concentrated at the west-central boundary to limit their impact (Mossman 2003).

The highest quality habitats for grassland birds (**Figure 2**) are found in the extensive non-native grasslands (Surrogate Grasslands) in the southcentral tract and northcentral section of the SPRA. High-quality grassland bird habitat with a moderate shrub component is located in the northeast section of the SPRA. These areas should be contiguous and when combined with the restoration potential of the surrounding property and landscape would offer significant management opportunities for viable populations of grassland and shrubland birds.

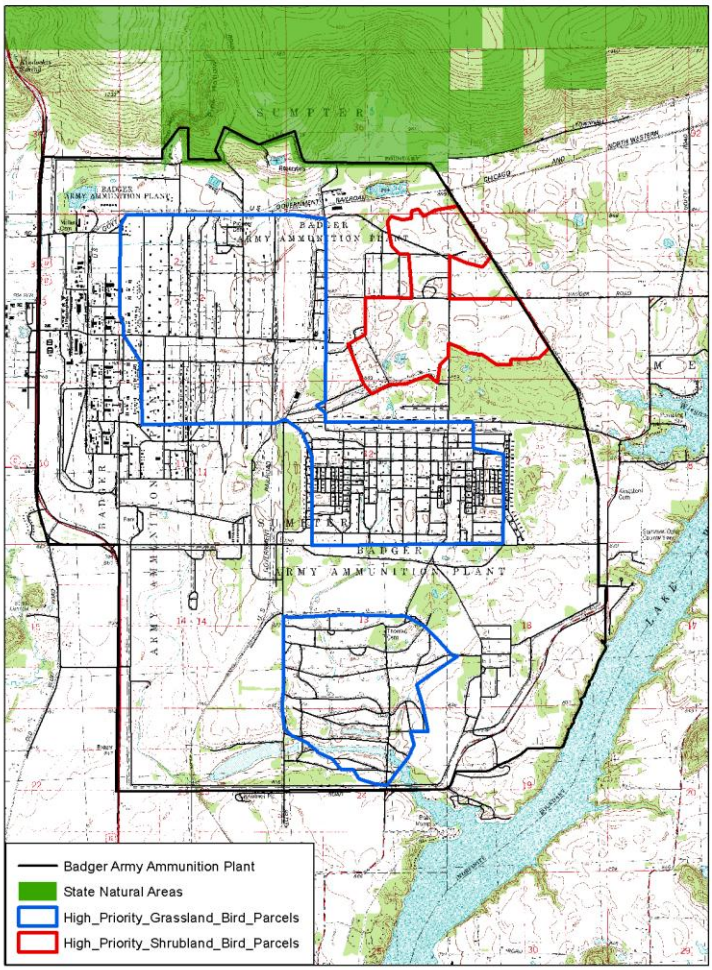

Figure 2: Distribution of critical species of open grassland and shrubland habitats at Sauk Prairie Recreation Area, Sauk County, WI.

SITES OF HIGH CONSERVATION SIGNIFICANCE

Two ecologically important sites were identified on the SPRA. These Primary Sites were delineated because they generally encompass the best examples of: 1) rare or representative natural communities; 2) documented occurrences of rare species populations; and/or 3) opportunities for ecological restoration or connections. ***Refer to Map G.***

These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site's ecological significance, and management considerations.

SPRA01. Sauk Prairie Recreation Area Baraboo Hills Woodland

Location

County:	Sauk
Landtype Association:	222Kd06. Moon Valley Plains;
	222Ld03. West Baraboo Ridge;
	222Lc17. Mississippi River Valley Train – South
Approximate Size (acres):	188

Description of Site

This site contains the most diverse topographic features of the SPRA and constitutes a part of the Baraboo Hills (**Figure 3**). The bluff in the northwest part of the site rises 240 feet above the rest of the site. Below the bluffs, the site is characterized by a ridge of rock and other material that was deposited during the retreat of the Wisconsin glacier. The slope is considerable on the south-facing bluff surrounding the reservoirs, but becomes more gradual at the base of the hills. In the eastern half of the site, the topography is less steep with a moderately sloped area at the base of the Baraboo Hills. In the center of this area is a steep ridge with an east – west orientation that was part of the Johnstown moraine and is comprised of thick glacial till. To the south of this ridge is a natural kettle pond that formed behind the moraine during the glacial period (Clayton and Attig 1990).

One drainage originates in a wet meadow north of the boundary fence in Devil's Lake State Park, and flows through the center of the site and drains into a depression (Oleum West) west of the road that runs roughly north – south through the center of the site. There are several drainages to the south of the steeper portion of the bluff that carry seasonal flow. A seep trickles out at the base of the bluffs in the center of the unit. Two cement-lined reservoirs exist on the site; the east reservoir supports a population of neotenic tiger salamanders. The reservoirs were excavated from the quartzite bluff in 1942, with the rubble deposited into fan-shaped piles west and east of the reservoirs. A small farm pond is found west and slightly south of the reservoirs. Below this, adjacent to a north - south road, are the two shallow ponds excavated in 1997 and 1998 during the clay removal process. The Oleum East pond is a natural kettle pond that was manipulated during the construction of BAAP and received cooling water discharge from the former Oleum Plant.

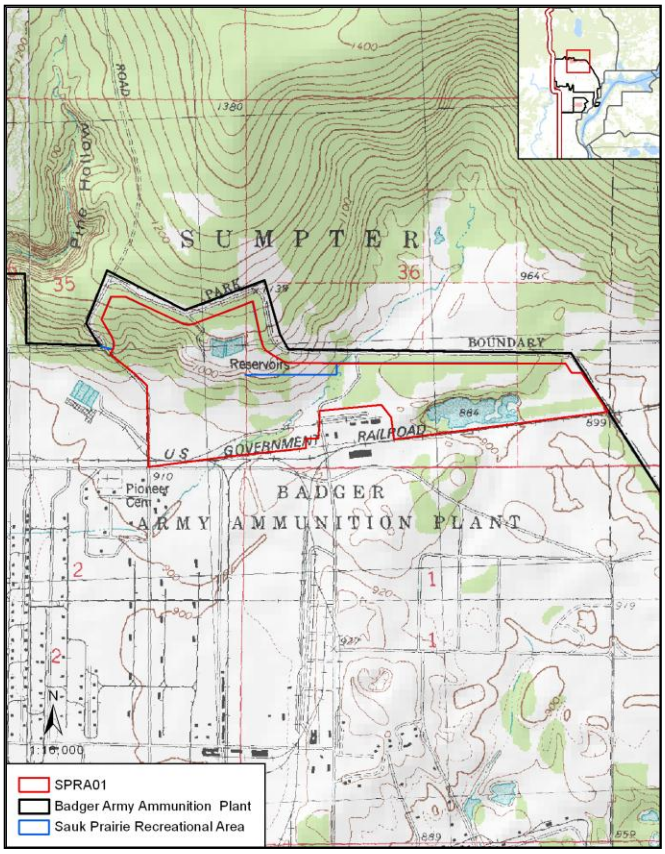

Figure 3: Sauk Prairie Recreation Area Baraboo Hills Woodland.

To the south of the site are an old rail line and the Oleum Plant with associated buildings and roads.

Review of 1937 aerial photos for this site indicates that at that time it was characterized by open pasture. In the northwestern part of the site the area has transitioned from generally a more open canopy to closed-canopy forest. Only on the steepest slopes in the northwest section was there a closed-canopy forest in the 1937 aerial photo. Today that area resembles a Bedrock Glade natural community in part because of the huge quartzite boulders and rock outcroppings. This very small area (<5 acres) has a canopy of large (30"+ dbh), stunted white oak. The canopy is over a dense subcanopy of shagbark hickory and black cherry, a sapling layer of white ash and buckthorn. Although ground layer species of Bedrock Glades are typically similar to those of prairie and savanna, the species at this site resemble those of the surrounding forest instead.

Much of the forest in this site has developed from savanna-like conditions, crop fields, or pasture (as interpreted from 1937 aerial photos and historical accounts). Current forest condition varies based on these differences. The highest quality forests are those that developed from savanna-like

conditions, including the area north of the reservoirs and on the moraine ridge north of Oleum Pond. These areas resemble Oak Woodland natural communities with a canopy dominated by white oak, shagbark hickory, and black cherry. Common woodland species are whorled loosestrife, pointed tick trefoil, dogbane, field pussy-toes, and Pennsylvania sedge.

Significance of Site

The significance of this site is that it creates a buffer to the highly-significant Baraboo Hills and South Bluff/Devil's Nose State Natural Area. This site harbors degraded examples of Bedrock Glade and Oak Woodland and supports habitat for rare plant and animal species. The Western Coulee and Ridge Ecological Landscape offers major opportunities to sustain Oak Woodland and Bedrock Glade, two globally imperiled communities. Oak woodland once occupied approximately 1.4 million acres in pre-Euro-American settlement Wisconsin; today, it is extraordinarily rare – only about 140,000 acres remain in the state (Hoffman 2009).

Based on 2011 herptile surveys, the bedrock outcrops within this site provide the best opportunity for enhancing habitat for herptiles on the SPRA. Existing records of rare snakes are found adjacent to this site and would likely benefit from restoration efforts to restore the Bedrock Glade to a more open state.

This site was not specifically targeted in the most recent breeding bird survey effort but previous surveys and incidental observations in 2011 located several uncommon species utilizing this area. These results indicate that restoration of this site to an Oak Woodland would enhance bird habitat with the adjoining Baraboo Hills forest.

Management Considerations

Restoration of the remnant natural communities (Bedrock Glade and Oak Woodland) and enhancement of habitat for rare species should be considered a high-priority. Restoring these historically fire dependant communities to a more natural state would allow for a gentle transition zone between the vast closed canopy forests of the Baraboo Hills and the expansive grasslands of BAAP. Invasive species are prevalent and cause serious harm to the integrity of the site as well as have the potential to spread into the neighboring Devil's Lake State Park. Restoring site hydrology is also important since this site supports multiple springs and ponds.

SPRA02. Sauk Prairie Recreation Area Prairie and Savanna

Location

County: Sauk

Landtype Association:

222Kd06. Moon Valley Plains

Approximate Size (acres): 110

Description of Site

This site, located in the Magazine Area (**Figure 4**), features a complex of remnant prairie, Oak Woodland, and surrogate grassland. The remnant prairie is small and grass dominated with big bluestem, yellow Indian grass, side-oats grama, hairy grama, and Kentucky bluegrass common. Tree and shrub encroachment is common along the edge of the prairie and typically has scattered black cherry, autumn olive, honeysuckle, and prickly ash, over a low diversity prairie with such problem species as wild parsnip, Queen Anne's lace, and smooth brome. At the south end of the prairie is an area resembling an Oak Woodland natural community with semi-open grown bur oaks (15-30 inch dbh) in the canopy and black cherry (10 inch dbh) in the subcanopy over a very dense layer of brambles, burdock, honeysuckle, and smooth brome. The majority of the site is characterized by a smooth brome dominated old field with scattered cottonwood groves and shrubs, including autumn olive. Cement building foundations are common.

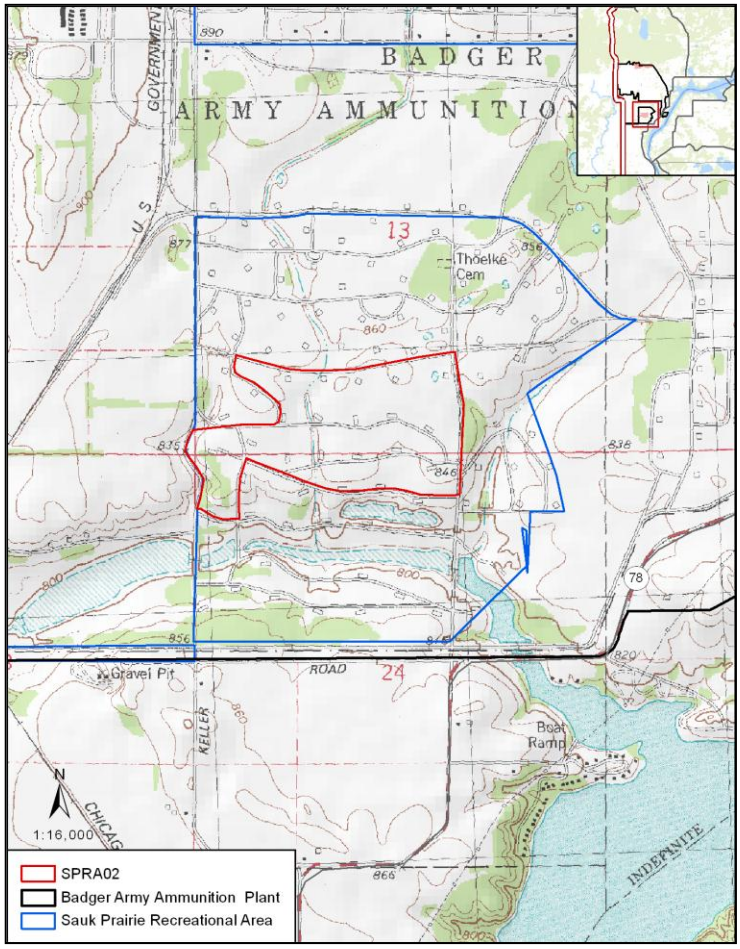

Figure 4: Sauk Prairie Recreation Area Prairie and Savanna.

Significance of Site

This site, in conjunction with the large expanse of surrogate grassland making up the entire SPRA, offers an opportunity to restore two globally rare natural communities and improve habitat

for many grassland, savanna, and woodland plant and animal specialists, especially grassland birds. Prairies and Oak Woodlands were historically common in Wisconsin but are now rare throughout the state. Restoration of these globally rare natural communities is critical to the survival of many rare plants and animals that depend on them. Oak Woodland once occupied approximately 1.4 million acres in pre-widespread Euro-American settlement Wisconsin; today, it is exceedingly rare – only about 140,000 acres remain in the state (Hoffman 2009). With most of these remnants being highly degraded and having converted to closed-canopy oak forest.

Prairie once occupied approximately 2.1 million acres in Wisconsin. Now, approximately 2,000 acres remain – less than 0.1%. 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, invasion of woody species, non-native invasive species and, in the case of Wet Prairies, ditching and tiling. Wisconsin has more Dry Prairies than any other state because of the many steep-sided bluffs in the extensive Driftless Area, the rough terrain of the kettle interlobate moraine, and the north-south orientation of several major river valleys such as the Mississippi, the Chippewa, and the St. Croix. These topographic attributes provide suitable sites for the development and persistence of this prairie type in conjunction with management to control brush and non-native invasive species encroachment.

Rare plants have been known from this area, although recent intensive surveys have not relocated the populations. One of the best populations in the entire state of the prairie vole is found at the SPRA with documented records from nearby the primary site. Its habitat is limited to Dry Prairies and sandy oldfields in the southern half of Wisconsin. The primary site falls within one of the high priority grassland bird parcels (**Figure 2**), as several conservative grassland obligate bird species breed within this area.

Management Considerations

The Dry Prairie within this site has received close attention from volunteer groups conducting prairie restoration at the former BAAP. Current management practices include brush removal and prescribed burning. Both of these activities are compatible with the remnant prairie flora that is present.

This small site is unique because remnant plant communities are very rare at the SPRA, and therefore warrants special management consideration in future master planning efforts. In order to provide the habitat size and structure necessary for grassland and shrubland bird communities that may be using this small site, compatible management outside of the site that restores prairie and savanna or connects surrogate grasslands such as pasture, idle exotic grasses or late-cut grass hay is crucial. The value of this site for animals depends entirely on opening a large expanse of open grassland habitat. The site itself is too small to meet the needs of area sensitive grassland species alone but creating connections to open landscapes to the north and clearing brush on adjoining properties to the east and west would be critically important to the long-term viability

of the grassland animal community present here. The most aggressive non-native invasive plant species at this site are generally limited to the tree and shrub dominated areas.

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Numerous rare species have been documented within the SPRA. No high quality natural communities were located, although numerous areas have potential to increase in quality with ecological restoration. **Appendix A** shows the rare species currently known from the SPRA. Documented rare species for the SPRA include: one State Special Concern (S-SC) amphibian, seven S-SC aquatic invertebrates, 22 S-SC and four State Threatened (S-THR) birds, three S-SC and two S-THR mammals, one S-SC reptile, one S-SC animal assemblage (bat hibernaculum), and five S-THR and two State Endangered (END) plants. One of the S-End plants, prairie bush clover, is also listed as Federally Threatened.

Ecological Priorities for SGCN

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 B** highlights the Ecological Priorities for vertebrate SGCN on the SPRA. Note that these Ecological Priorities include all of the natural communities that we have determined to provide the best opportunities for management on the SPRA from an ecological/biodiversity perspective.

Bat Conservation

As reported in the Rapid Ecological Assessment (WDNR 2011), the Driftless Area of Wisconsin, including the Baraboo Hills, is particularly rich in known and potential bat hibernacula (Special Concern animal assemblage) within easy commuting distance of the SPRA for summer resident bat populations. The SPRA also provides habitat along a critical migratory corridor, the Lower Wisconsin River. The older forests of the Baraboo Hills provide favorable characteristics for bats by offering roosting, foraging, and commuting habitat. One limited mobile survey at the SPRA was conducted in June 2010 along roadways primarily encircling the 2011 NHI survey parcels. Surveys detected the presence of four of the seven species currently known from Wisconsin, and included two state Threatened and two Special Concern species.

By feeding on insects, bats are an important component of healthy ecosystems. Opportunities to promote bat habitat include providing resources for roosting, foraging, and drinking. Bats of the SPRA may be roosting under loose, peeling bark and in crevices and cavities in trees. Often these attributes are found in older forests with snags of varying decay level, size, and height.

Foraging is done in and along small to medium forest openings or gaps, such as ponds, natural and artificial openings, roads, or water courses. Though uncommon on the highly modified landscape of the SPRA, these habitat features are still important, especially along the south edge of the Baraboo Hills and natural and artificial wetlands on the property. Maintaining diverse forest flora and reducing non-native plant abundance is important for promoting invertebrate prey diversity and thus promoting foraging opportunities for bats.

Water resources are used for drinking, travel, and foraging. Maintaining high-water quality and access to water is important for protecting bat populations. Wide buffers (generally wider than those recommended in Best Management Practices for Water Quality) around water, including rivers, streams, and wet meadows, are important for bats and other wildlife species using these areas.

Hibernaculum disturbance, habitat degradation, and wind-turbine mortality are threats that affect all bat species found in Wisconsin. An emerging threat to Wisconsin's bats, White-Nose Syndrome (WNS) has been called the "most precipitous wildlife decline in the past century in North America" by Bat Conservation International and has devastated bat populations in the eastern United States since 2006 (*White-nose Syndrome)*. It has recently been discovered that the fungus *Geomyces destructans* is the causal agent of White-Nose Syndrome. Due to the emerging threats that bat populations face in Wisconsin, more surveys (acoustic and roost) are needed to more accurately describe the bats that use the SPRA.

A bat hibernaculum with 50 big brown bats was found recently on the property within a man-made structure. Bats hibernate in both the above-ground portion of this building as well as several subsurface reservoir areas and are able to access these areas through several entrances. Military ammunitions production and storage bunkers and similar facilities at the former BAAP can provide additional unique research and management opportunities to help in the treatment and recovery of bat populations from WNS (Schehr 2011). The subterranean nature of these structures makes them suitable candidates for artificial hibernacula due to the buffered temperatures and humid conditions they provide. Without excessive cost or effort, the environmental conditions of these man-made structures are being modified and are a possible site for future treatments of the fungus that causes WNS. Structures that are likely suitable for use in these bat conservation and management efforts include storage magazines, nitroglycerin production bunkers, cannon range tunnels, and subterranean infrastructure such as large-diameter water and sewer piping and water containment areas.

RECREATIONAL FACILITIES AND USE

As a new property, there are no established recreational uses or facilities. This will be determined during the master planning process.

Recreation opportunities within the actual boundary fence of the former BAAP have been extremely limited because of the ongoing deconstruction of the plant facilities. However, during the last several years the Army has allowed limited deer hunting during the regular 9-day gun

season, and the 4-day anterless hunt in December. Hunting is by permit only with hunters assigned to a zone and a specific parking area. The Army has also allowed limited opportunities for the spring turkey hunt. Hunting again is by permit only, and is mostly limited to the Learn to Turkey Hunt program and disabled hunters.

Over the years the Army has also allowed many tours of the property. These are by escort-only and are mostly limited to viewing the plant property from the vehicle windows.

The Sauk Prairie Conservation Alliance (TSPCA) has been allowed to organize and manage several volunteer work days each year. Activities have mostly focused on the "prairie hillside" and one oak savanna area to remove invasive species. They also incorporate an educational component by teaching the participants about the plant history, prairie restoration, and birds. TSPCA has also started a similar program for school groups. The program brings neighboring school kids to the property to remove invasives, collect and scatter prairie grass seeds, and learn about the plant and the outdoors.

CULTURAL RESOURCES

The Sauk Prairie Recreation Area evidences a wide variety of recorded prehistoric and historic era archaeological sites and features. Prehistoric site types are varied and include Archaic (ca. 8000-500 BC) "isolated finds", Woodland (ca. 500 BC-1000 AD) burial mounds (including Late Woodland effigy mounds), and more poorly known "lithic scatters". A "dance ring" evidently associated with historic Indian peoples is located just north of the property. Historic Euro-American (remnant) farmsteads are the most numerous of site types found on the parcel, although other historic sites (including historic Euro-American cemeteries) are also located within SPRA.

Additional, unidentified archaeological sites almost certainly exist on the property. A number of reported (and, likely, unreported) sites have been adversely impacted by the decades-long operations of the Badger Army Ammunition Plant. All of these sites, especially the burial mounds and cemeteries, are protected against unauthorized disturbance under provisions of Chapters 44 and/or 157 of Wisconsin statutes (Dudzik 2012). ***Refer to Map H.***

ADMINISTRATIVE AND OTHER NON-PUBLIC USE FACILITIES OR STRUCTURES

In 1942, 138 parcels of land comprising 10,565 acres were taken for construction of the plant. An entire community, including 80 farms, Lake Wisconsin cottages, a gas station, three churches, three cemeteries, three schools and a town hall, was vacated.

When completed, BAAP comprised:

- 1,400 buildings (some reports have this as high as 2,266 buildings)
- 157 miles of road
- 60 miles of railway
- 200 miles of elevated steampipe
- 110 miles of electric lines
- 13 miles of boundary fence
- 661 fire hydrants
- Water pumping capacity of 85 million gallons per day

BAAP had its own power plants, telephone system, hospital, cafeterias, laundry, wastewater treatment facility, landfill, employee housing, fire department, police force, and even Wisconsin's first four lane highway leading to and from the plant's entrance.

Currently, the extent of facilities and structures on the entire Sauk Prairie Recreation Area has been greatly reduced; decommission activities are going on to date. Based on data received from the Army, 174 buildings remain on the entire property (69 on DNR parcels). However, 2092 concrete slabs remain on the entire property (974 on DNR parcels). Most buildings at Badger were constructed on concrete slabs. In recent years the Army has been removing slabs as part of the sewer line removal project. They are also removing the slabs from production buildings where there was potential for chemical or explosive material leaks into or under the slab. It is not yet known how many slabs (as well as unfilled basements, cisterns, manholes, and piles of crushed concrete) will remain after the Army vacates the property.

Miles of fence, road, railroad and drainage ditches cross the property. Two water reservoirs are located on the north side of the property and are fenced off to public use. The river pump house in Parcel N is vacant and fenced off to prevent public access. ***Refer to Map Series I.***

SIGNIFICANT MANAGEMENT ISSUES AND CONSTRAINTS

Below is a selected list of management issues and constraints common to the Sauk Prairie Recreation Area. Issues include those items that are short-term and can be addressed (i.e. concrete slabs) versus constraints that are long-term limitations (i.e. dig restrictions).

Resource Management

- Ownership of HCN parcel
- MEC sites/ dig restrictions ***Refer to Map J.***
- Cemeteries
- Landfills
- Groundwater contamination
- High level of shrub and tree encroachment in the grasslands
- Adjacent land use

- Railroads – rails and wood ties
- Power lines
- Concrete slabs
- Piles of rubble/rebar
- Existing roads/buildings – keep or remove
- Reservoirs
- Cisterns, wood lined shafts (per walk through reports)
- Pump house (Parcel N)
- Water intake pipe per Map H-2

Recreation Management

- Public access to the property
- Soil and groundwater contamination
- Adjacent land use

Future Needs

The Rapid Ecological Assessment (WDNR 2011) project was designed to provide a rapid assessment of the biodiversity values for the SPRA. 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 on the SPRA.

Breeding Birds – Breeding bird populations respond quickly to changes in vegetation structure and can be indicators of change in habitat types. Continued monitoring of breeding bird populations will be critical as this property undergoes management.

Small Mammals – Several records of the prairie vole are located within the SPRA. More survey work is needed to detail the rarity of this species statewide, but the SPRA appears to be an important landscape for maintaining this uncommon small mammal.

Invasive Species – Monitoring and control of terrestrial and aquatic non-native invasive species will be critical on the SPRA.

Bats – Due to the emerging threats that bat populations face in Wisconsin, more information in the form of surveys (acoustic and roost) are needed to more accurately describe the bats that use the SPRA.

Herptiles - Additional inventory and monitoring is needed for reptiles and amphibians on the SPRA. Efforts to identify additional amphibian breeding ponds, monitoring of existing pond sites, and continuation of existing frog and toad survey routes would be beneficial. Additional surveys for reptiles (snakes and lizards) with low detection probabilities would be warranted as the property holds good potential to harbor uncommon species.

Aquatic Resources –

- Intensively monitor the Ballistics Pond and the unnamed stream flowing from Pine Glen for oxygen, conductivity, temperature and pH using continuous monitoring equipment.
- Further baseline monitoring of the unnamed stream flowing from Pine Glen is necessary to determine if the waterway should be listed as impaired.
- Collect water chemistry samples on a monthly basis from the Ballistics Pond and the unnamed stream from May through November.
- Baseline monitoring for two other intermittent streams flowing from springs in the northern part of the property.
- Collect fish and instantaneous water quality at all other ponds that were not recently (past 10 years) created on the SPRA property.
- Collect fish from the Ballistics Pond for disease evaluation.

Other Rare Species and Habitats – Locations of surrogate grassland and remnant prairie and savanna habitats should be identified and mapped. These areas should be prioritized for conducting additional rare animal surveys or representative species during appropriate seasons. This should include additional vertebrate and invertebrate animal taxon groups.

FINDINGS AND CONCLUSIONS

Recreation areas are defined and authorized by Chapter 23.091, Wis. Stats. State recreation areas are environmentally adaptable to multiple recreational uses, or are so located to provide regional or urban recreational opportunities or for preservation. The Department may establish use zones within state recreation areas providing for the full range of recreational uses, including hunting and fishing. It may promulgate rules to control uses within zones and may limit the number of persons using any zone.

PROPERTY'S ECOLOGICAL SIGNIFICANCE AND CAPABILITY

Landscape-scale Management

The location of the SPRA, situated between the Baraboo Hills and the formerly extensive Sauk Prairie, presents the opportunity to consider management options within the greater landscape context. For example, grassland, shrubland, and oak savanna restoration and management at the SPRA could be coordinated with similar initiatives at Roznos Meadow within Devil's Lake State Park, at Riverland Conservancy's Merrimac Preserve, and on private lands nearby (Mossman 2003).

The SPRA offers a significant opportunity to manage a landscape scale surrogate grassland habitat. Within this surrogate grassland, a mosaic of grassland, shrubland, and savanna habitats could be established to meet the needs of many animal species that require a variety of grassland structure for shelter, foraging, and rearing their young. Managing from a landscape perspective can better accommodate complex habitat needs, including wetland, upland, and savanna components, needed for grassland birds, small mammals, herptiles, terrestrial invertebrates, and other grassland obligate species.

Additionally, the bluffs at the north end of the SPRA are part of the extensive Baraboo Hills, and offer opportunities for coordinated management of oak woodland and glade restoration. By providing this continuum, the habitat needs for wildlife 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 suitable areas or to fulfill their life history requirements.

Grassland and Shrubland Birds

Badger Army Ammunition Plant was recognized as a Priority Landscape for Grassland Bird Management (Sample and Mossman 1997) because of the grassland bird habitat present including idle warm season grass/forb (short, medium, and tall), oak savanna, and dry old field. Grassland and shrubland bird habitat management is a major component of the Natural Resources

Management Plan for the former BAAP, the ecological restoration plan for 1,300 acres of the former BAAP (Luthin 1999), and is addressed in the need to restore prairie and savanna habitat at the former BAAP in Value 7, Criterion 7.2 in the BAAP Reuse Plan (2001).

The SPRA provides extensive surrogate grassland, shrubland, and savanna habitat for 97 confirmed or probable breeding bird species, of which 21 are grassland and shrubland dependent (Mossman 2003).

Grassland and shrubland birds, a group of species of critical conservation need in Wisconsin, would benefit from a diversity of grassland habitat in large unfragmented tracts. Grassland bird habitat is most effectively maintained as large landscapes of continuous grassland, uninterrupted by hedgerows, with the cover of woody plants less than 5% (Sample and Mossman 1997). Currently the high level of shrub and tree encroachment in the grasslands of the SPRA threatens the diverse grassland bird community.

Water Resources

Streams and ponds are rare at this site, and deserve protection as they provide water resources and wetlands that interconnect the forested Baraboo bluffs, with the grasslands and prairies. They provide watering sites for birds, insects, and mammals as well as breeding sites for shoreland birds, salamanders, frogs, turtles, fish and aquatic insects, including rare and special concern species.

Rare Animals and Plants

The Sauk Prairie Recreation Area (SPRA) supports numerous rare species. Thirty-three rare animal species are known from the SPRA, including four State Threatened and 29 Special Concern species. Seven rare plant species are known from the SPRA, including two State Endangered (one is also Federally Threatened) and five State Threatened species.

Bat Conservation

The Driftless Area of Wisconsin, including the Baraboo Hills, is particularly rich in known and potential bat hibernacula sites within easy commuting distance to the SPRA for summer resident bat populations. The SPRA also provides habitat along a critical migratory corridor, the Lower Wisconsin River. Military ammunitions production and storage bunkers and similar facilities at the former Badger Army Ammunition Plant (BAAP) can provide a unique research opportunity to aid the National conservation and recovery actions for bat populations suffering from White-Nose Syndrome (WNS; Schehr 2011), an emerging and devastating threat to Wisconsin's bats.

Site Specific Opportunities for Biodiversity Conservation

Two ecologically important sites were identified on the SPRA. These sites warrant high protection and/or restoration consideration during the development of the property master plan.

- **Sauk Prairie Recreation Area Baraboo Hills Forest.** This site contains the most diverse topographic features of the SPRA and constitutes a part of the Baraboo Hills. The significance of this site is that it creates a buffer to the highly-significant Baraboo Hills and South Bluff/Devil's Nose State Natural Area. This site harbors degraded examples of Bedrock Glade and Oak Woodland and supports habitat for rare plant and animal species.
- **Sauk Prairie Recreation Area Dry Prairie and Woodland.** This site, located in the Magazine Area, features a complex of remnant prairie, Oak Woodland, and surrogate grassland. This site offers an opportunity to restore two globally rare natural communities and improve habitat for many grassland, savanna, and woodland plants and animal specialists. Rare plants have been known from this area, although recent intensive surveys have not relocated the populations. Some of these rare plant populations may be restored with appropriate management.

PROPERTY'S RECREATIONAL SIGNIFICANCE AND CAPABILITY

The Sauk Prairie Recreation Area should be considered in the larger context of the Baraboo Hills/Devil's Lake recreation landscape. By adding these lands to this landscape, a number of options exist to provide a full range of recreation experiences that are managed by the State of Wisconsin.

The Department's 3,800 acres of public land is connected by a four lane highway to major population centers offering easy access to outdoor recreation opportunities. The following recreational options should be considered during the master planning process:

Trail Networks

Both motor and non-motorized trail networks should be considered. A number of trail opportunities are lacking within the Baraboo Hills/Devil's Lake recreation landscape that may be met here.

Water Access

The property will provide Department access to Weigand's Bay, Lake Wisconsin (Parcel N) and the Wisconsin River (Parcel L). River access improvements should be considered. Both sites have potential for consumptive and non-consumptive water resource recreation and wildlife uses.

Hunting and Trapping

Limited deer hunting has occurred on the property in the past. There are a number of habitat types that can support robust hunting and trapping activity. Hunting and trapping should be considered for the property in the future. Additionally, limited/controlled hunts could be considered as this will offer a unique experience not found anywhere else in the region.

Non-Traditional Outdoor Recreation Uses

A number of non-traditional outdoor recreation uses should be considered. With the large open spaces the potential exists to fill out the Baraboo Hills/Devil's Lake recreation landscape. The topography and landscape can support such uses as rocketeering, shooting ranges, geocaching, dog parks, paintball, community gardens and other recreation activities not typically found on Department lands.

CONCLUSION

The regional significance of the property's ecological capabilities sets the context for providing compatible recreation opportunities. The extensive existing road network throughout the property can contribute to both nature-based and developed trail opportunities, which would help address the regional recreational supply shortage identified for the Southern Gateways Region (WDNR 2006).

Primary limitations on future management and use of the property are associated with the land use restrictions assigned at the time of conveyance. The property has a number of landfills, dig restriction areas, and Munitions and Explosives of Concern (MEC) areas as well as areas of cultural and historical importance that limit the extent of disturbance, and therefore use, allowed.

Within the larger Sauk Prairie Recreation Area landscape lays an incredible and unique opportunity to reestablish an example of the natural mosaic of prairie-savanna-woodland that characterized so much of the Midwest prior to Euro-American settlement, but which has since disappeared.

Major opportunities exist at SPRA with regard to breeding birds, as a result of the site's rich avifauna, large size, extensive grasslands, public ownership, proximity to other significant public and private properties, and accessibility for research, education, and recreation. The property already has one of the most significant grassland bird populations in the state. It has been said that if grassland bird populations are ever to recover in the Midwest, it is essential that we learn how farming and wildlife can once again coexist. The SPRA in its entirety offers this opportunity.

From an administrative perspective, in 2002, the Department requested the Natural Resources Board establish a state recreation area and facilitate restoration of the area to a natural and

productive condition. Key management goals identified for the Sauk Prairie Recreation Area included:

- Maximize the potential for grassland and oak savanna restoration and public recreation.
- Preserve and enhance the transition zone between the Baraboo Hills and the Badger prairie lands.
- Preserve and enhance the ecological corridor from the Baraboo Hills to the Wisconsin River.

Based on this report's findings, the best overall functional role for the Sauk Prairie Recreation Area is to fulfill the highlighted ecological opportunities available while maximizing compatible recreation opportunities. This approach also takes into consideration the nine key values identified in the *Badger Reuse Plan*, approved by the Sauk County Board in 2001.

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APPENDIX A

RARE SPECIES AND HIGH-QUALITY NATURAL COMMUNITIES OF THE SAUK PRAIRIE RECREATION AREA

Numerous rare species have been documented within the SPRA. No high quality natural communities were located, although numerous areas have potential to increase in quality with ecological restoration. Table A-1 shows the rare species currently known from the SPRA.

Species with a "W" in the "Tracked by NHI" column are on the Watch List and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present; this may not be a complete list. State status is based on the NHI Working List published in 2011. ***Refer to the REA (WDNR 2011) for summary descriptions of the rare species or an explanation of the ranking and status.***

Table A-1: Documented rare species and high-quality natural communities for the Sauk Prairie Recreation Area.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Amphibian								
Pickerel Frog	*Lithobates palustris*	1993	S3?	G5	SC/H		Y	Y
Aquatic Invertebrate								
A Fingernet Caddisfly	*Wormaldia moesta*	1993	S2S3	G5	SC/N		Y	Y
A Lepidostomatid Caddisfly	*Lepidostoma libum*	2011	S2S3	G3G4	SC/N		Y	Y
A Predaceous Diving Beetle	*Agabus inscriptus*	2011	S2S3	GNR	SC/N		Y	Y
A Predaceous Diving Beetle	*Agabus leptapsis*	1993	S2S3	GNR	SC/N		Y	Y
A Predaceous Diving Beetle	*Hydroporus pseudovilis*	2011	S2S3	GNR	SC/N		Y	Y
A Predaceous Diving Beetle	*Laccophilus undatus*	1993	S2S3	GNR	SC/N		Y	Y
Swamp Darner	*Epiaeschna heros*	2011	S2S3	G5	SC/N		Y	Y
Bird								
American Woodcock	*Scolopax minor*	1998	S3S4B	G5	SC/M		Y	W
Bald Eagle	*Haliaeetus leucocephalus*	2011	S4B,S4N	G5	SC/P		Y	Y

Bell's Vireo	*Vireo bellii*	2011	S2B	G5	THR		Y	Y
Black-billed Cuckoo	*Coccyzus erythropthalmus*	2011	S3S4B	G5	SC/M		Y	W
Blue-winged Warbler	*Vermivora pinus*	2011	S4B	G5	SC/M		Y	W
Bobolink	*Dolichonyx oryzivorus*	2011	S3S4B	G5	SC/M		Y	W
Brown Thrasher	*Toxostoma rufum*	2011	S3S4B	G5	SC/M		Y	W
Cerulean Warbler	*Dendroica cerulea*	2011	S2S3B	G4	THR		Y	Y
Common Nighthawk	*Chordeiles minor*	2011[1]	S2S3B	G5	SC/M		N	Y
Dickcissel	*Spiza americana*	2011	S3B	G5	SC/M		Y	W
Eastern Meadowlark	*Sturnella magna*	2011	S3S4B	G5	SC/M		Y	W
Field Sparrow	*Spizella pusilla*	2011	S3S4B	G5	SC/M		Y	W
Grasshopper Sparrow	*Ammodramus savannarum*	2011	S3B	G5	SC/M		Y	W
Henslow's Sparrow	*Ammodramus henslowii*	2011	S2S3B	G4	THR		Y	Y
Hooded Warbler	*Wilsonia citrina*	2011	S2S3B	G5	THR		Y	Y
Least Flycatcher	*Empidonax minimus*	1998	S4B	G5	SC/M		Y	W
Northern Bobwhite	*Colinus virginianus*	1998	S2S3B	G5	SC/M		Y	Y
Red-headed Woodpecker	*Melanerpes erythrocephalus*	1998	S3B	G5	SC/M		Y	W
Upland Sandpiper	*Bartramia longicauda*	2002	S2B	G5	SC/M		Y	Y
Vesper Sparrow	*Pooecetes gramineus*	2011	S3S4B	G5	SC/M		Y	W
Western Meadowlark	*Sturnella neglecta*	2002	S2B	G5	SC/M		Y	Y
Whip-poor-will	*Caprimulgus vociferus*	1998	S3B	G5	SC/M		Y	W
Willow Flycatcher	*Empidonax traillii*	2011	S4B	G5	SC/M		Y	W
Wood Thrush	*Hylocichla mustelina*	2011	S4B	G5	SC/M		Y	W
Yellow-billed	*Coccyzus*	2011	S3B	G5	SC/M		Y	W

[1] More information is needed on this occurrence before it is processed into the NHI Database.

Cuckoo	*americanus*							
Yellow-breasted Chat	*Icteria virens*	2002	S2B	G5	SC/M		N	Y
Mammal								
Big Brown Bat	*Eptesicus fuscus*	2011	S2S4	G5	THR		N	Y
Eastern Red Bat	*Lasiurus borealis*	2010	S3	G5	SC/N		Y	W
Hoary Bat	*Lasiurus cinereus*	2010	S3	G5	SC/N		Y	W
Little Brown Bat	*Myotis lucifugus*	2010	S2S4	G5	THR		N	Y
Prairie Vole	*Microtus ochrogaster*	2008	S2	G5	SC/N		Y	Y
Reptile								
Timber Rattlesnake	*Crotalus horridus*	2004	S2S3	G4	SC/P		Y	Y
Animal Assemblage								
Bat Hibernaculum		2011[2]	S3	GNR	SC		N	Y
Plant								
Drooping Sedge	*Carex prasina*	1993	S3	G4	THR		NA	Y
Pale Green Orchid	*Platanthera flava var. herbiola*	1993	S2	G4T4Q	THR		NA	Y
Prairie Bush-clover	*Lespedeza leptostachya*	1993	S2	G3	END	LT	NA	Y
Purple Milkweed	*Asclepias purpurascens*	1999	S3	G5?	END		NA	Y
Roundstem Foxglove	*Agalinis gattingeri*	1993	S2	G4	THR		NA	Y
Slender Bush-clover	*Lespedeza virginica*	1993	S2	G5	THR		NA	Y
Woolly Milkweed	*Asclepias lanuginosa*	1993	S1	G4?	THR		NA	Y

Table A-2 lists rare species that are located within one mile of the SPRA and not currently known from the SPRA, or are mapped at a low precision in the NHI Database and are important to consider during planning efforts. These species may be located on the SPRA with additional survey efforts.

[2] More information is needed on this occurrence before it is processed into the NHI Database.

Table A-2. Rare species that are either: 1) found within one mile of the Sauk Prairie Recreation Area (SPRA) and not found on the SPRA; or 2) mapped at a low precision. Listing status is based on the NHI Working List published June 2011.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Animal								
A Predaceous Diving Beetle	*Lioporeus triangularis*	1985	S2S3	GNR	SC/N		Y	Y
Buckhorn	*Tritogonia verrucosa*	1993	S2	G4G5	THR		Y	Y
Acadian Flycatcher	*Empidonax virescens*	2011	S3B	G5	THR		Y	Y
Black Buffalo	*Ictiobus niger*	1980	S2	G5	THR		Y	Y
Blanding's Turtle	*Emydoidea blandingii*	1982	S3S4	G4	THR		Y	Y
Blue Sucker	*Cycleptus elongatus*	2010	S2	G3G4	THR		Y	Y
Canada Warbler	*Wilsonia canadensis*	2010	S3S4B	G5	SC/M		Y	W
Eastern Massasauga	*Sistrurus catenatus catenatus*	1932	S1	G3G4T3Q	END	C	Y	Y
Gray Ratsnake	*Pantherophis spiloides*	1920	S3	G5T5	SC/P		Y	Y
Kentucky Warbler	*Oporornis formosus*	1987	S1S2?B	G5	THR		Y	Y
Lake Sturgeon	*Acipenser fulvescens*	2005	S3	G3G4	SC/H		Y	Y
Louisiana Waterthrush[3]	*Seiurus motacilla*	2011	S3B	G5	SC/M		Y	Y
Osprey	*Pandion haliaetus*	2010	S4B	G5	SC/M		Y	W
Pirate Perch	*Aphredoderus sayanus*	2007	S3	G5	SC/N		N	Y
Pugnose Minnow	*Opsopoeodus emiliae*	1984	S3	G5	SC/N		N	Y
Shoal Chub	*Macrhybopsis aestivalis*	2009	S2	G5	THR		Y	Y
Silver Chub	*Macrhybopsis storeriana*	2010	S3	G5	SC/N		N	Y
Veery	*Catharus fuscescens*	2010	S3S4B	G5	SC/M		Y	W
Western Ribbonsnake	*Thamnophis proximus*	1975	S1	G5	END		Y	Y

[3] More information is needed on this occurrence before it is processed into the NHI Database.

Western Sand Darter	*Ammocrypta clara*	2010	S3	G3	SC/N		Y	Y
Worm-eating Warbler	*Helmitheros vermivorus*	1998	S1B	G5	END		Y	Y
Plant								
Christmas Fern	*Polystichum acrostichoides*	1991	S2	G5	SC		NA	Y
Hooker's Orchid	*Platanthera hookeri*	1946	S2	G4	SC		NA	Y
Prairie False-dandelion	*Nothocalais cuspidata*	1928	S2	G5	SC		NA	Y
Purple-stem Cliff-brake	*Pellaea atropurpurea*	1947	S2	G5	SC		NA	Y
Small Forget-me-not	*Myosotis laxa*	1993	S2	G5	SC		NA	Y
Small White Lady's-slipper	*Cypripedium candidum*	1885	S3	G4	THR		NA	Y
Vasey's Pondweed	*Potamogeton vaseyi*	1974	S3	G4	SC		NA	Y

APPENDIX B

THE SAUK PRAIRIE RECREATION AREA SPECIES OF GREATEST CONSERVATION NEED

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on the Sauk Prairie Recreation Area (SPRA) in the Western Coulees and Ridges and Central Sand Hills Ecological Landscapes. Only SGCN with a high or moderate probability of occurring in the Western Coulees and Ridges and Central Sand Hills 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 the SPRA.

Vertebrate SGCN associated with natural community types that are present on SPRA in the Western Coulee and Ridges Ecological Landscape.

	Major												Important		Present		
	Bedrock Glade	Cedar Glade	Coolwater streams	Dry Cliff	Dry Prairie	Dry-mesic Prairie	Oak Opening	Oak Woodland	Sand Prairie	Southern Dry Forest	Southern Dry-mesic Forest	Surrogate Grasslands	Ephemeral Pond	Southern Sedge Meadow	Impoundments/Reservoirs	Southern Hardwood Swamp	Warmwater streams
Species that are Significantly Associated with the Western Coulee and Ridges Landscape																	
Acadian Flycatcher										L	S						
American Woodcock							L			L		L	L			L	
Bald Eagle															S		
Bell's Vireo					M	M	L		M			M					
Black Buffalo															M		
Black Rat Snake		S		S	S	M	M	S	L	S	S					M	
Black-billed Cuckoo							L									L	
Blanchard's Cricket Frog			S											S	S		S
Blanding's Turtle		M	M		S	M	S	M	S		M		S	M	S	M	M
Blue-winged Teal					L	M			L			M	L	M	M	L	
Blue-winged Warbler	M						M	M		M	M					L	
Bobolink						S	L					S		M			
Brown Thrasher					M	M	S		S			M					

Bullsnake	S	S		S	S	S	S	S	S	M	M						
Canvasback															M		
Cerulean Warbler								M		L	S						
Dickcissel					L	S	L					S					
Eastern Massasauga Rattlesnake					S	S			S				S	S		M	
Eastern Meadowlark					M	S	M		M			S		M			
Field Sparrow		S			S	M	S		S			M					
Four-toed Salamander			M										S	M		S	
Grasshopper Sparrow		L			S	S	L		S			S					
Henslow's Sparrow						S	M					S		L			
Hooded Warbler											S						
Kentucky Warbler											M						
Lake Sturgeon															S		
Lark Sparrow		S			M				S								
Least Flycatcher								L		L	L					L	
Lesser Scaup															M		
Louisiana Waterthrush			S								S						
Northern Bobwhite					M	M	M	L	L			S					
Northern Harrier					M	M			L			S		M			
Northern Long-eared Bat		L	S				L	M		M	M		S	M	L	M	M
Northern Prairie Skink	S	S		M	S	M	S	M	S	M	M						
Ornate Box Turtle		S			S	M	S	S	S	S	S						
Ozark Minnow																	S
Peregrine Falcon				S													
Pickerel Frog			S										S	S	S	M	S
Prairie Racerunner	M	S			S		S		S								
Prairie Ringneck Snake	S	S			S	S	S	M	M	M	M						
Red-headed Woodpecker							S	S		M	M						
Red-shouldered Hawk											M		S			L	
Redside Dace			M														M
Rusty Blackbird													M			S	
Short-billed Dowitcher															M		
Starhead Topminnow																	S
Timber Rattlesnake	M	S		S	S	M	S	S	S	S	S					M	
Veery								L			M					L	
Vesper Sparrow					S	M	M		S			L					
Western Meadowlark					M	S			M			S					
Western Slender Glass Lizard					S	S	M		S								
Western Worm Snake		S			S					M	M						
Whip-poor-will	M							S		S	S						
Willow Flycatcher					L	M	L		L			M		M		L	
Wood Thrush								M		M	S					L	
Wood Turtle			S		S	M	M	M	S				M	M		M	S
Worm-eating Warbler										M	S						
Yellow-bellied Racer		S		M	S	M			S	M	M						
Yellow-billed Cuckoo								L		L	M					M	
Yellow-crowned Night-Heron													S			M	

Species that are Moderately Associated with the Western Coulee and Ridges Landscape																	
American Golden Plover						M						M		L	M		
Black Tern														L	M		
Buff-breasted Sandpiper						M						M					
Eastern Red Bat		L	S				M	M		M	M		S	M	L	M	M
Franklin's Ground Squirrel					L	S	S	M	S			M					
Gilt Darter																	S
Hoary Bat		L	S				L	L		L	L		S	M	L	L	M
King Rail														M			
Osprey															S		
Prairie Vole					S	S	M		S			M					
Short-eared Owl					M	M			L			S		M			
Silver-haired Bat		L	S				L	L		L	L		S	M	L	L	M
Solitary Sandpiper			M										S	L		L	M
Upland Sandpiper					S	S	L		M			S		L			
Whooping Crane														M			
Woodland Vole							S	S		S	S						
Yellow-throated Warbler											M						

Vertebrate SGCN associated with natural community types that are present on the SPRA in the Central Sand Hills Ecological Landscape.

	Major			Important			Present				
	Impoundments/Reservoirs	Inland lakes	Southern Sedge Meadow	Dry Prairie	Surrogate Grasslands	Warmwater streams	Cedar Glade	Dry-mesic Prairie	Ephemeral Pond	Oak Opening	Oak Woodland
Species that are Significantly Associated with the Central Sand Hills Coastal Landscape											
American Bittern			M		L						
American Woodcock					L				L	L	
Bald Eagle	S	S									
Black Buffalo	M										
Black Tern	M	M	L								
Black-billed Cuckoo										L	
Blanding's Turtle	S	S	M	S		M	M	M	S	S	M
Blue-winged Teal	M	M	M	L	M			M	L		
Blue-winged Warbler										M	M
Bobolink			M		S			S		L	
Brown Thrasher				M	M			M		S	
Cerulean Warbler											M
Dickcissel				L	S			S		L	
Eastern Meadowlark			M	M	S			S		M	
Field Sparrow				S	M		S	M		S	
Forster's Tern	M	L	L								

Franklin's Ground Squirrel				L	M			S		S	M
Grasshopper Sparrow				S	S		L	S		L	
Henslow's Sparrow			L		S			S		M	
Lake Sturgeon	S	S									
Least Darter		M				M					
Least Flycatcher											L
Northern Bobwhite				M	S			M		M	L
Northern Harrier			M	M	S			M			
Ornate Box Turtle				S			S	M		S	S
Red-headed Woodpecker										S	S
Red-shouldered Hawk									S		
Short-billed Dowitcher	M										
Veery											L
Vesper Sparrow				S	L			M		M	
Western Meadowlark				M	S			S			
Western Slender Glass Lizard				S				S		M	
Whip-poor-will											S
Whooping Crane			M								
Willow Flycatcher			M	L	M			M		L	
Wood Thrush											M
Yellow-billed Cuckoo											L
Species that are Moderately Associated with the Central Sand Hills Coastal Landscape											
American Golden Plover	M		L		M			M			
Banded Killifish		M				L					
Bullsnake				S			S	S		S	S
Dunlin	M										
Eastern Red Bat	L	M	M			M	L		S	M	M
Four-toed Salamander			M						S		
Hoary Bat	L	M	M			M	L		S	L	L
Hudsonian Godwit	L										
Lark Sparrow				M			S				
Le Conte's Sparrow					S						
Northern Long-eared Bat	L	M	M			M	L		S	L	M
Osprey	S	S									
Pickerel Frog	S	M	S			S			S		
Prairie Vole				S	M			S		M	
Rusty Blackbird									M		
Short-eared Owl			M	M	S			M			
Silver-haired Bat	L	M	M			M	L		S	L	L
Solitary Sandpiper			L			M			S		
Upland Sandpiper			L	S	S			S		L	
Water Shrew	L	M				M					
Yellow-bellied Racer				S			S	M			