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**Wisconsin Department of Natural Resources**

**LOWER WOLF RIVER BOTTOMLANDS  
NATURAL RESOURCES AREA**

**MASTER PLAN AND ENVIRONMENTAL  
ASSESSMENT**



September, 2012  
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**APPROVED BY THE NATURAL RESOURCES BOARD  
SEPTEMBER, 2012**

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## LIST OF ACRONYMS

ADA	Americans with Disabilities Act
ATV	All-terrain Vehicle
BMPs	Best Management Practices
COA	Conservation Opportunity Area
CRP	Conservation Reserve Program
CTH	County Highway
DNR	Department of Natural Resources
DOT	Department of Transportation
EAB	Emerald Ash Borer
EL	Ecological Landscape
FA	Fishery Area
GIS	Geographic Information System
HA	Habitat Area
HMA	Habitat Management Area
LWRBNRA	Lower Wolf River Bottomlands Natural Resources Area
MFL	Managed Forest Law
NCMA	Native Community Management Area
NHI	Natural Heritage Inventory
NNC	Navarino Nature Center
NRB	Natural Resources Board
NRCS	Natural Resources Conservation Service
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SGCN	Species of Greatest Conservation Need
SNA	State Natural Area
SNW	Slow No Wake
USFWS	U.S. Fish and Wildlife Service
WA	Wildlife Area
WDNR	Wisconsin Department of Natural Resources
WisFIRS	Wisconsin Forest Inventory and Reporting System
WRP	Wetlands Reserve Program

## **CHAPTER ONE: INTRODUCTION AND PLAN OVERVIEW**

The Lower Wolf River Bottomlands Natural Resources Area (LWRBNRA) is located within Shawano, Outagamie, Waupaca, and Winnebago counties in east-central Wisconsin (Map A). It is a landscape-scale project approved by the Natural Resources Board in 2002, encompassing 214,000 acres along and adjacent to the lower Wolf River and its tributaries. The LWRBNRA was established in recognition of the area's significant ecological and recreational resources, and the need to connect existing state-owned lands in order to preserve and enhance recreational values and protect larger blocks of habitat for wildlife and ecosystem functions. The plan area contains 14 existing state properties totaling approximately 31,000 acres, including Wildlife Areas, a Fishery Area, and State Natural Areas (Map B). There also are over 3,400 acres of LWRBNRA Habitat Areas in scattered parcels, part of the 45,000-acre acquisition goal established in the LWRBNRA Feasibility Study (WDNR 2002a).

### **PURPOSE AND MANAGEMENT AUTHORITY**

Property master planning is a process that determines how a property will be managed and developed. The development of master plans is governed by NR 44, Wis. Admin. Code, the master plan rule. This rule defines master planning, sets forth its purposes, and specifies the general planning process and content of a master plan. This rule also establishes a uniform land management classification system to be applied in the master plan. By administrative code, the master plan is the controlling authority for all actions and uses on a property.

Wildlife Areas (WAs) and Fishery Areas (FAs) are managed under the authority of Sections 23.09(2)(d)3, 14, and 15, Wis. Statutes, and NR 1.51, Wis. Admin. Code. WAs and FAs are set aside to enhance and maintain habitat for wildlife and as places where people can hunt, trap, hike, watch wildlife, and fish. Habitat Areas (HAs) are managed under the authority of 23.092 Wis. Statutes; they are areas designated in order to enhance wildlife-based recreation such as hunting, fishing, nature appreciation, and wildlife viewing. Wildlife habitat needs and wildlife-based recreation shall receive major consideration in management planning for WAs, FAs, and HAs; however, forestry, wild resources, and outdoor recreation objectives may be accommodated where they are compatible and do not detract significantly from the primary objectives.

State Natural Areas (SNAs) are managed under the authority of NR 1.32, Wis. Admin. Code and 23.27 to 23.29 Wis. Statutes. SNAs are sites that protect outstanding examples of the state's native natural communities. They are areas that are essentially unaltered by human-caused disturbances or that have substantially recovered from such disturbances. SNAs are considered the state's best examples of native biodiversity. Protection and enhancement of these natural features will receive major consideration in management planning for SNAs; other recreational uses are permitted if they do not threaten these natural values.

## **SIGNIFICANCE OF THE PLAN AREA**

The LWRBNRA contains an ecologically significant assemblage of natural communities, some extensive and of high quality, associated with the floodplain of a large, free-flowing river and its tributaries. The floodplain of the lower Wolf is the largest and most intact of any river in eastern Wisconsin, and stands out in a surrounding landscape that is largely dominated by agriculture and where urban and suburban development is increasing. The area's connectivity to extensive northern forested landscapes such as the Menominee Forest and the Nicolet National Forest makes it an important place for exchange of genetic material between northern and southern species, as well as a dispersal and migration corridor for southern species northward in response to changes in climate and forest composition. Wetland and aquatic communities are especially significant here. Bottomland forests, emergent wetlands, shrub swamps, and warm-water rivers and streams host a rich diversity of birds, mammals, herptiles, fish, and invertebrates, including many rare species.

The plan area also is significant from a recreation standpoint. Its proximity to several large population centers in the Fox Valley and Green Bay areas makes it very popular for a variety of outdoor recreational activities, particularly hunting, fishing, trapping, and wildlife viewing, all activities for which the state properties offer the greatest opportunity. These properties protect numerous fish spawning areas, and fishing is especially popular. The annual spring white bass and walleye runs attract anglers from around the state. The annual migration of the globally rare lake sturgeon also draws many visitors.

## **OVERVIEW OF THE PLAN**

The LWRBNRA Master Plan outlines how the state properties will be managed, used, and developed. The plan reflects a focus on maintenance of wetlands, both forested and open, and associated wildlife through habitat management, and maintenance and protection of extensive tracts of Floodplain Forest and other natural communities through native community management. Recreation management focuses chiefly on the traditional outdoor activities of hunting, fishing, and trapping, as well as wildlife viewing, boating, and support of an environmental education facility on Navarino WA.

The plan also recognizes the importance of private lands, which comprise 85% of the lands within the LWRBNRA boundary, and the need to collaborate with local governments, conservation organizations, and private landowners to achieve common goals.

### **Resource Management**

The plan emphasizes habitat management of forested and open wetlands, including bottomland forests, shrub swamps, emergent marshes, flowages, and riverine habitats. These habitats support a wide diversity of wetland- and wet-forest-dependent wildlife. Over 60% of the state's breeding bird species nest here, including waterfowl, rails,

## **CHAPTER 1: Introduction and Plan Overview**

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herons, songbirds, and bald eagles. The Wolf River is an important migratory corridor for bats and for waterfowl, shorebirds, and landbirds in both spring and fall. Critical spawning sites for walleye and sturgeon are found throughout the plan area, and the Wolf River and its tributaries host a rich variety of both game and non-game fish which will benefit from management of river bank and near-shore areas.

The plan also includes management of upland habitats such as aspen and oak forests, upland grasslands, and upland brush. Though less extensive than the wetlands, these areas provide excellent habitat for woodcock, ruffed grouse, wild turkey, white-tailed deer, and numerous other species.

Extensive, interconnected stands of Floodplain Forest along the Wolf River and Embarrass Rivers are a major feature of ecological significance in the plan area. Native community management of these areas will support a wide variety of wildlife, including many rare species such as red-shouldered hawk and prothonotary warbler. Existing SNAs will continue to receive native community management to support the rare features they contain. Several additional sites that contain regionally rare natural communities such as Northern Sedge Meadow and Open Bog are identified as SNAs.

### **Recreation Management**

The traditional outdoor pursuits of hunting, fishing, and trapping are the focus of recreation in the Master Plan, as they are the primary recreational uses of the state properties in the plan area. Fishing and waterfowl and deer hunting are especially significant draws for users. Management to support these activities consists largely of habitat management as well as maintenance of waterfowl closed areas and the seasonal posting of important fish spawning sites as “No Entry Zones”. New proposals include: evaluating the effectiveness of the plan area’s 4 seasonally closed refuges in retaining waterfowl for the benefit of local waterfowl hunting, and eliminating the Outagamie WA refuge in favor of creating a larger one on the adjacent Wolf River Bottoms WA—Herb Behnke Unit; developing new flowages for waterfowl habitat on Navarino WA, Wolf River Bottoms WA—Herb Behnke Unit, and LWRBNRA HA Wilderness parcel; adding a Class 2 dog training area on the Herb Behnke Unit; and improving access to an accessible hunting blind on Navarino WA.

Wildlife viewing is an increasingly popular activity. The Master Plan calls for maintaining existing wildlife viewing areas and adding additional accessible viewing opportunities on Navarino WA.

Boating is an extremely popular recreational pursuit in the plan area. Motor boating is especially common on the larger southern reaches of the Wolf River. Provisions in the Master Plan related to this activity include rules aimed at preventing the introduction and spread of aquatic invasive species. Canoeing and kayaking are more popular in the northern reaches of the Wolf and on smaller tributaries. The Master Plan creates 2 designated dispersed camping areas on the Wolf River—one on the LWRBNRA HA

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Krubsack parcel in Shawano County and one on the Wolf River Bottoms WA, LaSage Unit—to serve paddlers making multiple-day trips.

The Navarino Nature Center (NNC) is an environmental education facility administered as a 501(c)3 non-profit organization, operating on 41.5 leased acres on Navarino WA. It provides a full range of educational and interpretive programming for children and adults, including maintenance of 15 miles of multi-use trails. The Master Plan supports the activities provided by this regionally important educational facility through continuation of lease and trails agreements between the Department and NNC and collaboration on wildlife education programming through the Bureau of Wildlife Management's Wildlife Education Strategic Plan.

**External Partnerships**

The Master Plan recognizes that 85% of the land within the LWRBNRA boundary is privately owned. The ability to achieve the plan vision and reach the goals for this area will be realized only if that vision and those goals are shared by the private landowners, local units of government, and other conservation organizations within the project boundary. The plan provides for continued collaborations between the Department and private landowners, local units of government, and a variety of conservation organizations to protect and manage the natural resources of the plan area.

**Boundary Modifications**

No boundary modifications are made in this Master Plan. The LWRBNRA Feasibility Study (WDNR 2002a), approved by the Natural Resources Board in 2002, established the 214,000-acre Natural Resources Area project boundary within which is a 45,000-acre acquisition goal, and identified Focus Areas that would be targeted for acquisitions and easements toward this goal (Map C). The following criteria were used to identify the Focus Areas:

- Lands containing shoreline along the lower Wolf River and its tributaries.
- Lands providing opportunity for corridors connecting wildlife habitat and recreational opportunities.
- Lands containing habitat for endangered or threatened species or other critical habitat.
- Lands containing fish spawning areas.
- Large tracts promoting ecological and/or recreational opportunities.

Any acreage acquired will be from willing sellers within the previously approved project boundary, with the Focus Areas defining lands that are the highest priority.

## CHAPTER TWO: MANAGEMENT, DEVELOPMENT, AND USE

### INTRODUCTION

This chapter details the management, development and use of the state properties within the Lower Wolf River Bottomlands Natural Resources Area (LWRBNRA) needed to achieve the properties' long-range vision and goals. Each property is planned and managed to optimize its own inherent capabilities, yet at the same time to realize its importance as a component of the larger landscape mosaic of public and private properties. Chapter Two is organized into three main parts: the **Introduction** contains an overview of the benefits of public land protection, the Vision and Goals that guide the overall project, and an overview of the importance and role of private and non-state public lands in the plan area; **Section One** covers universal plan elements which apply to all the state properties in the plan area; and **Section Two** focuses on the individual properties including a property description followed by management objectives and prescriptions unique to that property.

The Lower Wolf River Bottomlands Natural Resources Area includes the following properties, shown on Map B:

- LWRBNRA Habitat Areas
- Navarino Wildlife Area
- Wolf River Bottoms State Natural Area
- Deer Creek Wildlife Area
- Maine Wildlife Area
- Wolf River Bottoms Wildlife Area—Herb Behnke Unit
- Outagamie Wildlife Area
- Mack Wildlife Area
- Wolf River Bottoms Wildlife Area—LaSage Unit
- Hortonville Bog State Natural Area
- Wolf River Fishery Area
- Mukwa Wildlife Area
- Shaky Lake State Natural Area
- Wolf River Wildlife Area
- Rat River Wildlife Area
- Winchester Meadow New State Natural Area

### **Public Lands: An Investment in Wisconsin's Future**

Wisconsin is known for its abundant natural resources, for the value our citizens place on the rich traditions of hunting, fishing, trapping, camping and hiking, and for the ease of access to recreational land and wild places for everyone who lives here, including those who live in our largest metropolitan areas. We are defined by our clean lakes and rivers, vast forests, and abundant fish and wildlife. Conserving these resources is not an expense, but an investment that pays many dividends, both economic and social. A University of Minnesota study found that for every \$1 invested in conserving natural areas in that state, there is a return of up to \$4 (MEP 2011). Although similar data are not

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available for Wisconsin, one can imagine that a similar return of \$4 on each \$1 investment in public land in Wisconsin is quite possible.

The State of Wisconsin manages about 1.6 million acres of publicly-owned forests, barrens and savannas, grasslands, wetlands, shrublands, streams and lakes. Most of these lands are open to hunting, fishing, trapping, hiking, cross-county skiing, wildlife watching, and other outdoor, nature-based recreation. The economic impact of fishing, hunting and wildlife watching in Wisconsin is considerable. According to the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, Wisconsin report (USFWS 2008), a total of 2.9 million residents and non-residents aged 16 years and older fished, hunted and/or watched wildlife in Wisconsin in 2006, spending \$3.7 billion in the process.

Nearly 1.39 million anglers spent 20.8 million days fishing in 2006, accounting for \$1.66 billion in retail sales and \$2.75 billion in overall economic output. This generated \$196 million in state and local taxes and provided 30,000 jobs (Southwick Associates 2007a). Nearly 700 thousand hunters spent 10 million days hunting in 2006, accounting for \$1.39 billion in retail sales, \$2.19 billion in overall economic impact, and generating \$197 million in state and local tax revenue and 25,000 jobs (Southwick Associates 2007b).

In addition, Wisconsin's \$12 billion/year tourism industry (TFW 2012) and \$23 billion/year forest industry (WDNR 2009) both are inextricably linked to abundant natural resources and a vibrant public land base.

All WDNR-managed lands have been certified as sustainable by two separate third-party audit firms, indicating that these lands meet the social, ecological, and economic rights and needs of the present generation without compromising those of future generations. All timber harvested from state lands can be marketed as sustainable and therefore has an enhanced value.

Even those citizens who do not engage in hunting, fishing, hiking, camping, or other outdoor activities on public lands have a reason to value them. These lands provide "ecosystem services" that improve our quality of life in various ways. Ecosystem services are conditions or processes associated with natural ecosystems that provide benefits to humans.

For example, land conservation protects human health by keeping our drinking water clean and is a cost-effective tool in protecting water quality. A growing understanding of the role that forests and natural lands play in filtering pollutants and maintaining water quantity and quality has led many municipalities and water suppliers, particularly those in growing communities, to consider land protection as part of a multiple-barrier approach to providing safe drinking water. A study conducted by the Trust for Public Land and the American Water Works Association showed that forestland in particular greatly reduces the cost of treating drinking water. For every 10 percent increase in the source area's forest cover (up to 60 percent), treatment and chemical costs decreased approximately 20 percent (Ernst 2004).

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Wetlands provide natural flood insurance by acting as sponges, storing rain that runs off the land and slowly releasing it to the atmosphere, groundwater, and adjacent lakes, rivers and streams. Strategic wetland protection and restoration can help reduce flood peaks and damage, protect human health and safety, and reduce the need for expensive projects such as levees, detention ponds, and the reconstruction of flood-damaged roads.

Ingraham and Foster (2008) estimated the value of some of these basic ecosystem services. They calculated an economic value for the wildlife habitat, carbon sequestration, disturbance prevention (e.g., flood control), freshwater management and supply, nutrient regulation, and waste management provided by USFWS National Wildlife Refuges in the contiguous United States. The value of services provided by forests, shrublands, grasslands, and wetlands amounted to \$2,900/acre/year. Using the same approach, Wisconsin's public lands provide a total return of \$3.33 billion/year or \$2,400/acre/year (Table 2.1).

**Table 2.1. Estimated Annual Value of Ecosystem Services Provided by WDNR-owned Lands.**

	Dollars/acre*	WDNR-owned acres	Value
Forests	\$1,014.27	879,898	\$892,454,144
Shrublands	\$660.13	121,928	\$80,488,331
Grasslands	\$61.67	160,211	\$9,880,212
Wetlands	\$10,608.43	221,522	\$2,350,000,630
<b>Total</b>		<b>1,383,559</b>	<b>\$3,332,823,318</b>

\*Source: Ingraham and Foster 2008

Our wild lands also provide a cultural and historical connection to who we are and where we've been. They provide a sense of place in the landscape and are important habitats for people. They include historic and archaeological sites, scenic views, water access, bridges and more. Trails, for example, are links to our natural resources. They play an important role in providing access to the outdoors for people with varied physical abilities, support environmental education, and build a public commitment to environmental conservation.

The majority of Americans agree that preserving undeveloped land for outdoor recreation is important (Outdoor Foundation 2011). Lack of access to, and interest in, nature keeps kids from experiencing the outdoors, leading to a growing disparity between the time children spend indoors wired to technology and the time they spend outside enjoying nature (The Nature Conservancy 2011). Evidence suggests that children and adults benefit so much from contact with nature that land conservation can now be viewed as a public health strategy (Frumkin and Louv 2007).

It can be difficult to weigh the ultimate value of purchasing, conserving, and managing public land in Wisconsin. Upfront costs are obvious and immediate, while benefits are usually long-term and may seem vague by comparison. However, in addition to dollars and cents, land conservation also should be measured in the currency of recreation,

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environmental benefits, connections to nature, and land health. Expenditures for public land conservation and management are best understood not as a cost but as an investment that will pay dividends, including economic ones, long into the future (Gies 2009). Likewise, the land acquisition and management strategies outlined in this master plan will pay commensurate dividends to the region and its residents, long into the future.

### **Vision**

The Lower Wolf River Bottomlands Natural Resources Area is managed recognizing the interconnectedness of air, water, and land in sustaining ecosystems in balance with local cultural and economic values. In partnership with citizens as stewards of the natural resources, we work to protect, restore, maintain, and enhance healthy diverse ecosystems and the natural, scenic beauty of the corridor, while providing compatible recreational pursuits, beneficial uses, and educational opportunities for current and future generations.

### **Goals**

- Provide long-term sustainability for the natural communities and rare species of the LWRBNRA.
- Provide opportunities for a range of compatible outdoor recreational and educational activities that enhance the quality of life and economy within the LWRBNRA.
- Promote shared responsibility for the stewardship of the natural resources in the LWRBNRA for the benefit of current and future generations.
- Protect the quality and quantity of surface and groundwater resources.
- Promote opportunities to preserve agricultural land through creative land management options.

### **Private Lands and Non-state Public Lands: Working Towards a Shared Vision**

The LWRBNRA boundary encompasses approximately 214,000 acres, 85% of which is privately owned. The ability to achieve the vision and reach the goals for this area will be realized only if that vision and those goals are shared by the private landowners, local units of government, and other conservation organizations within the project boundary.

The LWRBNRA is an ecologically important landscape tucked between the urban areas and agricultural communities of east central Wisconsin and the extensive forests of northern Wisconsin. The area is predominately rural with large open and forested wetlands (particularly extensive stands of bottomland hardwoods) and agriculture dominating the landscape. Protection of the natural resources in the area can be accomplished through a variety of methods including: 1) development of land management and education partnerships between the Department and citizens, local, county, state, and federal governments, and various non-profit organizations; 2)

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utilization of state and federal short-term land conservation programs where applicable; and 3) acquisition of land or easements by the Department.

The LWRBNRA project depends on partners to meet its goals. Other government agencies and private groups have recognized the need to preserve the natural resources in this area of the state. Local units of government provide important land, facilities, and programs within the LWRBNRA that complement Department recreation and education goals of this plan. Counties, cities, and towns provide facilities ranging from boat landings and fishing piers on the Wolf River and other waters, to sturgeon viewing areas, to picnic and day-use areas, to recreational trails.

Outagamie County operates the Mosquito Hill Nature Center near New London. This staffed nature center located on the Wolf River provides nature-based and environmental education programs for school groups and adults at its grounds and classroom facilities. The Department will share information with the Mosquito Hill Nature Center to help the center foster in its visitors an appreciation and stewardship ethic for the Wolf River corridor and its fish and wildlife resources. Mosquito Hill will be encouraged to utilize applicable themes and messages from the Department's Learning Experiences and Activities in Forestry (LEAF), Angler, and Wildlife Education programs as well as other Department environmental education resources.

Local conservation organizations may partner with private landowners to enhance habitat on their lands through projects such as improving a walleye spawning marsh or establishing nesting cover for upland game birds. Organizations like Shadows on the Wolf, Walleyes for Tomorrow, Sturgeon for Tomorrow, Pheasants Forever, Lake Poygan Sportsmen's Club, The Nature Conservancy, and Northeast Wisconsin Land Trust are just a few of the organizations that have been active in protecting the natural resources of the Wolf River.

Landowners with forested acres meeting certain program requirements can enroll these lands in the Wisconsin Managed Forest Law (MFL) program administered by the Department. With this program, landowners receive property tax reduction benefits in exchange for placing their forested lands under a management plan that will sustain the forests.

Federal farm programs such as the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), Wildlife Habitat Incentives Program (WHIP), and the USFWS Partners for Fish and Wildlife Program provide cost-sharing, and in some cases annual payments to private landowners implementing appropriate conservation practices. The goals of many of these programs are compatible with the goals of the LWRBNRA.

Private landowners may seek permanent ways to keep their land in an undeveloped or wild state while retaining ownership. The Department may acquire permanent easements within the LWRBNRA boundary to maintain a variety of habitat types and wild shoreline. Areas of highest interest for these easements, following the criteria used to

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identify Focus Areas in the LWRBNRA Feasibility Study (WDNR 2002a), would protect several of the following attributes: 1) shoreline of the lower Wolf River and its tributaries; 2) corridors to connect wildlife habitat and recreational opportunities; 3) habitat of endangered or threatened species or other critical habitat; 4) spawning areas for protection and habitat management; and 5) larger tracts promoting ecological and/or recreational opportunities. Landowners may seek to sell or donate voluntary protective easements to private land trusts such as the Northeast Wisconsin Land Trust. Such easements could maintain natural communities or prevent conversion of lands to residential or commercial uses.

The key to protecting the rich natural resources of this corridor for the future is evaluating the potential opportunities to connect state properties along the lower Wolf River. These state properties include designated Wildlife Areas, a Fishery Area, State Natural Areas, and remnant fish habitat lands. Opportunities include protection of critical habitat for threatened and endangered species, fisheries spawning areas protection, protection of the water quality of the Wolf River and its tributaries, providing corridor connections for wildlife and recreation, and managing larger blocks of land for ecological restoration and increased recreational opportunities.

There are a variety of other local, regional, and state long-range resource and outdoor recreation plans that identify the LWRBNRA as important for protection and to be held in public trust for future generations. Establishing cooperative ventures with various partners and private landowners will be critical to the success of this project.

**SECTION ONE: UNIVERSAL PLAN ELEMENTS FOR ALL DEPARTMENT PROPERTIES**

**Resource Management by Land Management Classification**

Management of these properties is generally described by a specific land management classification per NR 44 that indicates the primary management objective for an area within the property. All lands covered under this plan fall into the following land management classifications:

*Native Community Management Areas (NCMAs)* are managed to represent, restore and perpetuate native plant and animal communities, whether upland, wetland or aquatic, and other aspects of native biological diversity.

*Habitat Management Areas (HMAs)* are managed to provide or enhance habitat, whether upland, wetland or aquatic, to support specific species of plants and animals.

*Special Management Areas (SMAs)* are managed to provide and maintain areas and facilities for special uses not included under other land management classifications.

The total acreage of these management areas by property is shown in Table 2.1, and management area locations are shown in Map D and Map Series D1-D10.

**Table 2.2. Land Management Classifications of the LWRBNRA State Properties.**

Property Name	NCMA acres*	River corridors NCMA acres*†	HMA acres*	SMA acres*
Lower Wolf River Bottomlands Natural Resources Area		1,974.55	2,444.47	2.81
Navarino Wildlife Area	818.35	1,572.16	14,954.63	27.62
Wolf River Bottoms State Natural Area	55.39			
Deer Creek Wildlife Area	292.83		1,205.19	
Maine Wildlife Area			713.55	
Wolf River Bottoms Wildlife Area—Herb Behnke Unit			2,739.13	3.30
Outagamie Wildlife Area		344.17	639.12	
Mack Wildlife Area			1,372.86	
Wolf River Bottoms Wildlife Area—LaSage Unit	93.89	183.66	176.39	1.11
Hortonville Bog State Natural Area	1898.04			
Wolf River Fishery Area		244.19		
Mukwa Wildlife Area	170.01	1,329.32		
Shaky Lake State Natural Area	293.01			
Wolf River Wildlife Area			2,299.26	
Rat River Wildlife Area			7,530.72	
Winchester Meadows New State Natural Area	443.66			

\* Land management classification acreages are extracted from the DNR Managed Lands GIS spatial database, and may differ from the acreages represented in property deed legal descriptions.

† See page 10 for an explanation of the river corridors NCMA.

### *Native Community Management Area*

Native Community Management Areas are managed with the primary objective of representing, restoring, and perpetuating native plant and animal communities, whether upland, wetland, or aquatic and other aspects of native biological diversity. Areas that initially do not have the desired community conditions but have a reasonable potential to be restored to those conditions may be included under this classification. Management activities shall be designed to achieve land management objectives through natural processes and management techniques that mimic those processes whenever possible.

In the plan area, the 4 existing and 6 new SNAs are classified as NCMAs. Another NCMA along the Wolf and Embarrass Rivers is described below.

#### Lower Wolf and Embarrass River Corridors Native Community Management Area

This NCMA is located along the entire lengths of the Wolf and Embarrass Rivers throughout the plan area wherever extensive, interconnected stands of bottomland hardwood forests exist (Map D).

The ecological significance of the Wolf River and its tributaries is highlighted in various reports, notably in the Wolf River Basin Biotic Inventory (WDNR 2002b). The Nature Conservancy has identified the Wolf River Basin as a critical watershed for the conservation of at-risk freshwater fish and mussel species in the U.S. (Master et al. 1998). The lower Wolf River is identified in the Wisconsin Wildlife Action Plan Implementation (WDNR 2008) as a Continentally Important Resource, Large River Corridor, and a Conservation Opportunity Area (which also includes the Embarrass and Shioc Rivers). The *Wisconsin Land Legacy Report* (Pohlman et al. 2006) identifies the Lower Wolf River Bottomlands as a Legacy Place that supports one of the world's largest remaining lake sturgeon populations. Breeding and migrating birds and bats also heavily use these river corridors. The Lower Wolf River Bottoms is a noted Important Bird Area (Steele 2007), supporting a wide variety of high conservation priority bird species, particularly those associated with extensive bottomland forest and emergent wetland habitats.

Extensive, mostly intact Floodplain Forest, interspersed with other wetland communities in a natural mosaic, occurs along virtually the entire lower Wolf river corridor and much of the Embarrass River corridor. This area contains one of the last large, continuous, and intact floodplain communities in the Midwest, and is also connected to extensive northern forested landscapes such as the Menominee Forest and the Nicolet National Forest, providing a corridor for dispersal and migration of southern species northward in response to changing climates and shifting forest composition. As the dominant or “matrix” community, Floodplain Forest is a key natural community to focus on for management. In recognition of this ecological significance, the entire lower Wolf and Embarrass River corridors within the plan area have been identified as a NCMA.

The Floodplain Forest natural community includes the bottomland hardwood forest cover type (and can also include swamp hardwood). This NCMA was delineated according to

the occurrence of stands of bottomland hardwoods along the Wolf and Embarrass rivers, as this is the cover type that will receive management emphasis. Related communities that exist in natural complexes along with bottomland hardwoods and also may receive management attention include Southern Hardwood Swamp, Alder Thicket, Shrub Carr, Emergent Marsh, Southern and Northern Sedge Meadow, and Warm-water Rivers and Streams. However, the extensive, interconnected stands of bottomland hardwoods are the management focus of this NCMA and the feature that defines the corridors' shape and extent; other communities were included only if they were encompassed by or well connected to these large riverside bottomland hardwood stands.

The configuration of this NCMA also corresponds well to the Focus Areas identified in the LWRBNRA Feasibility Study (WDNR 2002a) (Map C) and meets many of the criteria used to identify the Focus Areas. The privately-owned portions of this NCMA are natural targets for management agreements with private landowners through programs such as the Managed Forest Law (MFL). A map showing lands currently enrolled in MFL within the plan area is provided in Appendix A. Over 2,300 acres of private land within the NCMA already are enrolled in MFL. These landowners are required to follow a sustainable forest management plan for 25 or 50 years in return for tax incentives from the State. Acquisitions and easements are also options where willing sellers exist.

By sustaining and managing for these floodplain communities in the long-term, we will capitalize on the local ecology and at the same time address statewide and regional needs. Larger habitat blocks, increased habitat connectivity, a variety of successional and developmental stages and patch sizes capable of supporting the species native to the area, and a diverse, functional mix of communities will benefit wildlife and aquatic species.

The following management objectives and prescriptions apply to the Lower Wolf and Embarrass River Corridors NCMA across the entire plan area, including on the following properties or portions of properties which it traverses or encompasses: Navarino WA; Outagamie WA; Wolf River WA—LaSage Unit; Wolf River FA; Mukwa WA; LWRBNRA Habitat Area parcels Beilfuss, Niemuth, Schmude, Price, Wilderness, Lutz, Lemke, and Larson; and several other scattered parcels (Map D).

Objectives:

- Maintain and enhance the extent, quality, and connectivity of Floodplain Forest and Southern Hardwood Swamp, and maintain their connections to adjacent open habitats (e.g., marshes, shrub swamps), to benefit common species such as wood duck, raccoon, white-tailed deer, wild turkey, and beaver and uncommon species such as red-shouldered hawk, cerulean warbler, and prothonotary warbler.
- Maintain a functioning Floodplain Forest ecosystem that contains many older trees and large-diameter trees, snags, coarse woody debris, patches of younger regenerating forest, habitat for the fullest range of Floodplain Forest species as possible, and minimal populations of invasive exotic species. The desired forest condition in this

type of stand-level mosaic may be represented by the following tree size-class distribution (DBH = Diameter at Breast Height):

- 0-5” DBH: 10% of patches within stands
- 5-11” DBH: 15% of patches within stands
- 11-15” DBH: 15% of patches within stands
- 15-30” DBH: 60% of patches within stands
- >30” DBH: at least 1 tree/acre throughout the bottomlands (Note: there are areas of bottomland hardwoods that are not suitable for conducting logging operations. These areas would be allowed to develop and could conceivably reach stand averages of 30” DBH, barring any natural disturbances such as wind storms, major floods or insect outbreaks. Even in the managed areas, 75% of the stand area would always be in a larger-diameter (sawlog) size class.)
- Manage non-Floodplain Forest communities to complement the Floodplain Forest objectives and support aquatic habitat management objectives and, secondarily, to support the wildlife habitat management objectives described under Habitat Management Area (p. 15).

*Prescriptions:*

- Follow the Bottomland Hardwood Management Guidelines and Timber Harvest Considerations provided in Appendix B to achieve and maintain the desired forest condition. In designing specific harvest prescriptions, the following elements should be emphasized: thin for improvement from below; retain and regenerate swamp white oak whenever possible; retain snags, living and dead cavity trees, coarse woody debris, and trees on outside river bends or leaning towards the river or major side channels that will reach the water once they tip, and create valuable fish habitat.
- Monitor and control invasive exotic species.
- Adhere to all Forestry Best Management Practices (BMPs) for Water Quality.
- Great care will be taken to avoid the introduction and/or spread of invasives, especially reed canary grass, in the understory of this community.
- Salvage of trees is permitted through consultation with affected DNR programs.
- Encourage the recruitment of natural woody debris into the river system through natural fluvial processes as well as management of river bank habitat. See Catfish Habitat (p. 21).
- Manage the non-bottomland hardwood communities that are interspersed among tracts of bottomland hardwoods as appropriate, according to the objectives and prescriptions in the Habitat Management Area, Aquatic Habitat Overlays, and the Management Prescriptions by Cover Type sections detailed later in this chapter

giving priority to the primary management focuses of the area – bottomland hardwoods and aquatic habitats.

### ***Habitat Management Area***

Various properties throughout the plan area have acreages bearing this classification, from Navarino WA in the northern portion to Rat River WA in the southern portion (Map D).

The habitats managed under this classification consist largely of forested or open wetlands such as bottomland hardwoods and swamp hardwoods (those occurring outside of the Lower Wolf and Embarrass River Corridors NCMA), shrub swamp, and emergent marsh, but also include smaller amounts of both forested and open upland habitats such as aspen, oak, upland brush, and grassland. Wildlife species supported by these habitats include waterfowl, shorebirds, ruffed grouse, American woodcock, white-tailed deer, muskrat, beaver, walleye, and smallmouth bass, among many others.

The following general management objectives and prescriptions apply, as appropriate to the management area and site, to all the properties covered under this plan. Additional management objectives and prescriptions for specific habitats and management areas on individual properties are included under the individual property sections.

#### **Objectives:**

- Provide maximum wildlife benefits on wetlands, particularly habitat for waterfowl nesting, brood rearing, and migratory stopover.
- Provide larger blocks of habitat and a continuum of habitats from lowland to upland; and provide linkages between habitat blocks that create travel corridors for the movement of species over time.
- Provide high-quality habitat for forest game and non-game species, with an emphasis on oak, aspen, native white pine, and swamp conifer habitats.
- Protect, enhance, and expand turtle nesting opportunities.

#### **Prescriptions:**

- Maintain and enhance the quality and extent of open wetlands, with particular emphasis placed on wet and wet-mesic prairie, sedge meadow, emergent marsh, and open bog for the benefit of common species such as mallard, blue-winged teal, wood duck, beaver, muskrat, otter, raccoon and uncommon species such as king rail, American bittern, least bittern, black tern, and willow flycatcher.
- Maintain existing shrub carr or alder thicket wetland in areas that do not have high potential for management as sedge meadow, wet prairie, or wet-mesic prairie.

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- For wildlife habitat value, maintain, enhance, and expand oak stands and retain aspen stands (expand aspen where opportunities exist to convert from red maple) where this is practicable and does not conflict with other property objectives to benefit common wildlife species such as ruffed grouse, American woodcock, and white-tailed deer and uncommon species such as golden-winged warbler, and black-billed cuckoo.
- Maintain the native white pine cover type where opportunities are present.
- Maintain and improve swamp conifer on all existing sites by favoring white cedar and tamarack, and improving their ability to regenerate.
- Manage pine plantations to rotation age and then convert to other forest type or maintain the conifer component where advanced conifer regeneration exists.
- Maintain upland brush on sites where it exists that are at a transitional stage between grassland and forest habitat.
- Wherever possible and consistent with overall wildlife and aquatic habitat objectives, manage for larger blocks of habitat, particularly forest, and provide a continuum of habitats from lowland to upland. Also, establish and maintain linkages between habitat blocks to create travel corridors for the movement of species over time.
- Evaluate non-forested areas within or adjacent to larger blocks of forested habitat for suitability to convert to forest to increase forest block size. Convert these areas to a forest type appropriate for the site where feasible and where conversion does not conflict with an existing property management objective.
- Where it does not conflict with other property objectives, create and maintain additional turtle nesting sites on open, southerly-exposed sandy areas that are elevated enough to escape most minor to moderate floods.
- Maintain existing dikes and water control structures. However, some structures may be removed where necessary after evaluation and consultation between Wildlife and Fisheries property managers.
- Convert most cropped land to native cover types.
- Where feasible, identify and eradicate populations of the invasive species by cutting, pulling, biological control, and/or herbicide treatment. Invasive species of particular concern currently include reed canary grass, common reed, flowering rush, purple loosestrife, buckthorn, spotted knapweed, honeysuckle, garlic mustard, Eurasian water milfoil, and curly-leaf pondweed.
- As appropriate, follow the Management Prescriptions by Cover Type provided later in this chapter when conducting management actions that support the above objectives and prescriptions.

### ***Special Management Area***

The Special Management Area classification is not universal to all properties. Management objectives and prescriptions are discussed in the following individual property sections: Lower Wolf River Bottomlands Natural Resources Area; Navarino Wildlife Area; Wolf River Bottoms Wildlife Area—Herb Behnke Unit; and Wolf River Bottoms Wildlife Area—LaSage Unit.

### ***Aquatic Habitat Overlays***

The aquatic overlay zones can be located in both Native Community Management Areas and Habitat Management Areas, and are sub-habitat management areas focused on the aquatic resources and habitats described below.

### **General Fisheries Management**

#### **Objective:**

- Maintain and enhance existing fisheries through habitat management and restoration, enhancement and protection, monitoring, and development of science-based angling rules.

#### **Prescriptions:**

- Conduct annual fisheries assessments to gather data necessary to determine current status, evaluate management objectives, monitor year-class strength and other important parameters of various species, and track long-term community trends.
- Maintain natural water connections and naturally isolated water bodies. Where possible and feasible, allow natural migration of the river channel. Maintain open water habitat in sloughs, oxbows, and river channels.
- Enhance/restore degraded shorelines where possible, allowing for ingress and egress of wildlife, especially nesting turtles.
- Stabilize eroding banks to protect existing infrastructure, water quality, and important cultural features utilizing the full spectrum of possible techniques, as appropriate, ranging from vegetative restoration to placement of rip-rap. Evaluate and address potential conflicts with other important objectives (e.g., turtle nesting areas) through consultation with affected programs (Fisheries, Wildlife, Endangered Resources, Water, etc.). Hard armoring should be avoided for aesthetic reasons (i.e., where erosion is not taking place) and at sites hosting valuable habitat features (e.g., natural shorelines, abundant coarse woody debris), threatened or endangered species, or where adverse environmental impacts are expected.

### Walleye Spawning Marshes

Walleye in the Winnebago system have evolved to use an unconventional habitat type for their spawning. Each spring, the majority of mature walleye leave Lake Winnebago and the upper pool lakes of Butte des Morts, Winneconne and Poygan and migrate up the Wolf and upper Fox Rivers to spawn on flooded grass and sedge marshes along the rivers and their old oxbows.

Two things are critical for these unique spawning marshes to function effectively: water flow and suitable vegetation. Snowmelt and spring rains swell the rivers, causing them to overflow their banks, temporarily flooding the wetlands and oxbows. Walleye enter these areas and spawn. These spawning marshes are not just low areas of standing water. There are distinct inlets and outlets to the marshes off the rivers. The inlets allow the rising water to begin to flow onto and over the marsh, while the outlets provide an area of concentrated flow back into the primary river channel. The second component in a functional walleye spawning marsh is suitable vegetation. Since these marshes are located in seasonally flooded areas, the vegetation is typical of wetland areas: grasses, sedges, rushes and willow in the open areas and mostly silver maple with scattered red maple, green ash and swamp white oak making up the forested areas.

Walleye spawning sites can be located in both HMAs and NCMAs, and are a specialized sub-habitat management area within the larger area. Each marsh has its own characteristics and needs, but management of these walleye spawning marshes focuses on maintaining or improving their critical elements: water flow and grass/sedge vegetation. Management techniques range from simple to intensive, depending on the conditions present on individual marsh spawning areas. Following is a list of management actions that may be employed in any combination for water flow and vegetation management of walleye spawning marshes.

#### Objective:

- Restore, enhance, and maintain the functional values of known walleye spawning marshes and establish new walleye spawning marshes where practicable.

#### Prescriptions:

- Protect important known or potential walleye spawning areas through purchase or easement as opportunities present themselves. Identify and evaluate for management and protection any new walleye spawning areas on the Wolf River. Continue to work with local clubs and public volunteers who have knowledge of the system to identify new potential spawning areas.
- Post important spawning areas as seasonal “No Entry Zone” for the public from March 15 to the 1st Saturday in May to limit/eliminate illegal activities and disturbance of spawning walleye and eggs and fry.

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- On Department-managed spawning areas, maintain the habitat as grasses, sedges and other soft-stemmed vegetation where spawning occurs by mowing brush and other woody-stemmed plants, cutting and removing trees and tops, and prescribed burns in marshes to remove debris and encourage new growth. Continue to work with invasive species management experts to decrease the abundance of the exotic reed canary grass and encourage native grasses and sedges.
- Maintain, increase, or restore seasonal spring water flow over and through marshes by utilizing bank cuts, with appropriate stabilization methods, and spillway structures, dike removal/modification, and installation of culverts and bridges as needed. Water Management specialists should be consulted to address potential regulatory requirements.
- Enter into Walleye Spawning Marsh Agreement leases with private landowners who desire to improve or protect walleye spawning habitat on their lands while retaining ownership.

Sturgeon Populations and Spawning Areas in the Wolf River

The Wolf River provides extensive spawning and nursery habitat for lake sturgeon of the Winnebago System, and is the main production area for the largest population of this species in North America. Historically, lake sturgeon were able to migrate up to Keshena Falls on the Menominee Indian Reservation, but two dams built within ten miles downstream of Keshena Falls in the late 1800s and early 1900s prevent sturgeon from reaching these historic spawning grounds. Although there are numerous spawning areas below the dams that sustain the lake sturgeon population quite well, joint efforts have been ongoing between the Department and the Menominee Tribe to restore migrant spawning and river resident lake sturgeon to the section of river below Keshena Falls above the dams. These efforts rely on utilizing adult and juvenile lake sturgeon and eggs from the population in the lower Wolf River. Sturgeon transferred to the Wolf River below Keshena Falls likely will produce young there that will contribute to the population in the lower Wolf River, and most of the migrant adults transferred upstream will move back downstream over the dams post-spawn. Capture and transfer operations are the preferred method of fish movement at this time due to aquatic invasive species issues. The feasibility of other methods to facilitate sturgeon movement upstream will be determined at a future date.

Lake sturgeon require less habitat management than walleye due to the fact that they do not leave the river channel proper to spawn. However, they do seek out a specific habitat type to spawn on. Historically, sturgeon used rock and cobble riffle areas in the Wolf, Little Wolf, and Embarrass Rivers and their tributaries for spawning. There were only a handful of these shallow rocky areas. However as recreational land ownership began to increase, so did efforts to keep the river from eroding personal property. Quarried rock was used to armor outside bends of the rivers where the current and boat wakes did the most damage. Sturgeon were quick to find this fresh rock and utilize it for spawning substrate since it had the right attributes: moving current to keep the eggs oxygenated and

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free of silt and interstitial spaces to protect the eggs from suckers and other predators. Once the eggs hatched, it also provided the larval sturgeon a hiding place for a while. Shoreline armoring proposals should be evaluated to maximize the potential use by spawning and larval lake sturgeon.

Objective:

- Restore, enhance, and protect the functional values of known sturgeon spawning areas on the Wolf River, and establish new quality spawning areas when opportunities allow.
- Restore migrant and resident sturgeon spawning populations to the Wolf River above Shawano Paper Mill and Balsam Row dams, including the river on the Menominee Reservation and the Red River above the Shawano Paper Mill dam, without negatively impacting the Winnebago System sturgeon population or recreational fishery. Utilize fish and eggs from sturgeon stock in the lower Wolf River for this effort.
- Work cooperatively with the Menominee Tribe to meet cultural sturgeon needs, and to develop and implement a cost-efficient and ecologically sound long-term process for restoring sturgeon to the upper Wolf River. Utilize fish and eggs from sturgeon stock in the lower Wolf River for this effort

Prescriptions:

- Identify and inventory potential spawning habitat from Shawano downstream.
- Evaluate shoreline armoring proposals for sturgeon spawning potential.
- Work with the public and DNR wardens to maintain a complete listing of all known and potential sturgeon spawning areas.
- Restore known spawning areas as needed with appropriately sized and placed materials to encourage sturgeon use and maximize hatching survival. When rock armoring is used, it should be in the size range of 6-18” to maximize the likelihood that it will be used by sturgeon for egg deposition.
- Work with partners, landowners, and internal staff to maintain spawning sites.
- Protect important sturgeon spawning sites through purchase, easement, or landowner agreements.
- Develop legal instrument to allow state monies to be expended on private properties for aquatic (catfish and sturgeon) habitat work, similar to the existing Coop Walleye Spawning Marsh Lease Agreements.
- Capture 100 lake sturgeon annually from the Wolf River below Shawano and transfer for release, following sonic and PIT tagging, to the Wolf River above the Shawano Paper Mill and Balsam Row dams, and in the Menominee Indian Reservation.
- Capture 15 lake sturgeon annually from sturgeon stock in lower Wolf River and provide to the Menominee Tribe for sturgeon cultural ceremonies and feasts.

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- Facilitate discussions among Winnebago System lake sturgeon interests, including sturgeon spearers, Sturgeon for Tomorrow, dam owners, Menominee Tribe, DNR and other sturgeon groups, and develop final recommendations for long-term restoration of sturgeon to the upper Wolf and Red Rivers.

Coarse Woody Habitat for Catfish and Other Species

Log jams and submerged trees create complex habitat that serves a variety of fish life history needs including: spawning cover and/or substrate, hiding/resting cover for adult and juvenile fish, and substrate for periphyton and invertebrates – important food items for fish. In addition, numerous management and research studies have shown that fisheries diversity and abundance tends to be higher in areas that contain large amounts of coarse wood habitat. Wood also serves as habitat for a variety of herptiles (snapping turtle, wood turtle, map turtle, and soft-shelled turtle) that use exposed logs for sunning/resting areas.

Coarse woody debris is particularly critical habitat for flathead catfish, which seek out submerged trees to construct spawning nests. A typical catfish spawning nest is located near the root ball of a submerged tree. It is important that trees are located at multiple depths within the stream channel to accommodate annual variation in water levels. Another unique life history characteristic of catfish is their wintering habitat. Flathead catfish seek out deep (>20 ft) lateral scour pools that have well defined eddy areas. Many of these sites also are associated with large woody debris.

Objectives:

- Provide a sustainable catfish fishery with opportunities for both quality and trophy harvest.
- Maintain and/or restore coarse woody habitat for catfish and the multitude of other fish and aquatic species that utilize this type of habitat.

Prescriptions:

- Evaluate bank stabilization projects for potential catfish habitat improvements.
- Maintain existing habitat and conduct coarse woody habitat development to improve cover, food supply, and spawning areas for catfish, other fish, and other aquatic organisms. Coarse woody habitat enhancement includes but is not limited to: tree drops, creation of log-jams, and single-tree additions for spawning habitat.
- Where feasible, incorporate larger rock in conjunction with wood into bank stabilization projects to create optimal interstitial space for juvenile catfish.
- Protect deep, lateral scour pools from any disturbance.
- Protect existing over-winter sites and identify others.

### Other Fish Species

The lower Wolf River and its tributaries are host to a rich variety of fish species, including game and non-game alike. Seventy-seven different species were identified in the Wolf River Basin Biotic Inventory and Analysis (WDNR 2002). In addition to walleye, sturgeon, and catfish, anglers ply these rivers' waters for northern pike and musky, small and largemouth bass, bluegill, crappie, pumpkinseed, yellow perch and white bass. Smallmouth in particular are a dominant species in some of the smaller tributaries such as the Waupaca, Little Wolf, Embarrass and the upper Wolf after the walleye are through spawning, and are the dominant predator on non-game species in the river system. Largemouth bass and panfish can be found in the more vegetated, quieter waters of sloughs and connected smaller lakes. Northern pike and musky prefer ambush cover near deeper, cooler water.

Forage and non-game species, such as blackchin shiner or shorthead redhorse, are important components of the river's ecosystem. Many of the non-game species provide forage for larger game fish, upward transfer of energy in the food web, are host species for mussels, or fill some other niche in the overall system. In addition, there are a number endangered, threatened or special concern species present in the river, such as greater redhorse, river redhorse, and shoal chub. All these species are dependant on the various diverse river habitats for their survival.

Healthy, fishable populations of game fish are dependent on a balanced, diverse non-game community. Managing these rivers for a diversity of natural shorelines and habitats will ensure that these communities, and the species they are composed of, remain viable and abundant.

#### Objective:

- Provide balanced and diverse game, panfish and non-game fish communities.

#### Prescriptions:

- Monitor game and non-game fish populations using standardized fish surveys to detect long-term trends in fish communities and establish management objectives.
- Allow natural hydraulic processes to occur wherever possible.
- Control excessive bank erosion through the use of watershed BMP's and vegetated banks.

### Mussel Habitat

Mussels are an important but often overlooked component of the river ecosystem. In the Wolf River system, which includes the Embarrass, Little Wolf, Shioc, Pigeon, and

Waupaca Rivers, there are 28 native species and 1 exotic species of freshwater mussels that have been positively identified. Two additional species may be present but are unconfirmed at this time. One species is listed as Federally Endangered, 3 as State Threatened, and 7 as State Special Concern (WDNR BER Working List 12/23/2011). A list of mussels of the Wolf River system and their host species is provided in Appendix C.

Dense populations of mussels with a high diversity of species often occur in clusters called “mussel beds”. These mussel beds are typically associated with stable sand/gravel substrate located in moderately flowing water. Mussel beds are not limited to shallow water depths, as several large beds have been observed in some of the deepest parts of the rivers. The location and extent of these beds is poorly known, and ongoing efforts should be made to locate and record mussel beds within the system.

Natural shorelines provide the best habitat for mussels and their host species, which are a critical part of their life cycle. Excessive use of poorly sized and placed rip-rap can disrupt, diminish or destroy entire beds by covering them or changing current patterns and increasing siltation downstream. Seawalls and permanent piers and pilings can also have a negative effect on mussels by changing flow patterns which in turn alter areas of scour and deposition. Mussel beds can be covered up by silt moved from upstream areas. Changes to shoreline habitat may result in a reduction of the intermittent host fish species in that area that the mussels rely on for reproduction.

Objectives:

- Maintain abundant and diverse mussel populations in the Wolf River system.
- Expand distribution and abundance data for mussels in the Wolf River system.

Prescriptions:

- Maintain natural shoreline, as this is the best habitat for mussels and their host species.
- Limit the use of aesthetic or landscaping rip-rap where erosion is not taking place, where threatened or endangered species or valuable habitat features (e.g., natural shorelines, abundant coarse woody debris) are present, or where adverse environmental impacts are expected.
- Carefully review permits for permanent pilings and seawalls relative to their potential impacts on flows and sediment transport.
- Develop a standardized mussel sampling protocol for non-wadable waters.
- Identify and inventory mussel beds within the Wolf River from Shawano Dam to Lake Poygan.
- Determine distribution and abundance of threatened and endangered mussel species within the Wolf River system.

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- Educate landowners regarding the importance of mussels and host species interactions.
- Work with Fisheries to prioritize future sturgeon spawning sites to ensure that mussel beds or mussel bed restoration areas are evaluated prior to establishing new sturgeon spawning sites.
- Promote the use of grassed waterways in agricultural areas to reduce sediments and runoff into the Wolf River and its tributaries.

**Management Prescriptions by Cover Type**

The Department commonly uses several habitat classification systems when planning and performing management activities. The two that are used most in this plan are natural communities and cover types. Each has a different purpose, function, and scale. The natural community system is broader and ecologically defined, based on assemblages of plant and animal species that are repeated across the landscape in an observable pattern. It is a particularly useful tool for identifying interconnected, functional natural elements. The cover type system is more focused, generally looking at a finer scale. This system breaks out the primary vegetative types on the landscape and classifies them by the dominant vegetation present on a particular site. The cover type system was developed as a forest management tool, used to identify and apply management to different timber types and other types of vegetation. Specifically, a forest stand is designated as a certain cover type if  $\geq 50\%$  of its basal area is dominated by a particular tree species. Sites having  $< 10\%$  trees are considered non-forested and are classified as various other habitat types (e.g., grassland, lowland brush, etc.) according to the predominant vegetation present. Forest reconnaissance data are collected using these cover types, and are stored in the Wisconsin Forest Inventory & Reporting System (WisFIRS).

Because the cover type system focuses on specific vegetation types, it is useful for directing and carrying out vegetation management activities. However, consideration of natural communities along with cover types is essential in planning and management to assure that the overall integrity and function of managed resources are maintained.

The property cover type maps (see Map Series F) are based on WisFIRS data. Table 2.3 lists some of the common cover types and species found on the properties in the plan area.

**Table 2.3. Property Cover Type Descriptions based on WisFIRS.**

	Forested	Non-forested
<b>Upland</b>	<b>Aspen</b> <b>Conifer</b> —Red Pine, White Pine, Fir-Spruce <b>Oak</b> <b>Hardwood</b> —Central Hardwood, Northern Hardwood, Red Maple, White Birch	<b>Agriculture</b> <b>Grassland</b> —Herbaceous Vegetation, Prairie Grasses, True Grasses, Upland Grass <b>Upland Brush</b>
<b>Wetland</b>	<b>Bottomland Hardwood</b> <b>Swamp Hardwood</b> <b>Swamp Conifer</b> —Tamarack, White Cedar	<b>Emergent Vegetation</b> —Emergent Marsh, Sedge Meadow <b>Lowland Brush</b> —Alder, Willow/Dogwood <b>Lowland Grass</b> <b>Minor Lake</b> <b>Water</b>

### ***Forested Habitats***

All forest management activities follow the guidelines in the DNR *Silviculture and Forest Aesthetics Handbook* (2431.5), the *Public Forest Lands Handbook* (2460.5), the *Timber Sale Handbook* (2461), and the *Old-growth and Old Forests Handbook* (2480.5). Consult these handbooks for additional details and management considerations.

The prescriptions listed below are for the primary forest types found throughout the LWRBNRA. The prescriptions include an overview of the general management methods and guidance from the *Silviculture Handbook* as well as some additional considerations to be applied to this group of properties.

#### General Forest Management Prescriptions

- Retain snags and coarse woody habitat whenever their retention does not conflict with other management objectives or pose a danger to loggers.
- Leave long-lived reserve trees as individuals or in groups to provide timber, wildlife, and aesthetic value whenever their retention does not conflict with regeneration and other forest management objectives.
- Salvage trees damaged by wind, ice, fire, insects, and disease as long as the salvage meets the overall objectives for the site and is economically feasible.
- Where appropriate, extend the rotation age for some stands of oak, red pine, white pine, and yellow birch in order to increase the abundance of older-age forest habitat, which is highly limited in the plan area.
- Maintain site hydrology for lowland forest types (bottomland hardwood, swamp hardwood, white cedar, tamarack); restore where feasible.
- Use intermediate forest treatments, such as release or crown thinning, where appropriate to develop young stands or improve composition (e.g., oak).
- Follow Wisconsin's Forestland Woody Biomass Harvesting Guidelines when conducting forest management in cases where biomass harvesting is compatible with site objectives.
- Require loggers to utilize established best management practices for all aspects of conducting timber harvest and removal, and require logging equipment to be cleaned prior to entry to and exit of state lands in order to prevent the spread of invasive plants.

### Bottomland Hardwood

This forest cover type is dominated by silver maple, green ash and swamp white oak. Stand management may be done to maintain stand vigor and encourage healthy growth. Invasive exotic species, wet soil conditions and high water tables can make timber management in this cover type a challenge. Also, deer browsing on seedlings and stump sprouts can hinder stand regeneration in some areas.

#### Prescriptions:

- Encourage silver maple and swamp white oak.
- Follow DNR Forestry management guidelines for emerald ash borer.
- Prior to planning any timber harvest, evaluate the potential for invasion of the site by reed canary grass. Any management strategy should focus on preventing the site's conversion to reed canary grass.
- Leave large cavity trees, both living and dead.
- Leave large white pine close to the main river channel for future bald eagle nest trees.
- Retain trees on the bank in the riparian management zone (RMZ), especially on outer bends, to add to the coarse woody debris in the river.
- Plant bottomland hardwood species to increase corridor width of this habitat when opportunities present themselves.

### Swamp Hardwood

Black Ash and green ash dominate these forest stands. With the arrival of emerald ash borer (EAB) in the state, perpetuating these stands in the long-term may no longer be feasible, unless future preventative measures curb EAB's spread.

#### Prescriptions:

- Follow DNR Forestry management guidelines for emerald ash borer.
- In stands with large components of conifer, manage to increase cedar and tamarack.
- In stands with a large silver maple, swamp white oak, red maple, or basswood component, manage for these species.
- In areas lacking conifers or other hardwoods, succession to lowland brush or sedge meadow may occur with the absence of ash. Any management strategy should focus on preventing the site's conversion to reed canary grass.

### Tamarack-dominated Swamp Conifer

Tamarack is the primary timber type in these stands, but a swamp hardwood secondary timber type dominated by red maple is often present as well. Stand maintenance is the main goal. Tamarack is a sun-loving species that requires full sunlight to regenerate. As the tamarack ages and dies, these stands will naturally convert to swamp hardwood or red maple. Strip clearcutting is the standard method of regenerating tamarack.

#### Prescriptions:

- When at least 60% of random 1/1000-acre plots contain vigorous advanced regeneration after logging, clearcut stand at site index rotation age. Rely on existing regeneration to stock future stand.
- When there is inadequate advanced regeneration, clearcut in strips when stand reaches site index rotation age following the guidelines in the Department's *Silviculture and Forest Aesthetics Handbook*.
- At least 20 years prior to rotation, reduce basal area stocking level to 100 sq. ft. whenever stand becomes accessible.

### White Cedar-dominated Swamp Conifer

White cedar is the primary timber type in these stands. A swamp hardwood secondary timber type dominated by black ash and/or red maple is often present in these stands as well. Lack of regeneration due to deer browsing is one of the main concerns for the long-term health of white cedar stands in this area. With the arrival of emerald ash borer, focusing efforts on removing the ash to promote cedar and red maple may become even more important.

#### Prescriptions:

- Remove ash and convert to cedar and red maple, favoring cedar if deer browsing will allow.

### Aspen

Aspen forests are a premier wildlife cover type in the uplands. Young aspen forests provide feeding and hiding cover for a host of game species and non-game species. While aspen is currently the second most common forest cover type north of the Tension Zone and is present at much higher levels than it was prior to Euro-American settlement, the cover type currently is in decline across the state. New research is indicating that young aspen stands, particularly those containing large scattered oaks, may provide important breeding habitat for golden-winged warblers, especially if adjacent to mature forest for the post-fledging period. White pine, another component of these stands, can

increase once sunlight reaches the young trees in the understory. Trees retained may wind throw and become coarse woody debris on the forest floor.

Prescriptions:

- Use coppice cutting at rotation age to regenerate the aspen, and oak if present.
- Evaluate hardwood stands that contain a remnant aspen component and determine if they may be converted to aspen/birch. Convert to aspen where the potential exists.
- In mixed stands, retain a component of other tree species, particularly pine.
- Whenever possible, leave cavity trees (living and dead).
- Islands of off-site aspen will not be actively managed.

Conifer Plantations

The management strategy for most conifer plantations is to convert to other forest cover types at rotation age using advanced regeneration. This is particularly true for sites where oak and white pine are abundant in the understory. It is also a viable option to maintain the conifer component at some sites by using advanced regeneration or supplemental planting of white pine seedlings to maintain the conifer type.

Prescriptions:

- For converting to deciduous species, allow advanced hardwood species to revegetate the stand via shelterwood harvests, overstory removal, or seed tree harvests.
- For maintaining the conifer type, if sufficient numbers of suitable conifer seedlings/saplings exist as advanced regeneration, then allow advanced regeneration to revegetate the stand via shelterwood harvests, overstory removal, or seed tree harvest.

Northern Hardwood

Northern hardwood stands are relatively rare in the LWRBNRA project due to the lack of rich upland soils capable of meeting the nutrient requirements of this type. These stands are characterized by sugar maple, basswood, and white ash. However, in Shawano County yellow birch, cherry and beech are also common associates. This forest type can be managed as an all-aged forest stand. Most of the hardwoods will be managed to diversify tree ages, sizes and types of tree species in each stand. Northern hardwoods are a climax cover type and provide opportunities for all-aged forest management in an area dominated by even-aged types.

Prescriptions:

- Use selection harvest as the primary management tool, and vary harvest intensity according to site specific conditions and needs. Plan harvests to maintain or increase species diversity in these stands.
- Depending on the objectives of a particular management area, silviculture systems such as shelterwood harvest, group selection, or gap creation may be used. These techniques may be applied to an entire stand or to parts of a stand in conjunction with a selection harvest.
- Where northern hardwoods are to be maintained, generally schedule management entries at intervals of every 10-20 years. To develop a northern hardwood stand with many age classes, evaluate the regeneration, spacing, density and other stand conditions.
- Evaluate poorer quality sites (dry-mesic sites) dominated by northern hardwoods for the potential to manage for quality red oak or white pine.

Oak

Oak has high value for wildlife. Scrub oak is the prevalent oak type on the project area. There are a few high quality sites that support red oak. Scrub oak is usually found on sandy sites in association with aspen and white pine. In these areas, clearcutting the stand while retaining the white pine is the preferred practice for regenerating this type, allowing oak stumps to sprout. This practice maintains stand diversity, while doing the harvest necessary to maintain the stand in scrub oak and aspen. Failure to conduct active forest management as these stands reach rotation age will usually result in long-term conversion to red maple, a cover type less desirable from a wildlife habitat standpoint.

Prescriptions—Scrub Oak:

- Clearcut at rotation age. Recommended rotation age is 45-70 years where aspen is present and 60-80 years where aspen is not present.
- Clumps of large-diameter trees may be retained for wildlife or aesthetic purposes. Clumps should be one-eighth to one-half acre in size, numbering 2 to 3 for every 40 acres harvested. In higher-quality stands (site index of 60 or higher), thinning to allow better quality oak to grow larger can also be done.
- Where site conditions are favorable, convert red maple to oak.
- Whenever possible, leave cavity trees (living and dead).

Prescriptions—Red Oak:

- Manage for an improved age-class distribution by focusing on regenerating 75% of the 100-110 year-old age-class in the next five years, and regenerating 75% of the current 75-85 year-old age-class in the following five years.

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- Manage red oak on appropriate habitat types by applying shelterwood harvests to high-quality oak sites. Timing of harvests should coincide with years with good acorn crops, making sure marking reaches crown closure targets.
- If necessary, apply intensive pre- or post-harvest site treatments to ensure successful regeneration of oak occurs, rather than conversion to red maple.
- Provide for old-growth characteristics on appropriate sites by leaving legacy trees or groves to live out their lives on site.
- Convert red maple to oak whenever the opportunity exists.
- On sites where regeneration of oak would be very expensive or silviculturally problematic, manage individual red oaks to biological maturity, fully expecting the stand to convert to central hardwoods.

### Red Maple

Red maple is common on stands of intermediate fertility and average to above-average moisture. It is an aggressive competitor to oak and outlives aspen and birch. As a result, as aspen and oak stands decline with age, red maple becomes the dominant tree species. The red maple cover type is not as valued for wildlife habitat as the aspen/oak cover types, and so conversion back to aspen and oak through coppice cutting when possible is the preferred management alternative for these stands. When there is no opportunity for natural conversion in these stands, red maple may be maintained.

#### Prescriptions:

- Use coppice cutting to convert to aspen and oak wherever possible.
- Where management for red maple is the primary objective, utilize even-aged management with a shelterwood cut at rotation age of 90 years.

### White Birch

White birch is valuable to wildlife as a food source (catkins, seeds, buds) and for developing good snag trees. The white birch cover type is in decline across the state as private forest lands age and landowners focus on all-aged hardwood management rather than coppice/shelterwood cutting to regenerate white birch. In the LWRBNRA, white birch is found in small pockets associated with more dominant habitat types such as aspen or upland hardwoods (especially red maple). It requires mineral soil for a proper seedbed to germinate, and it is a highly drought-sensitive species. To maintain this forest community in the landscape, harvest followed by active management is the most effective method. Harvest and ground disturbance provide for good regeneration of white birch as well as development of a diverse mix of grasses, forbs and shrubs important during successional stages of this forest community.

Prescriptions:

- Regenerate white birch by clearcutting stands, strip cutting, shelterwood harvest or by modified clearcuts that open up stands. Typically use ground disturbance during harvest, mechanical scarification, or prescribed fire to prepare the forest floor for white birch seed germination.
- On mixed stands of white birch and other species use selection harvest, shelterwood harvest, and clearcut harvest, as appropriate, for diverse natural regeneration.
- Where white birch is an associate in aspen stands, clearcut harvest the birch along with aspen. (White birch can stump sprout from healthy cut trees and can seed in on soils that are exposed by mechanical methods along with the aspen regeneration).

White Pine

Natural white pine stands are common in northern portions of the river corridor and are an important feature on the landscape. These stands often contain significant amounts of aspen and oak as associates, and so provide a forest type with lots of structural and species diversity. White pine is a climax species on drier sites, so these stands provide viable long-term management opportunities.

Prescriptions:

- In mixed stands, maintain white pine regeneration to increase the pine component in the future for added diversity.
- Where white pine is the primary cover type, selectively thin to maintain the health, vigor and growth of the pines. Use individual stand conditions and the rotation length guideline based on habitat types found in the *Silviculture Handbook* as the basis for determining rotation age. Clearcutting, seed tree harvest, shelterwood harvest and overstory release may be used depending on site conditions to regenerate the stand. Stand considerations, seed sources, and site prep needs will determine the appropriate management action to use.
- Where white pine is a viable understory component in mixed stands, use natural regeneration techniques such as overstory removal. To promote pine to dominate the future stand, give established seedlings adequate light for optimal growth by reducing the overstory to no greater than 20% crown closure.
- Where a seed source exists and advance regeneration is inadequate or absent, patch clearcutting near the seed source can be done to establish a greater white pine component. Ground disturbance or prescribed fire may be used to promote regeneration of white pine where feasible and safe.
- Encourage and retain white pine near open water for future bald eagle nest sites.
- Leave scattered large white pine in many harvest areas if they are healthy and do not pose a risk to humans or forest health.

### *Lowland Habitats (non-forested)*

#### Alder Thicket

This lowland shrub community is dominated by alders, especially speckled alder, although dogwoods, willows, and other shrubs may also be present. Alder thickets provide valuable wildlife habitat for species such as American woodcock and golden-winged warbler.

#### Prescriptions:

- Cut alder on a 20-year rotation to regenerate stands. Mow or shear strips that are 50-100 feet wide. Alder may be cut in blocks if necessary.
- Position strips so that every 5 years, an adjacent strip can be cut. If near a water source, orient strips perpendicularly in order to provide a soil moisture gradient for woodcock feeding opportunities.
- Cutting may be implemented by loggers as part of a timber sale.
- Leave some areas of uncut alder for breeding golden-winged warblers, especially in sites adjacent to mature forest, as this species prefers tall shrubs for nesting.

#### Shrub Carr

Red-osier dogwood and various willows dominate this community. Shrub carr habitat is valuable wildlife habitat, especially for American woodcock, both during the breeding season and in winter.

#### Prescriptions:

- Use prescribed fire, mowing, tree cutting, and herbicide treatments to maintain shrub carr habitat.

#### Emergent Marsh

Shallow water is important to a majority of wetland plants and animals. The many flowages created by earthen berms (dikes) and water control structures on Wildlife Areas provide this shallow marsh habitat. Flowage water levels are manipulated throughout the year, especially after snow melt and large rain events. Water can be captured or drained, depending on management needs at the time. When aquatic vegetation in the pool is lacking (or when a dike requires repair) a drawdown is scheduled and water is slowly released. Shorebirds take advantage of mudflats as the water is withdrawn from the impoundment. With dry ground, growing conditions for plants become ideal and wetland vegetation produces cover and food necessary for wildlife, especially waterfowl. This also occurs naturally during times of drought. Sediments compact and dormant seeds of

wetland plants, like bidens (*Bidens spp.*) and smartweeds (*Polygonum spp.*), germinate and produce another crop of seeds that are utilized by waterfowl and other wildlife. Water is restored through capture of run-off, precipitation, ground-water recharge, and at a few locations, pumping from surface water sources. This habitat type also occurs throughout the LWRBNRA in situations where there is no artificial control of water levels. On these sites, habitat conditions and water levels vary depending on dry or wet periods. Some of these sites may still provide management opportunities.

Prescriptions

- Use periodic drawdowns, mowing, prescribed fire, or herbicides to attain a 1:1 ratio of emergent vegetation to open water in an interspersed pattern.
- Maintain dikes and water control structures in good condition.
- Remove invasive and woody species through mowing, cutting, burning, herbicide treatment, biological control, or a combination of these.
- Maintain or restore the original hydrology of wetlands where feasible.
- Wild rice should be a management priority where present.

Sedge Meadow

Sedge meadows support many wildlife species, including birds (waterfowl, herons, bitterns, rails, sedge wrens, etc.) and rare herptiles such as Blanding's turtle. Today, these open wetlands are much less abundant than they once were, although they remain fairly common in the plan area. Historically, fire played a key role in maintaining these open habitats. The lack of fire in the present landscape has allowed the encroachment of woody species. Many of these wetlands have been lost or severely degraded by drainage, flooding, lack of fire, or invasive species.

Degraded sedge meadows often are dominated by reed canary grass as a result of grazing and/or ditching. Reed canary grass is not desirable for wildlife because it replaces native plant species and creates a monotype with lower habitat value. Restoration can be a monumental task with few tools currently available. Continuing research on cost-effective, environmentally safe methods for removing reed canary grass from sedge meadows may provide future tools to accomplish these restorations.

Prescriptions:

- Control woody vegetation and invasive species using the best available and economical methods, including prescribed fire, mechanical cutting, herbicide treatment, or biological control agents.
- Restore the site's original hydrology where possible and compatible with other objectives.

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- Where practicable, reduce or eliminate competition to native vegetation from reed canary grass. Where opportunities exist, larger solid stands of reed canary grass may be eliminated by flooding with the resulting shallow emergent marsh providing native plants and better wildlife habitat. Alternatively, mowing reed canary grass in mid-summer followed by an intense, hot fire after the grass has dried can greatly reduce reed canary grass and increase native sedges.

***Upland Habitats (non-forested)***

Agricultural Habitats

Various state properties within the plan area contain formerly cropped agricultural lands. Most of these formerly cropped lands have been restored back to the original habitats that existed prior to conversion to cropland during settlement. However, the Department does partner with local farmers to rotationally crop open (non-wooded) habitats as a cost-effective means of keeping these areas from converting to woodlands, as well as providing a seasonal food source for wildlife. Currently, 709.25 acres are being sharecropped within the LWRBNRA. On newly acquired lands, cropping will be maintained for several years to prevent woody encroachment or invasion by exotic species while the site awaits restoration. Cropping is also continued when it is necessary to develop the proper conditions for a successful restoration to prairie, forest, or wetland.

Prescriptions:

- Provide migration or winter food for wildlife species at strategic locations by planting crops that provide grains or seeds. Crop establishment will be done via sharecropping agreements with neighboring farmers or cooperative agreements with conservation organizations.
- Prepare sites for conversion to native habitat (such as grassland or forest) through sharecropping on fields where long-term cropping is not needed in order to meet other management objectives.
- Utilize sharecropping in combination with appropriate soil and water conservation practices to efficiently develop and maintain nesting habitat for wildlife.

Grasslands

Grasslands in the plan area consist of cool-season grasses or prairie plantings. Some scattered native prairie openings also exist in the southern portion of the plan area. Most of these parcels are small in size (<50 acres), although some larger ones exist, and the majority of parcels are adjacent to lands that are in active agriculture. Although most parcels do not represent major opportunity for grassland species, they do provide some habitat for nesting grassland and grass-shrub birds and other species and will be maintained for this purpose.

*Prescriptions:*

- Use prescribed fire, herbicide treatments (when necessary), mowing and shearing. In large areas of grasslands, burn units on a rotation to maintain some cover for nesting birds and invertebrates.

Upland Brush

This habitat can include dogwood and alder and often occurs within numerous other habitat types. Upland brush can provide important woodcock feeding sites and nesting/brood rearing areas.

*Prescriptions:*

- Maintain upland brush on a 20-year cycle using heavy-duty mowers or biomass harvest if possible. Strive to cut strips or blocks every 5 years to provide a variety of age classes.

### **General Recreation Management and Uses**

All Department-owned lands within WAs, FAs, HAs, and SNAs, except for refuges that are closed to hunting during the waterfowl season and fish refuges closed to entry during fish spawning periods, are open to traditional outdoor recreational uses, including hunting, fishing, trapping, walking, and nature study. Asparagus, berry, and mushroom picking and nut-gathering are permitted on WAs, HAs, FAs, and SNAs.

A substantial percentage of the LWRBNRA properties are in the floodplain of the Wolf River and contain either wetlands or soils that are wet, poorly drained, and subject to periodic flooding, characteristics that make them unsuitable for trails or other intensive human uses (see LWRBNRA Soil Suitability map in Appendix B). Some of these properties, or portions of them that have dry access routes, provide good wildlife habitat but are not particularly suitable or attractive for recreational pursuits other than hunting or trapping. Other portions of the properties are useful for incidental hiking or bird watching but still are not of a recreational quality that would attract high levels of users. Only a small number of sites have qualities that make them attractive for non-hunting recreational uses as well as potential to develop facilities. Locations were chosen on Navarino WA, LWRBNRA HA Krubsack parcel in Shawano County, and Wolf River Bottoms WA—LaSage Unit (refer to individual property sections later in this chapter) to provide additional recreational opportunities that are compatible with both the primary recreational uses of these properties—hunting, fishing, and trapping—and with their physical limitations. Key criteria for selecting these sites include good public access, soil conditions appropriate to the use, scenic quality and/or exceptional wildlife watching opportunities.

The Department is initiating development of a State Water Trails program. This program will assist state and local government and conservation partners in the development and operation of a variety of water trail facilities and dissemination of water trails information. The program will support the purchase, subsequent development, and management of lands to provide trailhead-type facilities such as parking and non-motorized boat launch sites, informational signage, and provision of portage routes and areas for primitive camping for paddlers. Sections of the lower Wolf River will be evaluated for nomination to become part of the State Water Trail program. Analysis of the opportunities available on the lower Wolf will determine the appropriate level of development needed to accommodate paddlers. Facilities such as launch sites and camping may be proposed approximately every five miles. These facilities and other support for the water trail may also be provided by public and private partners in addition to what may be provided by the Department.

The Department also intends to consider the possibility of bicycle use on WAs within the LWRBNRA. Bicycle use generally has not been permitted on WAs. However, the Department will conduct an evaluation to determine the feasibility of accommodating this recreational use on WAs where it is compatible with property goals and resources and does not conflict with the primary uses of the property.

Several private businesses are located within or near the LWRBNRA that complement Department recreation goals of this plan by providing services not offered by or available from the Department. These businesses provide camping, watercraft rental, commercial game bird hunting, recreational shooting sports, hospitality, supplies for outdoor recreation, and additional river access. The Department's efforts to enhance and sustain the natural communities and water quality that support the fish and wildlife resources of the lower Wolf River corridor serve the interests of these businesses and their customers. The Department will make information regarding recreational opportunities on public lands and waters of the lower Wolf River corridor available to local businesses to assist visitors.

***Recreational Use Objectives for All Properties***

- Provide high-quality hunting, trapping, and fishing opportunities.
- Provide opportunities for high-quality, nature-based, non-hunting-related recreational activities, such as paddling, hiking, cross country skiing, and wildlife viewing, as is compatible with the property's capabilities and the primary objective, above.
- To the degree practicable, accommodate compatible incidental open-space recreational uses; for example, nature study and berry picking (incidental uses are uses that are not specifically managed for on the property).

***Recreation Management Prescriptions for All Properties***

- Bicycle and horse use are prohibited on the properties, except on roadways open to public vehicles and on any state trails developed in the future on former railroad grades that traverse the properties. ATV and off-road vehicle use is prohibited except as authorized for mobility-impaired access.
- Pheasant stocking by private clubs participating in the Day-old Chick program is permitted where appropriate at the discretion of the property manager.
- Snowmobile trails that are part of regional trail networks are permitted on WAs and LWRBNRA HAs at the discretion of the property manager. Snowmobiles are otherwise prohibited on the properties.
- Portions of these properties may be closed by posting to protect spawning walleye from March 15 through the first Saturday in May.
- Increase public awareness of the Wolf River's unique sturgeon resource by working with clubs, communities, and landowners to develop/improve accessibility and viewing opportunities at current and new sturgeon spawning sites, where feasible.

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- Where present, service roads, dike tops, and firebreaks provide foot access throughout the properties.
- Property boundaries are posted with appropriate signs to assist visitors in finding and staying on state lands. Other property regulatory and informational signs are posted at parking lots and access points.

Unique, property-specific management and developments are detailed in the individual property sections of this chapter.

### **State Natural Areas**

The primary purpose of State Natural Areas (SNAs) is to protect outstanding examples of Wisconsin's native natural communities, significant geological formations, and archeological sites.

SNAs are valuable for research and educational use, the preservation of genetic and biological diversity, and for providing benchmarks for determining the impact of use on managed lands. They also provide some of the last refuges for rare plants and animals.

Sections 23.27-23.29 Wis. Statutes provide legislative authority and direction for the acquisition, designation, dedication, and management of SNAs. Section 23.27 (1) defines natural areas as "reserves for native biotic communities...habitat[s] for endangered, threatened, or critical species...or areas with highly significant geological or archaeological features". Section 23.28(1) provides authority to designate natural areas as SNAs, and Section 23.29 provides authority to legally dedicate and protect SNAs in perpetuity.

SNAs may be either stand-alone properties or embedded within another property type, such as a State Wildlife Area. In the latter case, the SNA is an overlay designation where management for the natural area values takes precedence on the designated area.

The existing SNAs located within the LWRBNRA as well as new SNAs are as follows.

#### ***Existing SNAs***

- Wolf River Bottoms
- Hortonville Bog
- Mukwa Bottomland Forest (within Mukwa WA)
- Shaky Lake

#### ***New Designated SNAs***

The LWRBNRA Master Plan creates 6 new designated SNAs on lands owned by the Department. They are:

- Navarino Cedar Swamp (within Navarino WA)
- Navarino Sedge Meadow (within Navarino WA)
- Highway K Woods (within Navarino WA)
- Deer Creek Tamarack Bog (within Deer Creek WA)
- LaSage Bottoms (within Wolf River Bottoms WA—LaSage Unit)
- Winchester Meadows

These are described in detail later in this chapter.

## **General Administration Management Policies and Provisions**

The following section describes general property administration and management policies and provisions that apply to all state managed lands.

### ***Funding Constraints***

Implementation of the master plan is dependent upon staffing and funding allocations that are set by a process outside of the master plan. Operational funding for the Department is established by the state legislature. Development projects also follow an administrative funding and approval process outside of the master plan. Many of the initiatives contained within the plan are dependent upon additional funding and staffing support. Therefore, a number of legislative and administrative processes outside of the master plan will determine the rate this master plan will be implemented.

Properties that have either been purchased or managed using funding from the Federal Aid in Wildlife Restoration Act (also known as the Pittman-Robertson Act) or the Federal Aid in Sport Fish Restoration Act have additional management constraints that must be considered. The statutes and applicable regulations prohibit a state fish and wildlife agency from allowing recreational activities and related facilities that would interfere with the purpose for which the State acquired, developed, or is managing the land.

### ***Facility Management Authority***

Property managers may relocate or temporarily close road and trail segments or other public use facilities as deemed necessary after appropriate authorization by normal Department approval processes. The new road or trail (or other facility) location and design must be consistent with the land classification requirements (NR 44) and the management objectives for the management area in which it is located.

### ***Public Health and Safety***

All facilities will comply with federal, state, and local health and sanitation codes. The property manager has the authority to close trails and other facilities on the property when necessary due to health, safety, or environmental damage concerns. In designated public use areas, such as designated parking lots and designated trails, trees or other natural elements that are deemed public hazards will be removed. Safety inspections are done at least twice per year.

### ***Refuse Management***

Visitors are required to carry out any refuse they bring in because no designated refuse or recycling receptacles are available. Burying of refuse is not allowed anywhere on the properties.

***Road Management Plan and Public Vehicle Access Policy***

The properties have a network of primitive, lightly and moderately developed roads that are used for management purposes and public access. Except for roads that lead to public parking lots or boat access sites, all roads are closed to public vehicle access except for permitted use of power-driven mobility devices by the mobility-impaired. Closed roads are gated or signed.

All Department-maintained service roads that are not open to public vehicles will be maintained as primitive or lightly developed roads (NR 44.07(3), Wis. Admin. Code). On primitive roads, which are seasonal and not regularly maintained, ruts and downed trees may be present. Maintenance is done on primitive roads as needed. Public access roads managed by the Department shall be constructed and maintained as lightly developed or moderately developed roads. The property manager may determine which of these road standards to apply on a case by case basis.

The following management prescriptions apply to Department managed roads:

- Maintain permanent service roads and public access roads in a sustainable condition according to Wisconsin Forestry’s Best Management Practices for Water Quality.
- Maintain parking areas.
- Regularly inspect active roads, especially after heavy storm events. Clear debris as needed from the road surfaces, culverts and ditches to decrease unsafe conditions and prevent damage.
- Maintain stable road surfaces to facilitate proper drainage and reduce degradation from traffic during wet or soft conditions; or close the road when these conditions exist.
- Monitor soil disturbance and take measures to prevent excessive damage.
- Restore roads used in timber harvests to non-erosive conditions, in accordance with Wisconsin Forestry’s Best Management Practices for Water Quality.

***Public Access on Service Roads and Dikes***

The public may use service roads and dikes to gain access on properties for wildlife watching, nature appreciation, etc. These are not designed or maintained as hiking trails, but people are free to walk anywhere on properties unless posted closed to the public. Hiking trails may also be used by hunters, trappers and anyone else wishing to use these trails on properties open to hunting.

***Disabled Accessibility***

The Department is committed to providing exceptional outdoor recreation opportunities for people of all abilities around the state. All new construction and renovation of infrastructure will follow guidelines set forth within the Americans with Disabilities Act and also be done in a manner consistent with NR 44 standards of the land use classification of the site where the development is located.

The property manager has the authority to make reasonable accommodations for people with disabilities, consistent with the requirements of the area's land use classification. Property managers also may allow the use of power-driven mobility devices on trails consistent with a March 15, 2011 U.S. Department of Justice (DOJ) ruling.

***Endangered, Threatened and Species of Special Concern Protection***

Individuals of all endangered, threatened, special concern species and populations of SGCN will be protected. All known critical habitat for these species will be protected or maintained through management which incorporates guidance from staff specialists, research and current literature, and consultation with the Bureau of Endangered Resources. The Natural Heritage Inventory (NHI) will be checked prior to any management activity to ensure that any adverse impacts associated with listed species are avoided or minimized to the greatest extent practical.

***Cultural Resource Protection***

A cultural review of the LWRBNRA indicates hundreds of known prehistoric and early historic archaeological sites, with hundreds more likely to be discovered. These sites include prehistoric and historic Indian campsites and villages, burial areas including conical and "effigy" or animal shaped mounds, and garden beds. Historic sites associated with Euro-American settlement include fur-trade-era sites, remnant farmsteads, a transportation-related site, and historic structures.

All sites occurring on public lands are protected against unauthorized disturbance under provisions of various federal and/or state laws, and burial sites (including cemeteries and mound sites) are protected on private lands as well.

Management policy requires that any activities with potential to disturb archaeological sites will only be undertaken after consultation with the Departmental Archaeologist. Any sites with cultural or historical value identified on the LWRBNRA or acquired with future land purchases will be managed in accordance with Department guidance and statutory requirements (see Wis. Stats. 44.40 and Manual Code 1810.10). Archaeological and other cultural resource investigations may be necessary before a project is approved, and projects should designate funds for required investigations as a component of the project budget.

### ***Water Quality Issues***

Healthy aquatic ecosystems start with good water quality. Water quality on the Wolf and Embarrass Rivers can range from very good to poor depending on several factors, including time of year, precipitation events, and recreational use. The main problems with water quality on these rivers are erosion and turbidity. Erosion adds to sediment transport which can smother fish eggs and mussel beds. It can silt-in bayous, cutting off flows and spring water exchange. Build up of siltation in the river channel can lead to navigation problems for recreational boaters. Turbidity can hamper sight feeding fish and detracts from the aesthetic quality of the river.

Best management practices (BMP's) for agriculture (buffer strips along waterways, leaving crop residue on fields, plowing in spring instead of fall, contour plowing, etc.) greatly reduce sediment transport and turbidity problems. Construction BMP's (seeding and mulching, silt fencing, straw bales, detention ponds, etc.) should be used for the same reasons on any construction project. All forest management activities will comply with the most recent version of Wisconsin Forestry's BMPs for Water Quality. Maintenance of natural shorelines and a minimum of a 30-ft-wide associated buffer should be encouraged on state lands to protect water quality and maintain the aesthetic quality of the river for recreational boaters. Buffer strips on developed lots should be encouraged to intercept the runoff from lawns, which can carry excess nutrients, fertilizers, herbicides and pesticides directly to the water.

Mandatory "Slow No Wake" (SNW) areas have been used on the Wolf River during times of high water to protect property from the damaging effects of boat wakes when the river is out its banks. However, during periods of normal water level boat wakes have a constant negative effect on water quality when the wake impacts a bare, eroded shoreline. With each wave a small amount of silt and clay is carried back to the river. The cumulative effect of the number of waves over a summer can be drastic to both the shoreline and to water quality.

Wherever possible, natural shorelines should be maintained. Vegetated banks are better able to hold the soil from both the erosive forces of linear current flow and the lateral chop of boat wakes. On banks more difficult to vegetate, some other form of protection should be used. Softer bioengineering should be encouraged where erosive forces are less severe and where there is a relatively high chance of it being successful. Hard armoring, such as the use of riprap, may be necessary in more difficult or erosive areas if infrastructure may be lost. In any event, the goal is to reduce sediment transport and turbidity.

### ***Forest Certification***

In 2004, Wisconsin State Forests gained dual Forest Certification from the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI). In 2009, State Forests were re-certified under FSC and SFI and the balance of DNR-owned land was added to the certification. Independent, third-party certification means that management

of Wisconsin's DNR-owned land meets strict standards for ecological, social, and economic sustainability. Forest certification helps Wisconsin remain competitive in global markets that increasingly demand certified raw materials. Management of multi-use lands involves balancing the goals of conserving forestland, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities. Objective review is also instrumental in improving how we care for the land we manage.

### ***Forest Pest Control***

As stated in Wisconsin Statute 26.30, it is the public policy of the state to control forest pests threatening forests of the state. Any significant forest pest event within the LWRBNRA will be evaluated with consideration given to the property management goals and the potential threat of the pest to other landowners. Infestations of the non-native gypsy moth caterpillar will be managed according to the forest's Gypsy Moth Management Plan. Responses to significant infestations from other forest pests, including but not limited to the emerald ash borer, may include timber salvage or pesticide treatments. Any response to a significant pest outbreak or threat of a significant pest outbreak will be evaluated by an interdisciplinary team of scientists and communicated through press releases and notices to interested parties. If necessary, an immediate emergency response to prevent a major outbreak may be authorized by the State Forester.

### ***Control of Invasive Species***

Invasive non-native species have become recognized in recent years as a major threat to the integrity of most of our native plant communities. These species have the ability to invade natural systems and proliferate, often dominating a community to the detriment and sometimes the exclusion of native species. Invasive species can alter natural ecological processes by reducing the interactions of many species to the interaction of only a few species. Best Management Practices (BMPs) for Invasive Species will be incorporated into management practices on the property. If detected, invasive species may be controlled using appropriate and effective methods, including but not limited to the use of bio-control, herbicides, cutting, hand removal or fire. Control methods may be restricted in certain sensitive management areas. Before initiating control measures, the management prescriptions for the area being treated will be referenced.

The rules set forth in Chapter NR 40 of the Wisconsin Administrative Code create a comprehensive, science-based system with criteria to classify invasive species into two categories: "Prohibited" and "Restricted". These rules are aimed at preventing new invasive species from getting to Wisconsin, and enabling quick action to control or eradicate those here but not yet established. The rules also include preventive measures that are not species-specific but instead address common pathways that may allow invasives to spread.

Rules aimed at preventing the introduction and spread of aquatic invasive species are particularly important to the LWRBNRA, where boating and fishing are so popular.

These rules include: cleaning and disinfecting boats and equipment before transport to another waterbody; prohibitions on transporting live fish or spawn away from waters; and rules governing transportation of bait species and surface water between waterbodies. These rules, if followed by all lake and river users, will greatly slow the introduction and spread of undesirable aquatic species.

### ***Chemical Use***

Herbicides and pesticides may be used for various purposes such as the control of invasive plants, controlling plant competition in vegetation regeneration areas, or insect control except as restricted in the management prescriptions in this master plan. All department procedures and herbicide and pesticides label requirements will be followed.

### ***Prescribed Fire***

Prescribed fire may be used as a management tool where feasible and safe except when restricted by management area prescription. It may be used to help regenerate forest cover types such as oak types. It may also be used to create and maintain grassland/prairie/savanna habitat, wildlife habitat, to reduce fuels to lessen fire hazard and to control undesirable vegetation.

### ***Fire Suppression***

As stated in Wisconsin Statutes 26.11, “The Department is vested with power, authority and jurisdiction in all matters relating to the prevention, detection and suppression of forest fires outside the limits of incorporated villages and cities in the state except as provided in sub (2), and to do all things necessary in the exercise of such power, authority and jurisdiction.” Forest fire suppression actions will consider the property management goals and the threats of the fire to life and property. Appropriate techniques will be used in each event to provide effective fire suppression while minimizing resource damage.

### ***Authorized Response to Catastrophic Events***

Wildfires, timber diseases, and insect infestations shall be controlled to the degree appropriate to protect the values of each management area. Necessary emergency actions will be taken to protect public health and safety, or as directed by the State Forester to prevent a catastrophic insect or disease outbreak from spreading to adjacent forest lands.

Appropriate management responses to catastrophic events are determined on a case-by-case basis, and action will be taken as appropriate. At a minimum, salvage of trees damaged by wind, fire, ice, disease, or insects may occur if consistent with the objectives of the management area or as prescribed in the plan for the management area. Salvage may also occur as part of an emergency response plan authorized by the State Forester.

### ***Non-Metallic Mining Policy***

The Department may use gravel, sand, fill dirt or other fill material from Department-owned lands for Department use. Under certain circumstances other government bodies or agencies may also have access to these materials. Section 23.20 of the Wisconsin Statutes states, “the department may permit any town, county, or state agency to obtain gravel, sand, fill dirt or other fill material needed for road purposes from any department-owned gravel pit or similar facility if this material is unavailable from private vendors within a reasonable distance of the worksite. The Department shall charge a fee for this material commensurate with the fee charged by private vendors.”

Nonmetallic mining is regulated under the requirements of NR 135 Nonmetallic Mining Reclamation, Wis. Adm. Code, except for sites that do not exceed one acre in total for the life of the mining operation. Site reclamation under NR 135 is administered by the county. NR 135 requires mining sites to be located appropriately, operated in a sound environmental manner, and that all disturbed areas be reclaimed according to a reclamation plan. Department of Transportation (DOT) projects are exempt because DOT projects have their own reclamation requirements. New sites will not be considered where they would impact geological or ecological features of significance or within any designated State Natural Area.

### ***Real Estate Management***

#### **Acquisition Policies**

It is the policy of the Natural Resources Board and the Department to acquire lands from willing sellers only. As required by state and federal laws, the Department pays just compensation for property, which is the estimated market value based on an appraisal. At times, it is in the interest of the Department and the landowner for the Department to acquire only part of the rights to a property, or an easement. The Department has a number of easement options available to address these situations. Fisheries easements provide access for anglers, protection of riparian habitat, and control of land to conduct habitat development or management projects. This option should be pursued on streams and rivers to protect critical or unique habitat when fee acquisition is not feasible due to costs, local concerns, or an owner’s desire to retain fee title to the land.

Staff may periodically contact landowners within the property boundary to explain the Department’s land acquisition program and to see if they have an interest in selling their property. Acquisition priorities for the properties vary from year to year and are based on a number of factors, such as resource management or recreation needs and available funding, which may be from a variety of sources.

#### **Aids in Lieu of Taxes**

Under current law (Wis. Stats. 70), land acquired by the DNR is not subject to property taxes. Instead, DNR makes annual payments in lieu of taxes (PILT) to municipalities for

the parcels that the DNR owns within those municipalities. For more detailed information on how the Department pays property taxes, visit <http://dnr.wi.gov> and search for “PILT”.

#### Future Boundary Adjustment Process

From time to time adjustments in property boundaries are needed. In some cases parcels of land are removed from the boundary to allow alternative, necessary public uses by local governments. In other cases it may be desirable to add small parcels adjacent to the property so they can be purchased for resource protection or to meet expanding recreational needs. Property boundary changes of 40 acres or more require approval by the Natural Resources Board. Wisconsin Administrative Code Ch. NR 44 provides a plan amendment process that may be used to make adjustments to property boundaries.

#### Easements, Access Permits, and Land Use Agreements

Easements provide access across state property for utilities, town roads, or county highways. Easements are permanent and will continue to be upheld under the master plan. Permits and land use agreements allow temporary uses of Department lands. Many of these permits require payment of a rental fee. Access permits provide access across state property to private ownership within the property boundary. Land use agreements provide for a variety of uses on a Department property, such as snowmobile trails or cutting of marsh hay.

#### ***General Authorized Management Activities or Tools***

All activities listed above in the management prescriptions and those listed below are authorized on the properties as appropriate, unless restricted by a general habitat type prescription or any property-specific management prescription.

- Prescribed fire
- Chemical application
- Mechanical/mowing
- Hand cutting – chainsaw
- Biofuel harvest
- Timber harvest – even aged and uneven-aged silvicultural systems, including clear-cutting
- Placement of nest boxes, platforms, or similar devices to enhance reproduction of desired wildlife species

### **Public Outreach**

The public and other governments are provided opportunities to have ongoing involvement both in the development of this Master Plan and in its implementation after the plan is approved by the Natural Resources Board (NRB). During the development of the Master Plan, stakeholders and the general public are invited to provide input through a public comment period and public meetings at two points in the planning process: after the completion of the draft Regional and Property Analysis and preliminary Vision and Goals, and after the completion of the Draft Master Plan.

Once the Master Plan is approved by the NRB, the Department communicates periodically with the public regarding activities and developing issues on the LWRBNRA, and provides information on how the public will be notified of opportunities for involvement when significant new issues related to management of these properties arise. The three main avenues for this public outreach are the Master Plan Implementation Monitoring Report, the individual property Web pages, and the Master Plan variance or amendment notification.

The Master Plan Implementation Monitoring Report is a document prepared and released annually that summarizes for the past year the primary management and development activities that were completed as well as other significant issues that were addressed.

The Department will also use the individual property Web pages on its Web site to update the public regarding any planned management and development activities and any changing management actions or approaches. The individual property Web pages may also include other information of interest to the public on various topics related to management and use of the properties. Examples of additional types of information that may be included from time to time are: the status of forest insect or disease problems; storm damage; new information on endangered or threatened species; recreational management problems or new opportunities; and recreational use changes or trends.

A plan variance or amendment notification is released only if the Department is considering a change to the Master Plan. A variance is a relatively minor change to the plan, for example a new management activity or change to an activity or public use authorized in the plan that is consistent with the plan's land management classifications and objectives. An amendment is a more significant change to the plan, for example a change in land management classification. In the event the Department considers a variance or amendment to the Master Plan, the public will be informed of the proposal and the review and comment process. As appropriate, news releases will be used to announce Master Plan amendment/variance proposals and review procedures. The Department also will maintain a contact list of persons, groups, and governments who have requested to be notified of potential plan changes.

***WDNR Contact Persons***

The following Department staff may be contacted regarding questions about the LWRBNRA or the master plan. At the time of this publication, the contact information is:

General LWRBNRA or State Wildlife Area Questions:

Ellen Barth, Area Wildlife Supervisor  
Wisconsin Department of Natural Resources  
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Oshkosh, WI 54901  
Phone: 920-424-4003  
Email: [ellen.barth@wisconsin.gov](mailto:ellen.barth@wisconsin.gov)

Navarino, Deer Creek, Maine, Wolf River Bottoms—Herb Behnke Unit, Outagamie, Mack, and Wolf River Bottoms—LaSage Unit WAs; Wolf River Bottoms and Hortonville Bog SNAs; LWRBNRA HAs and other state-owned lands in Shawano and Outagamie counties:

Kay Brockman-Mederas, Wildlife Biologist  
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Mukwa, Wolf River, and Rat River WAs; Mukwa Bottomland Forest and Shaky Lake SNAs; Wolf River FA; LWRBNRA HAs and other state-owned lands in Waupaca and Winnebago counties:

Jake Fries, Wildlife Biologist  
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For Fisheries or aquatic resource questions:

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**CHAPTER 2—Section One:  
Universal Elements for all Properties**

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## SECTION TWO: INDIVIDUAL PROPERTY ELEMENTS

This section provides a description of each property in the LWRBNRA as well as the management and development specific to each property.

### **Lower Wolf River Bottomlands Natural Resources Area (LWRBNRA)**

*Current state ownership (not including existing state properties): 3,428.14 acres*

*Current acquisition authority: 45,000 acres*

*Current project boundary: 214,000 acres*

### **Lower Wolf River Bottomlands Natural Resources Area (LWRBNRA)**

#### ***Property Description***

The LWRBNRA is a landscape-scale project located in Shawano, Outagamie, Waupaca, and Winnebago counties in east-central Wisconsin, along and adjacent to the lower Wolf River and its tributaries (Map A). It was established in 2002 in recognition of the area's significant ecological and recreational resources, and the need to connect and protect large blocks of habitat to maintain and restore functioning natural communities and ecosystems.

The LWRBNRA encompasses a vast mosaic of ecologically significant natural communities, some extensive and of high quality, associated with the floodplain of a large, free-flowing river. It is rich in wildlife, including rare species, SGCN, and many common species. The area also represents a critical regional recreational resource, drawing thousands of visitors each year from the Fox Valley and Green Bay areas, and beyond, who participate in an array of outdoor recreational activities, particularly hunting, fishing, trapping, boating, and wildlife viewing.

The LWRBNRA Feasibility Study (WDNR 2002a) established a 45,000-acre acquisition goal targeting several Focus Areas (Map C). These areas are considered the highest priorities for acquisition by the Department. They were selected to encompass lands offering opportunity to: protect the shoreline of the Wolf River and its tributaries; protect endangered resources and critical habitats, including spawning areas; and create larger blocks of land for both ecological and recreational purposes by connecting existing state-owned properties. To date, 3,428.14 acres out of the 45,000-acre goal have been acquired as Habitat Areas in scattered parcels in each of the 4 counties of the LWRBNRA (Map B).

There are significant management opportunities for a number of natural communities within the LWRBNRA boundary: Floodplain Forest; Southern Hardwood Swamp;

Submergent Marsh; Emergent Marsh; Southern Sedge Meadow; Shrub Carr; Warmwater Rivers; and Warmwater Streams. Many of the largest and highest-quality examples of these communities are found along the Wolf River and its tributaries and fall within the Lower Wolf and Embarrass River Corridors Native Community Management Area (NCMA; see the Resource Management by Land Management Classification section, above). This area was delineated to include large, interconnected stands of bottomland hardwoods (the forestry cover type that corresponds to the Floodplain Forest natural community) that occur, interspersed with other open and forested wetland communities in a natural mosaic, along the corridors of these two rivers through much of the plan area. Any new lands acquired within that delineated area will become part of this NCMA and will be managed according to the description, objectives, and prescriptions detailed for it elsewhere in this chapter.

Any lands acquired that are not along the Wolf or Embarrass River corridors likely would be classified as Habitat Management Area (HMA). These lands will be managed according to the general HMA objectives and prescriptions, Aquatic Habitat Overlays, and Management Prescriptions by Cover Type, as appropriate to the habitats present. A habitat evaluation may indicate that a NCMA classification is warranted due to the presence of, or potential to restore, high-quality examples of the natural communities noted above or others (e.g., Northern Sedge Meadow, Open Bog) that are rare in the plan area and considered regionally significant.

The state properties of the plan area fill an important regional recreation need as the largest providers of public, nature-based recreational activities, especially hunting, fishing, and trapping, which are not widely available on other lands. Any new lands acquired would be open to these outdoor, nature-based pursuits.

The existing LWRBNRA HA parcels are served by 8 parking areas (on the Beilfuss, Niemuth, Institute of Paper Science, Krubsack, Schmude, Sorensen, Wilderness, DOT Mitigation Site, and Sauby Road parcels). There are 4 boat landings throughout the plan area, 2 of which are owned by the Department; of the other 2, 1 is private and the other is county-owned and maintained. These boat landings provide access to the Wolf and Rat Rivers and White Lake (Shawano County). There are some 13 miles of dikes. Regional snowmobile trails cross portions of parcels in Shawano and Outagamie counties. One Outagamie County parcel, known as the DOT Mitigation Site, is a Watchable Wildlife site (referred to as Bishcoff Road in the guide (Judd 1995)) and has an ADA-compliant wildlife viewing platform. An interpretive kiosk located next to the platform was destroyed by vandals in August, 2011 (Map Series E). Hunting, fishing, trapping, bird-watching and other wildlife viewing, hiking, and snowshoeing are the most common recreational uses.

**Table 2.4. Lower Wolf River Bottomlands Natural Resources Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwood	702	21	737	22
Swamp Hardwood	46	1	44	1
White Cedar	31	<1	31	<1
<b>Forested Upland</b>				
Aspen	106	3	98	3
Northern Hardwood	21	<1	21	<1
Oak	95	3	95	3
Scrub Oak	6	<1	6	<1
Red Maple	1	<1	6	<1
Red Pine	29	<1	25	<1
White Pine	20	<1	19	<1
<b>Non-forested Wetland</b>				
Emergent Marsh	609	18	673	20
Lowland Brush-Alder	38	1	38	1
Lowland Brush-Willow/Dogwood	236	7	206	6
Lowland Grass	551	16	463	14
Minor Lake	7	<1	7	<1
Minor Stream	10	<1	10	<1
Sedge Meadow	224	7	224	7
Water	165	5	165	5
<b>Non-forested Upland</b>				
Agriculture	245	7	0	0
Grassland	198	6	472	14
Upland Brush	6	<1	6	<1
<b>Other</b>				
Parking Area	2	<1	2	<1
Right-of-way	1	<1	1	<1
<b>Total</b>	<b>3,349*</b>	<b>100</b>	<b>3,349*</b>	<b>100</b>

\* Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreages represented in property deed legal descriptions.

### ***Land Use Classification***

The lands within these parcels are classified mainly as Habitat Management Area (2,347.40 acres). The Lower Wolf and Embarrass River Corridors Native Community Management Area encompasses 1,974.55 acres of the Beilfuss, Niemuth, Schmude, Price, Wilderness, Lutz, Lemke, and Larson parcels, as well as other scattered parcels. There is one 2.81-acre Special Management Area encompassing some existing buildings on the Wilderness parcel in Outagamie County (Map D and Map Series D1-D-10).

***Resource Management, Development, and Protection***

Native Community Management Area

*Lower Wolf and Embarrass River Corridors Native Community Management Area*

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15.

Habitat Management Area

The following HAs have unique management objectives or prescriptions. Unless specifically addressed below, HAs will be managed in accordance with the general Habitat Management Area objectives and prescriptions, Aquatic Habitat Overlays, and Management Prescriptions by Cover Type provided earlier in this chapter.

*Institute of Paper Science Habitat Management Area* (Shawano County)

This 10-acre parcel was purchased for its genetic stock of larch and aspen (Map D-1). There were 8 crosses of larch (3 acres) which were thinned and now are retained as a seed orchard for the WDNR Division of Forestry. The aspen trial had 2 sets of growth measurements taken before being abandoned and will now be converted to white pine and oak. Only the aspen was harvested out of the stand.

*Management Objectives:*

- Maintain exotic hybrid larch research stand as a seed orchard for future genetic trials and possible climate change research.
- Convert exotic aspen hybrid research stand to a native white pine and oak stand.

*Management Prescriptions:*

- Remove any aspen regeneration in the hybrid aspen stand during future commercial thinnings of existing pine and oak.

*Wilderness Habitat Management Area* (Outagamie County)

This 972-acre property was purchased in 2007 from Wilderness Conservation Holdings, LLP, a private hunting club. The property lies just north of Outagamie WA and just east of Wolf River Bottoms WA-Herb Behnke Unit, and has approximately 1 mile of Wolf River frontage on the east side (Map D-4). There are a series of dikes which hold water in several sloughs and flowages (590 acres), grassland openings (45 acres), and woodlands (337 acres). Forest types present include swamp hardwoods (8 acres), various pine/spruce plantations (21 acres), oak (81 acres), aspen (72 acres) and bottomland hardwoods (155 acres). There is one parking area on this parcel.

*Management Prescriptions:*

- Restore permanent wetland habitat in the existing impoundment by manipulating water levels.
- Develop 3 new flowages to enhance habitat for waterfowl.
- Lower the grade of the road crossing the oxbow in the southern portion of the property and maintain as a spillway to allow water flow for walleye spawning.
- Maintain the electric pumping station in the northern portion of the property used to manipulate water levels, and assess the need to retain the non-electrified pump on the bank of Wolf River in the northeast corner of the property.
- Study potential strategies for managing waterfowl hunting pressure on this and adjacent state properties during traditional peak use times to enhance hunting quality.

*DOT Mitigation Site Habitat Management Area* (Outagamie County)

This 480-acre parcel is directly adjacent to Mack WA, north of Hwy 54 (Map D-5). It was purchased by DOT in 1991 to mitigate wetland losses due to highway construction. Dike construction was completed in 1993, creating 420 acres of wetland habitat. WDNR took over management of this property in 2000 through a memorandum of understanding, and DOT turned ownership over to the Department in 2007. This property has 4 impoundments of differing water levels which make it a very productive and diverse wetland site. There also are a wildlife viewing platform and parking area on this parcel.

*Management Objective:*

- Maintain and enhance wetland habitats for diverse wildlife species, wildlife-related recreation, and floodwater management, in collaboration with the Outagamie Drainage District.

*Management Prescriptions:*

- Implement management to control *Phragmites*, and non-native and hybrid cattails.
- Assess stands of planted bottomland hardwoods subsequently invaded by willow for tree survivorship, and conduct management (brushing) to improve tree viability if enough trees have survived to grow. If tree viability appears poor, allow the site to succeed to willow.
- Continue working with the Outagamie Drainage District to develop a management plan for the 4 cells east and west of Van Patten Road.

*Lutz Habitat Management Area* (Outagamie County)

This 346.5-acre property was purchased in 2006 and is north of the adjacent Wolf River Bottoms WA-LaSage Unit (Map D-6). A 40-acre woodlot is enrolled in the Managed Forest Law program through 2016 and was last harvested in 2005. Another portion (110 acres) was entered into a perpetual easement under the Wetland Reserve Program in 1997. Nine shallow ponds were developed under NRCS guidance along with ditch plugs. Two pumps still remain but there are plans to remove them. Sixty percent of the property is in the 100-year floodplain, including a walleye spawning marsh in the 5 acres next to the Wolf River. The majority of the property is enclosed by a deer-proof fence and is currently being leased to a local farmer.

*Management Prescriptions:*

- Restore agricultural lands to native habitats after the sharecropping agreement is completed. Ditches may be plugged and small berms constructed to create basins. Prairie species may be planted to provide permanent nesting habitat. Bottomland hardwood species such as swamp white oak, silver maple, and hackberry may be planted in fields adjacent to existing stands of bottomland hardwoods.
- Retain the deer-proof fence as needed to protect planted bottomland hardwoods from deer browse. When no longer needed, request bids for its removal by private contractors.
- Work with NRCS to develop and implement a management plan for the existing WRP parcel on this property.

Special Management Area

*Wilderness Special Management Area* (Outagamie County)

DNR maintains several administrative buildings within this 2.81-acre Special Management Area on the Wilderness parcel for managing nearby state lands and other uses (Map D-4). These buildings have been retained with the recent purchase of the property. There is a semi-furnished residence (30 ft. x 33 ft.) that includes a kitchen/dining area, living area, bathroom, two bedrooms on the main floor and attic on the second floor. A basement area includes the garage under the house. This house is being used temporarily as living quarters for staff involved in a local, long-term deer research project. The need to retain the house will be evaluated upon completion of this project. Immediately behind the house is large garage building (28 ft. x 40 ft.) that will be used for cold storage of DNR equipment and materials. Southeast of these buildings is a building (32 ft. x 67 ft.) that can also be used for storage of DNR equipment. A metal lean-to (21 ft. x 24 ft.) is going to be moved. These buildings may also be used to support equipment storage needs of the deer research project. These three buildings are across the road from the Special Management Area of the Herb Behnke Unit and will be managed to complement the use of buildings on that property.

*Management Objectives:*

- Provide areas and facilities to support routine, seasonal, and incidental operations and administration needs.

*Management Prescriptions:*

- Continue to provide cold storage facilities for use by Department staff. Maintain and utilize the two storage buildings to meet Department operations and land management needs and evaluate their potential for replacing comparable storage space across the road in the Herb Behnke Unit Special Management Area, in buildings that are in decline or would present expensive repair or replacement costs.
- Continue to provide a temporary residence for research staff, and maintain the residence to provide housing meeting accepted standards for the duration of the deer research project. Upon project completion, if no other housing need is determined, sell the house for salvage and reclaim the site. Enhance the site's landscaping to improve aesthetics while providing visual security for the remaining storage building.
- Maintain the grounds (turf, trees, etc.) around all buildings as appropriate to enhance building maintenance and protection from wildfires or storm damage, ensure visitor safety, and where appropriate, for improved aesthetics. Maintain the two driveways to the storage buildings and adjacent public lands. A small parking lot utilizing one of these driveways may be developed in the future for additional public access to public land on the east side of the road, as developing recreational use patterns may dictate.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 8 parking areas and 2 boat landings.
- Continue working with partners to maintain the viewing platform on the DOT Mitigation Site in Outagamie County.
- Provide a designated dispersed camping area (to be utilized by permit) on the Krubsack parcel in Shawano County to serve paddlers making multiple-day trips on the Wolf River.
  - Designate a location for landing canoes and kayaks near the camping area that minimizes erosion, and post as such; maintain as necessary.
  - Maintain the service road to the camping area for performing maintenance.

**CHAPTER 2—Section Two:  
Individual Property Elements—LWRBNRA**

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- No facilities will be provided and visitors will be expected to remove their trash upon leaving. User regulations will be provided with camping permits.
- Management of vegetation at the camping area will be minimal, as needed to ensure visitor safety, control invasive exotic plants, and provide open areas for tent placement.
- Develop a 3-vehicle parking area on the Larson parcel in Waupaca County.
- Evaluate recreational opportunities and parking area needs on an ongoing basis as additional parcels become available through acquisition.

**Navarino Wildlife Area**

*Current state ownership: 14,712.64 acres*

*Current acquisition authority: 16,500 acres*

*Current project boundary: 16,500 acres*

**Navarino Wildlife Area**

***Property Description***

Navarino WA is located approximately 7 miles south of Shawano in southern Shawano and northeast Waupaca counties, in the Townships of Navarino, Lessor, Waukechon, Hartland, and Matteson (Map B-2). Currently, 14,712.64 acres are publicly owned, making Navarino by far the largest state property within the LWRBNRA and the third-largest in the state. The property is comprised of sandy uplands and ridges with marshy depressions. Sedge meadows, emergent and submergent marshes, bottomland hardwoods, swamp conifer, lowland shrub, bog, pine plantations, aspen-oak forests, oldfields, and restored prairie make up the habitat types on this property. The West Branch of the Shioc River and Wolf River run through the property.

Navarino began in 1953 with the purchase of 557 acres by the Wisconsin Conservation Commission. Local conservation groups were leaders in urging the state to develop a wildlife area prior to the first acquisition. Navarino was well known for its prairie grouse, deer, squirrel, rabbit, ruffed grouse, pheasant, and duck populations. The area was approved as an upland wildlife management area and in the 1960s it was thought to have potential as a satellite area for the Horicon goose flock. Pheasants were favored and stocked through 1967. The first dike was constructed in 1962. There currently are 6.82 miles of dikes and 19 water control structures, creating 16 flowages. Water can be manipulated on 1,492 acres. Old agricultural fields have been converted to grassland habitat composed of prairie species which are periodically burned. Other fields are sharecropped to provide additional wildlife food and viewing opportunities. In 1986, the Navarino Nature Center was formed and began leasing 20 acres on Navarino Wildlife Area. The leased area has since expanded to 41.5 acres.

Navarino currently is managed for forest, grassland, and wetland wildlife. Forest management utilizing timber sales provides important wildlife habitat, especially for young forest species. Water control structures are used to manipulate water levels. Prescribed burns reduce the amount of woody vegetation within grassland habitats.

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The leased acreage of the Navarino Nature Center provides a variety of recreational opportunities. This area is equipped with an education center, picnic area, picnic shelter, amphitheater, rustic restrooms, pump well, parking lot, and cabin to accommodate program participants. Self-guided nature trails also have been developed for visitors. Cross-country skiing, snowshoeing, hiking, berry-picking, and hunting are popular activities. There is a 1,000-acre seasonal closed area at Pikes Peak Flowage which is closed to hunting and trapping except for gun deer hunting during the waterfowl season. The site is also a Watchable Wildlife site, featuring a viewing platform with a pair of mounted binoculars. Another wildlife viewing site is a small mound on Lindsten Road, which overlooks cropped fields where geese and cranes congregate during migratory periods. A snowmobile trail, which links to a larger county trail network, runs through the northern part of the wildlife area; it is groomed and maintained by local, private snowmobile clubs. There is a 40-acre Class 2 dog training area on Oak Road. The dike-tops as well as many miles of rough service roads or logging roads are used informally by visitors for foot access through the property. There are 57 parking areas located throughout the property, and 3 boat landings provide access to the Wolf River (Map E-2).

**Table 2.5. Navarino Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	1,321	9	1,321	9
Swamp Hardwoods	912	6	899	6
Tamarack	21	<1	21	<1
White Cedar	122	<1	122	<1
<b>Forested Upland</b>				
Aspen	3,109	21	3,109	21
Hemlock	30	<1	30	<1
Northern Hardwoods	94	<1	79	<1
Oak	683	5	675	5
Scrub Oak	227	1.5	219	1.5
Red Maple	190	1	176	1
White Birch	151	1	151	1
Fir-Spruce	34	<1	34	<1
Jack Pine	21	<1	21	<1
Red Pine	85	<1	30	<1
White Pine	139	1	239	2
<b>Non-forested Wetland</b>				
Emergent Marsh	1,757	12	1,847	13
Lowland Brush-Alder	2,444	17	2,401	16
Lowland Brush-Willow/Dogwood	1,252	9	1,218	8
Lowland Grass	332	2	332	2
Minor Lake	74	<1	74	<1
Water	445	3	445	3
<b>Non-forested Upland</b>				
Agriculture	165	1	165	1
Grassland	886	6	822	6
Upland Brush	42	<1	42	<1

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Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Other</b>				
Right-of-way	77	<1	77	<1
<b>Total</b>	<b>14,613*</b>	<b>100</b>	<b>14,613*</b>	<b>100</b>

\* Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and many vary from the acreage represented in the property deed legal description.

***Land Use Classification***

The majority of Navarino is classified as Habitat Management Area. There are 3 Native Community Management Areas: a 449-acre Northern Wet-mesic Forest site; a 345-acre Northern Sedge Meadow site; and a 33-acre Northern Dry-mesic Forest site. The Wolf and Embarrass River Corridors NCMA encompasses 1,572 acres of Navarino. There is also a 27-acre Special Management Area that includes a WDNR administrative area and facilities associated with the Navarino Nature Center (Map D-2).

***Resource Management, Development, and Protection***

Habitat Management Area

Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives and the Aquatic Habitat Overlay Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions, Aquatic Habitat Overlay Prescriptions, and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Maintain the open, treeless sandblows within the grasslands east of CTH K for tiger beetles.
- Develop 4 new flowages to enhance habitat for waterfowl.
- Where stands of white pine 95 years old or older occur on appropriate sites, manage them to biological maturity.

Native Community Management Area

Lower Wolf and Embarrass River Corridors

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15.

*Navarino Cedar Swamp (new State Natural Area)*

This is a 449-acre site featuring Northern Wet-mesic Forest, a regionally rare community that extends north from this area into the Northern Lake Michigan Coastal EL. The site consists of large-diameter white cedar as well as black ash, Eastern hemlock, yellow birch, and 80 other plant species. The site has intact hydrology and meets the criteria for a High Conservation Value forest and ecological reference site.

*Management Objective:*

- Protect a functioning white cedar swamp with little disturbance and nearly free of invasive exotic species.

*Management Prescriptions:*

- Allow development of old-growth characteristics predominantly through passive techniques.
- Limit active management to:
  - Control of invasive exotic species.
  - Development of a strategy to manage black ash if emerald ash borer threatens the site, which may include release of biological control agents.

*Navarino Sedge Meadow (new State Natural Area)*

This is a 345-acre site featuring a Northern Sedge Meadow community of some 90 plant species, with no apparent invasive species and intact hydrology. It meets criteria for a High Conservation Value site and has the potential to serve as an ecological reference area for maintenance of native community function in the face of climate change.

*Management Objective:*

- Protect a functioning Northern Sedge Meadow.

*Management Prescriptions:*

- Allow the site to function naturally predominantly through passive techniques.
- Limit active management to:
  - Control of invasive exotic species.
  - Winter removal of shrubs along the edges to constrain woody encroachment on the open sedge meadow.

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Individual Property Elements—Navarino Wildlife Area**

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- A prescribed burn conducted occasionally (approximately every 25 years) to rejuvenate the sedge meadow nutrient cycling system.

*Highway K Woods (new State Natural Area)*

The Highway K Woods is 33 acres in size, consisting of three separate ridges and knolls forested with mature, second-growth Northern Dry-mesic Forest. Large-diameter white pines are mixed with oaks, red maple, red pine, and paper birch. Ground-layer diversity is high, with over 100 species recorded including Indian cucumber-root and 2 other state Special Concern species. The site meets the criteria for a High Conservation Value forest and has the potential to be an excellent ecological reference site.

*Management Objective:*

- Protect a functioning Northern Dry-mesic Forest with little disturbance and nearly free of invasive exotic species.

*Management Prescriptions:*

- Allow old-growth characteristics to develop predominantly through passive techniques.
- Limit active management to:
  - Control of invasive exotic species.
  - In the event of a blowdown toppling more than 1/3<sup>rd</sup> of the canopy trees, a salvage operation may be considered to enhance the potential for oak regeneration.

Special Management Area

This 27-acre Special Management Area includes the Navarino Nature Center (NNC) and an administrative area encompassing the Navarino WA field office and several storage buildings.

The NNC is an environmental education facility administered as a 501(c)3 nonprofit organization relying on membership fees, a fund-raising banquet, grant writing, donations, and event fees to sustain its programming. It was started in 1986 by local citizens in cooperation with DNR to provide educational programs relative to Navarino WA. NNC is a Friends Group of the DNR and leases 41.5 acres of the Navarino WA for its facilities and use of trails and grounds.

NNC has a paid staff to provide educational and interpretive programming and organization support as well as a group of member-volunteers who provide educational and naturalist programming, office support, and facilities maintenance. Facilities include

parking for approximately 90 vehicles, a special activity cabin, outdoor amphitheater (seating 60), restrooms, a picnic shelter (30 ft. x 40 ft.), and an 11,000-square-foot building containing classrooms, a conference room, an office, a kitchen and restrooms that was initially built in 2000 and expanded in 2009 incorporating green energy technologies.

The mission of NNC is to educate people of all ages on the importance of developing, promoting and conserving natural resources and wildlife habitat. This is accomplished by events and programs for school groups and the general public. Yearly, over 4,000 students and adults participate in NNC programming and estimated yearly visitor use is around 12,000 people. Programs occur in the classroom facility, the immediate grounds and trails, and on the Navarino WA and nearby Wolf River. NNC maintains approximately 15 miles of multi-use trail (hiking, skiing, snowshoeing) including 2 board-walk crossings (200 ft. and 400 ft.). NNC also provides a mapped 47-mile interpretive auto-trail route. The classroom facility is also used by DNR staff for meetings and training events.

Future plans call for construction of a cold storage building (approx. 30 ft. x 70 ft.) for NNC equipment, increasing naturalist staff members to help meet the increasing demand for programs and customer/visitor services at NNC, and accommodating increased ski and trail use.

The Department maintains several administrative buildings within this Special Management Area for managing the Navarino WA and other state lands in Shawano and western Outagamie counties. There is an office facility including a small conference and break room, a restroom, and a large, heated vehicle storage and work area. This building is 50 ft. x 40 ft. and serves as the work station for one permanent Wildlife Technician, temporary staff, and summer interns. There are also three, cold storage buildings for DNR equipment consisting of a barn (50 ft. x 40 ft.), a large pole building for vehicles and implements (51 ft. x 102 ft.), and a smaller storage building (60 ft. x 32 ft.).

*Management Objectives:*

- Provide areas and facilities to support operations and administration needs and provide facilities to help deliver public services and educational programming.
- Provide educational programs that develop outdoor skills emphasizing appreciative as well as consumptive uses of wildlife resources and other manners of enjoying natural resources and the outdoors.
- Provide interpretive and educational services that create an appreciation for wildlife and natural resources conservation and management.
- Provide educational programs and demonstration of technology being used at Navarino Nature Center to foster appreciation and interest in renewable energy.

*Management Prescriptions:*

- Continue to provide an office/heated work area and storage areas for use by Department staff. Existing buildings will be maintained, replaced, or enhanced and expanded as necessary to meet Department public land management needs or to carry out its mission.
- Continue to lease 41.5 acres to NNC, Inc. for their operation and maintenance of the NNC facilities including trails, boardwalks, picnic shelter, parking areas, cabin, amphitheater, classroom facility and immediate grounds. Details are found in the lease agreement between the Department and NNC (see Appendix E for lease and trails agreements).
- Working with the Department, NNC will site and construct a cold storage building (approx. 30 ft. x 70 ft.) for its use within the Special Management Area.
- Maintain the grounds (turf, trees, etc.) around all buildings as appropriate to enhance building maintenance and protection from wild fire or storm damage and to ensure visitor safety. As appropriate for improved aesthetics and visitor education through interpretation, utilize native landscape plantings in strategic locations. Away from buildings, manage the landscape to sustain existing native habitats and provide for visitor education through interpretation.
- Provide on-site programs to visiting school groups utilizing the grounds, trails, and classrooms (see Appendix F for lists of programs and skill sets for academic standards).
- Provide on-site/on-property training and events geared toward development of outdoor skills and outdoor enjoyment for various age groups including adults. Expand skills programs as volunteers and mentors are available to organize and lead training events.
- Provide on-site/on-property programs and events that increase environmental awareness and that interpret ecological processes, wildlife and natural resources conservation practices and management, and nature as may be found at Navarino Wildlife Area.
- Provide interpretation and demonstration of green building and renewable energy technology using the NNC classroom facility as an example for such items as geothermal heating and cooling, solar electric power, recycling, sun-tunnel lights and more. Utilize available energy education programs for school groups and the general public.
- Promote healthy lifestyles and physical fitness through a wide range of outdoor and nature-based activities and events, and accommodate disabled access needs to allow participation in activities and programs.
- Meet Wisconsin Dept. of Public Instruction standards for skill sets in the areas of Environmental Education, Science, English, Social Studies, Mathematics, and Physical Education as appropriate for programs offered to school groups at NNC.

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- Provide wildlife education programming compatible with the WDNR Bureau of Wildlife Management’s Wildlife Education Strategic Plan.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 57 parking areas and 3 boat landings on the property.
- Maintain the 40-acre Class 2 dog training area on Oak Road in cooperation with volunteers.
- Maintain wildlife viewing area on Lindsten Road.
- Maintain a 1,000-acre closed area at Pikes Peak Flowage as a waterfowl refuge (NR 11.04(4)(a), Wis. Admin. Code).
- Continue working with NNC to maintain the observation platform on Pikes Peak Flowage.
- Provide additional accessible wildlife viewing opportunities on Pikes Peak Flowage.
- Improve the path to an accessible duck-hunting blind on McDonald Flowage.

**Wolf River Bottoms State Natural Area**

*Current state ownership: 56 acres*

*Current acquisition authority: 56 acres*

*Current project boundary: 56 acres*

**Wolf River Bottoms State Natural Area**

***Property Description***

This SNA is located on the Wolf River, in the Leeman Bottoms area south of Navarino WA in Shawano County (Map B-3). The site contains significant stands of mature Floodplain Forest that exhibits old-growth characteristics in some places. Large (15-50 inches in diameter) silver maple, swamp white oak, and green ash dominate the canopy. A rich understory includes sensitive fern, jumpseed, cardinal flower, wood nettle, and a high diversity of grasses and sedges. Many rare aquatic species have been found at the site, including fish, mussels, and invertebrates, and 2 state-threatened terrestrial species, Blanding’s turtle and red-shouldered hawk, have been recorded on the site or in adjacent parcels.

The site has been passively managed as an old-growth Floodplain Forest, aquatic, and wetland preserve and ecological reference area. The only access to the site is by water. The Wolf River Bottoms SNA was formerly owned by the Bureau of Commissioners of Public Lands. It is SNA Number 536 and was designated in 2007.

**Table 2.6. Wolf River Bottoms State Natural Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	51	91	51	91
<b>Non-forested Wetland</b>				
Lowland Brush-Alder	5	9	5	9
<b>Total</b>	<b>56</b>	<b>100</b>	<b>56</b>	<b>100</b>

***Land Use Classification***

This entire property is classified as Native Community Management Area (Map D-3).

*Resource Management, Development, and Protection*

Management Objectives:

- Maintain the site as an old-growth Floodplain Forest preserve, aquatic preserve, wetland protection site, and as an ecological reference area.
- Natural processes will largely determine the structure of the forest.

Management Prescriptions:

- Allow the forest to age naturally predominantly through passive techniques.
- Limit active management to control of invasive exotic species.
- Do not salvage trees after a major wind event, as this is not compatible with the management objectives for this area.

*Public Use Management and Development*

There are no facilities to maintain on this property. The only access to the site is by water.

**Deer Creek Wildlife Area**

*Current state ownership: 1,490.46 acres*

*Current acquisition authority: 1,490.46 acres*

*Current project boundary: 1,490.46 acres*

**Deer Creek Wildlife Area**

***Property Description***

Deer Creek Wildlife Area is located in northeast Waupaca and northwest Outagamie counties in the Townships of Deer Creek and Matteson, approximately 5 miles west of Leeman and 10 miles east of Clintonville (Map B-3). Currently, 1,490.46 acres are state-owned. The wildlife area is comprised of rolling uplands of fine sand which surround a central peat bog. The ridges are ancient dune complexes from the fringes of Glacial Lake Oshkosh. Habitats include aspen-oak forests, swamp conifer, lowland shrub, sedge meadow, bog, pine plantations, and restored grasslands. The property drains to the Embarrass River, which is 2 miles to the west. The Wolf River lies 3 miles to the east.

Deer Creek Wildlife Area began with the purchase of 440 acres from Outagamie County in 1942. Additional land was acquired by the Wisconsin Conservation Commission from 1957-65. During the 1950s and early 1960s, other lands were leased for public hunting within and around the property. These lands were stocked with pheasants for public hunting at that time. As late as 1957, small numbers of greater prairie-chickens and sharp-tailed grouse were present on the area. Six miles of ditches are remnants of the Deer Creek Drainage District, active from 1913-23.

Since state ownership, vegetative succession has resulted in management aimed at more forest-dependent species. White-tailed deer, ruffed grouse, cottontail rabbit, and snowshoe hare take advantage of the aspen-dominated habitats present. The main ditch draining the area was fitted with a water control structure in 1971, which flooded approximately 120 acres of land for waterfowl habitat. Some prairie species have been planted in the open areas. A 5-mile cross-country ski trail was constructed in 1974 but has not been maintained due to lack of funds. A snowmobile trail passes across the north portion of the property. Two osprey platforms were placed in the flowage in 1992. The property is served by 4 parking areas. A parking area on the adjacent LWRBNRA Sorensen parcel provides additional parking and access to Deer Creek (Map E-3).

Current management on the property emphasizes habitat for forest and wetland wildlife. Aspen is managed through clear-cutting with retention of oaks and den trees to benefit

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wildlife. Grassland habitat can be maintained through mowing rather than prescribed burning as the poor, sandy soils support only sparse growth.

**Table 2.7. Deer Creek Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Swamp Hardwoods	44	3	44	3
Tamarack	220	15	220	15
<b>Forested Upland</b>				
Aspen	476	32	476	32
Central Hardwoods	5	<1	5	<1
Northern Hardwoods	29	2	29	2
Oak	8	<1	8	<1
Red Maple	229	15	229	15
Jack Pine	5	<1	5	<1
Red Pine	20	1	20	1
White Pine	107	7	107	7
White Spruce	8	<1	8	<1
Miscellaneous Coniferous	4	<1	4	<1
<b>Non-forested Wetland</b>				
Emergent Marsh	34	2	34	2
Lowland Brush-Alder	11	<1	11	<1
Lowland Brush-Willow/Dogwood	143	10	143	10
Lowland Grass	71	5	71	5
Minor Lake	17	1	17	1
<b>Non-forested Upland</b>				
Grassland	55	4	55	4
Low-growing Shrubs	3	<1	3	<1
<b>Other</b>				
Developed	1	<1	1	<1
<b>Total</b>	<b>1,490*</b>	<b>100</b>	<b>1,490*</b>	<b>100</b>

\* Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and many vary from the acreage represented in the property deed legal description.

***Land Use Classification***

The majority of this property is classified as Habitat Management Area. There is a 293-acre Native Community Management Area featuring a remnant tamarack bog (Map D-3).

***Resource Management, Development, and Protection***

Habitat Management Area

*Management Objective:*

- Management will be in accordance with the general Habitat Management Area Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Remove the water control structure at the outlet of the main ditch and replace with a rock spillway to help maintain the hydrology of the tamarack bog.
- Maintain sand prairie openings as potential turtle nesting areas through mowing.

Deer Creek Tamarack Bog Native Community Management Area (new State Natural Area)

This 293-acre site features a remnant Tamarack (poor) Swamp/Open Bog community that has remained intact despite its hydrology being altered by numerous ditches years ago. It consists of black spruce-tamarack forest and open bog with numerous bog plants present among a ground layer of over 70 species. Invasive species currently are limited to the edges of the site. The site meets the criteria for a High Conservation Value forest and has the potential to be an excellent ecological reference site.

Management Objective:

- Protect an existing black spruce-tamarack forest and open bog.

Management Prescriptions:

- Allow development of old-growth characteristics primarily through passive techniques.
- Limit active management to:
  - Control of invasive exotic species.
  - Explore opportunities to restore site hydrology and implement in a careful manner that will not affect the dominant trees.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 4 parking areas on the property.

**Maine Wildlife Area**

*Current state ownership: 720 acres*

*Current acquisition authority: 760 acres*

*Current project boundary: 760 acres*

**Maine Wildlife Area**

***Property Description***

Maine Wildlife Area is located in north-central Outagamie County in the Township of Maine, approximately 7 miles north of Shiocton (Map B-3). The state currently owns 720 acres. The wildlife area is comprised of extensive wetlands on nearly level terrain, with scattered low upland ridges on fine sand—dune complexes from the margins of extinct glacial lakes. The wetlands consist of sedge meadow, shrub swamp, and tamarack bog. The low ridges are forested with aspen, oaks, red maple, paper birch, basswood, green ash, and sugar maple. The Wolf River flows 1 mile to the east. Private lands surrounding the property are largely agricultural.

Acquisition at Maine began in 1942 with the purchase of some tax-delinquent land by the Wisconsin Conservation Commission. The only major development project was the creation of a level ditch, which connects several dug ponds. The property currently is managed for forest and wetland wildlife. There is 1 parking area in the southern portion of the property. A short section of snowmobile trail passes across the property (Map E-3). Access to the north half of the property requires a long trek through the central wetlands and is easier in winter when they are frozen. Hunting and trapping are the main uses of the property.

**Table 2.8. Maine Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Swamp Hardwoods	21	3	21	3
Tamarack	73	11	73	11
<b>Forested Upland</b>				
Aspen	115	17	115	17
Northern Hardwoods	14	2	14	2
Oak	16	2	16	2
<b>Non-forested Wetland</b>				
Lowland Brush	383	57	383	57

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Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
Sedge Meadow	44	7	44	7
Water	3	<1	3	<1
<b>Total</b>	<b>669*</b>	<b>100</b>	<b>669*</b>	<b>100</b>

\* Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and many vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Habitat Management Area (Map D-3).

***Resource Management, Development, and Protection***

Follow the general Habitat Management Area Objections and Prescriptions and Management Prescriptions by Cover Type provided in Section One of this chapter.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 1 parking area on the property.

**Wolf River Bottoms Wildlife Area—Herb Behnke Unit**

*Current state ownership: 2554.68 acres*

*Current acquisition authority: 2,642.78 acres*

*Current project boundary: 2,642.78 acres*

**Wolf River Bottoms Wildlife Area—Herb Behnke Unit**

***Property Description***

The Herb Behnke Unit of the Wolf River Bottoms Wildlife Area is located in northwest Outagamie County in the Townships of Deer Creek and Maine, approximately 4 miles north of Shiocton (Map B-4). Current state ownership is 2554.68 acres. Topography is low and nearly level, with scattered low, sandy ridges. Much of the property is in the Wolf River floodplain and habitats are predominantly wet. In addition, significant acreage (~1,800 acres) has been impounded for waterfowl habitat. Wetlands consist of emergent marsh, shrub swamp, reed canary grass meadow, and hardwood swamp. Young aspen thickets predominate in the uplands along with some oak, scattered stands of mesic sugar maple-basswood-oak-paper birch forest, and spruce plantation. There also are some small areas of planted prairie. Some residential development exists along CTH M which runs along the eastern border of the property.

The Herb Behnke Unit was purchased in 1991. It was originally known as the “K&S Unit” after its former owners, Killoren and Spaulding. The Natural Resources Board later dedicated the property to Herb Behnke, a long-time Board member, and it was renamed on May 11, 2006. Formerly, it was an active game farm called Maine Creek Farm, established in 1954 (a portion of the original property was excluded from purchase and presently remains as Maine Creek Farm). The entire property was surrounded by a fence, of which much has since been removed. The previous owners emphasized trophy deer and waterfowl in their management of the property. Peat harvesting, Christmas tree production, and aquaculture were other uses that were explored and abandoned.

After the Department purchased the property, management focused on recovery of the vegetation from deer overpopulation. Current forest management emphasizes early-successional aspen-oak and alder management to favor game species such as deer, turkey, and woodcock. The main emphasis of the property, however, is wetland management. Flowages provide an interspersion of open water and wetland vegetation. There are 22 water control structures that manipulate water levels on 14 flowages, which create 2,070 acres of wetland habitat with 11.05 miles of dikes. Lowland shrub habitat is maintained through mowing and prescribed fire in areas that do not have potential for sedge meadow management. The northeast flowages have two high-capacity wells that were upgraded

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in hopes of raising warmwater fish species for stocking Wisconsin waters in the future; Fisheries Management now plans to abandon these wells. Four osprey platforms have been erected on the property.

The property has 5 buildings used for equipment and vehicle storage and 1 residence used seasonally by Department staff and volunteers. There are 3 parking areas for public access to the property (Map E-4). The dike tops are used by visitors for informal foot access. Major uses of this property are deer and waterfowl hunting, trapping, and bird-watching.

**Table 2.9. Wolf River Bottoms Wildlife Area—Herb Behnke Unit: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	26	1	26	1
Swamp Hardwoods	42	2	40	2
<b>Forested Upland</b>				
Aspen	248	10	245	9
Balsam Fir	9	<1	0	0
Northern Hardwoods	111	4	120	4
Oak	111	4	111	4
White Birch	41	2	33	1
White Pine	8	<1	8	<1
White Spruce	7	<1	7	<1
<b>Non-forested Wetland</b>				
Emergent Marsh	891	34	921	36
Lowland Brush-Willow/Dogwood	550	21	537	21
Water	354	14	354	14
<b>Non-forested Upland</b>				
Grassland	197	8	193	7
<b>Total</b>	<b>2,595*</b>	<b>100</b>	<b>2,595*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

The majority of this property is classified as Habitat Management Area. There is a 3-acre Special Management Area containing buildings used by the Department for equipment storage and field housing (Map D-4).

*Resource Management, Development, and Protection*

Habitat Management Area

Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Develop 2 new flowages to enhance habitat for waterfowl.
- Reserve from management the 14-acre stand of 180-year-old oak.

Special Management Area

The Department maintains several administrative buildings within this 3-acre Special Management Area for managing nearby state lands and for other uses. These buildings were retained with the original purchase of the property and maintained and modified to meet Department needs. There is a semi-furnished residence (62 ft. x 25 ft.) that includes an office, kitchen, dining/living area, accessible bathroom, and sleeping quarters upstairs and downstairs. This building is used to support the annual spring sturgeon spawning protection program, serving as headquarters for law enforcement activities and staging this program's volunteer work force. It is used by student interns working for WDNR as a temporary residence. It also provides a command center for WDNR staff to use for incidents on the nearby state properties. It provides a headquarters and temporary residence for staff, students, and volunteers involved in local research projects and is also used by WDNR staff for small meetings relating to nearby state properties.

Other buildings being used at this site include: a barn (152 ft. x 52 ft.) used for equipment storage by WDNR law enforcement; a storage/workshop building (30 ft. x 16 ft.) attached to the barn that can be heated; an additional storage building/garage (82 ft. x 25 ft.) attached to a smaller garage (36 ft. x 28 ft.); and open bay storage (83 ft. x 28 ft.) for equipment and materials. The grounds near the buildings are used to store gravel, water control structure parts, culverts, and other materials used to maintain facilities on nearby properties. There is room for parking approximately 6 vehicles near the residence.

Management Objective:

- Provide areas and facilities to support routine, seasonal, and incidental operations and administration needs.

Management Prescriptions:

- Continue to provide cold storage facilities for use by Department staff. Existing buildings will be maintained, replaced, enhanced, or eliminated as necessary to meet Department operations and land management needs or carry out its mission.
- Continue to provide an office/residence for periodic seasonal uses in support of law enforcement activities, research projects, internship programs, Department meetings, and management of incidents on state lands. Maintain, enhance or expand the existing office/residence to meet standards for accessible use and for temporary housing and to accommodate volunteer participation in work activities. Maintenance and modifications should incorporate improved energy efficiency where applicable.
- Maintain the grounds (turf, trees, etc.) around all buildings as appropriate to enhance building maintenance and protection from wild fire or storm damage, ensure visitor safety, and where appropriate, for improved aesthetics. Native landscape plantings may be used to enhance the site.
- Maintain an area for parking vehicles associated with use of the residence.
- Maintain a Department access road serving these buildings and adjacent public lands.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 3 parking areas on the property.
- Develop a Class 2 dog training area in the northeast corner of the property, including a 10-car parking area.
- Designate Osprey Flowage in the northwest corner of the property (~740 acres) as a waterfowl closed area with no entry during the open migratory bird seasons except for the regular deer gun and muzzleloader seasons. Legally taken migratory birds may be retrieved by hand or dog while not possessing a firearm in posted waterfowl retrieval zones.
- Study potential strategies for managing waterfowl hunting pressure on this and adjacent state properties during traditional peak use times to enhance hunting quality.

**Outagamie Wildlife Area**

*Current state ownership: 997.37 acres*

*Current acquisition authority: 690.43 acres*

*Current project boundary: 690.43 acres*

**Outagamie Wildlife Area**

***Property Description***

Outagamie Wildlife Area is located in northwest Outagamie County in the Townships of Maine and Bovina, approximately 4 miles north of Shiocton. The LWRBNRA Habitat Area Wilderness parcel is directly adjacent to the north and the Herb Behnke Unit of the Wolf River Bottoms WA to the west and north (Map B-4). The state currently owns 997.37 acres. All of Outagamie WA is located in the Wolf River floodplain. Shrub swamp and bottomland forests of silver maple, swamp white oak, and green ash are the dominant vegetation types. There also are some stands of emergent marsh, sedge meadow, and aspen thickets. The Wolf River bisects the property, allowing excellent access by boat.

Outagamie WA started in 1940 as a 412-acre parcel leased from Outagamie County by the Wisconsin Conservation Commission for a 20-year period for use as public hunting grounds. The lease did not permit any management of the land and, with strong local support from sportsmen's clubs, the property was purchased in 1958. Additional acreage was acquired later from adjacent landowners. In 1960 a dike was constructed to create a 264-acre flowage. Other short dikes and plugs on old oxbows created another 16 acres of flowage area. Five water control structures and water transfer ditches connect the various flowages. In the early 1960s, a diesel pump was installed on the Wolf River to permit flooding of the flowages during dry periods. It was replaced in 1969 by an electric lift pump which was in service until 1989. A new pumping station has since replaced this old structure.

Current management focuses on maintaining the bottomland hardwoods and aspen stands, and maintaining and restoring the marshes and sedge meadows. There is a 50-acre waterfowl refuge in the main flowage, and walleye spawning areas are closed to fishing in the spring. There are 3 osprey nesting platforms. The property features 4 parking areas, 1 boat landing (county-owned), and some 2.5 miles of dikes (Map E-4). Duck hunting and bird-watching are the most popular uses of the property.

**Table 2.10. Outagamie Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	293	31	293	31
Swamp Hardwoods	30	3	30	3
<b>Forested Upland</b>				
Aspen	57	6	57	6
Oak	62	7	62	7
<b>Non-forested Wetland</b>				
Emergent Marsh	44	5	53	6
Lowland Brush-Alder	5	<1	5	<1
Lowland Brush-Willow/Dogwood	207	22	203	22
Lowland Grass	160	17	155	17
Minor Lake	14	1.5	14	1.5
<b>Non-forested Upland</b>				
Agriculture	48	5	48	5
Upland Brush	12	1	12	1
<b>Total</b>	<b>932*</b>	<b>100</b>	<b>932*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

### *Land Use Classification*

Most of this property is classified as Habitat Management Area. The Lower Wolf and Embarrass River Corridors Native Community Management Area encompasses 344 acres of the property (Map D-4).

### *Resource Management, Development, and Protection*

#### Lower Wolf and Embarrass River Corridors Native Community Management Area

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15.

#### Habitat Management Area

#### Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives and Aquatic Habitat Overlay Objectives provided in Section One of this chapter.

*Management Prescriptions:*

- Follow the applicable Habitat Management Area Prescriptions, Aquatic Habitat Overlay Prescriptions, and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Maintain some shrub cover in the southern grassland unit on the east side of the Wolf River for woodcock habitat.
- Maintain the pumping station for flowage management.

*Public Use Management and Development*

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 4 parking areas on the property.
- Open the existing 50-acre closed area to waterfowl hunting in favor of creating a larger closed area as a waterfowl refuge on an adjacent property.
- Study potential strategies for managing waterfowl hunting pressure on this and adjacent state properties during traditional peak use times to enhance hunting quality.

**Mack Wildlife Area**

*Current state ownership: 1,357.9 acres*

*Current acquisition authority: 1,358 acres*

*Current project boundary: 1,358 acres*

**Mack Wildlife Area**

***Property Description***

Mack Wildlife Area is located approximately 2 miles northeast of Shiocton in the Township of Bovina in north-central Outagamie County (Map B-5). The state currently owns 1,357.9 acres. The area, once a glacial lakebed, features nearly level topography. Soils are muck and a high water table limits the vegetation types present. The dominant community is a low, dense, young aspen stand. Also present are bottomland hardwoods of red maple, ash, and elm, shrub swamp, fallow fields, and some sedge meadow. State Hwy 54 forms most of the property’s northern border, and a now-inactive railroad corridor that will form part of the Newton-Blackmour State Trail (currently under construction) traverses the southern part of the property. North of Hwy 54, directly adjacent to Mack, is a 480-acre property formerly owned by DOT. It is now owned by the Department as LWRBNRA HA, and is known as the DOT Mitigation Site.

The Wisconsin Conservation Commission purchased all of Mack as a single unit in 1943. In the 1950s, share-cropping was conducted on a portion of the property for pheasants. Approximately 3 miles of trail were constructed through the forested portion. At various times, short level ditches or potholes were created primarily for wildlife watering holes. Forest succession has since focused management away from pheasants towards other species.

Mack is managed to maintain bottomland hardwoods, aspen, shrub swamp, and grassland areas for wildlife. There are 2 parking areas on the property (Map E-5). Recreational uses here include hunting, trapping, hiking, bird-watching and other wildlife viewing, and snowshoeing.

**Table 2.11. Mack Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
Forested Wetland				
Bottomland Hardwood	402	30	402	30

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Individual Property Elements—Mack Wildlife Area**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
Swamp Hardwood	43	3	43	3
White Cedar	1	<1	1	<1
<b>Forested Upland</b>				
Aspen	534	39	534	39
<b>Non-forested Wetland</b>				
Lowland Brush-Alder	9	<1	9	<1
Lowland Brush-Willow/Dogwood	135	10	135	10
Minor Lake	1	<1	1	<1
<b>Non-forested Upland</b>				
Grassland	175	13	175	13
Lowland Grass	38	3	38	3
Upland Brush	2	<1	2	<1
<b>Other</b>				
Parking Area	1	<1	1	<1
Right-of-way	16	1	16	1
<b>Total</b>	<b>1,357*</b>	<b>100</b>	<b>1,357*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Habitat Management Area (Map D-5).

***Resource Management, Development, and Protection***

Habitat Management Area

Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Consider a coppice cutting or biomass harvest to control the infestation of buckthorn on this property and to reduce competition with aspen.
- Manage existing grassland areas as openings within a mosaic of trees and shrubs for woodcock singing and roosting areas.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 2 parking areas on the property.

**Wolf River Bottoms Wildlife Area—LaSage Unit**

*Current state ownership: 486.05 acres*

*Current acquisition authority: 486.05 acres*

*Current project boundary: 486.05 acres*

**Wolf River Bottoms Wildlife Area—LaSage Unit**

***Property Description***

The Wolf River Bottoms Wildlife Area—LaSage Unit is located in west-central Outagamie County in the Township of Ellington, approximately 1 mile northwest of Stephenville and 4 miles southwest of Shiocton (Map B-6). Current state ownership stands at 486.05 acres. The property is entirely situated in the Wolf River floodplain, and the primary natural community here is a mature floodplain forest of silver maple, swamp white oak, and green ash where sensitive forest-interior birds (red-shouldered hawk and cerulean warbler) have been documented in the past. There also are impounded marshes, shrub swamp, aspen stands, and a prairie restoration. The Wolf River runs along the entire eastern boundary of the property, allowing excellent access by boat. An historic “Indian crossing” of the Wolf River is located on the northern portion of the property. There is 1 major sturgeon spawning area on the river here, and there was a history of walleye spawning prior to flowage construction.

This property was previously owned by a private individual and was used as a hunting/fishing and vacation retreat. The Department purchased the property in 1998. Nearly 3 miles of dikes enclose 300 acres on 3 flowages with 7 water control structures and artesian wells. A ditch was also dug to allow water flow from nearby Hortonville Bog SNA. A residence on the property, known as the LaSage Lodge, along with 2 outbuildings and some 20 acres of land, was formerly leased to the Fox Valley chapter of Whitetails Unlimited for outdoor skills and educational purposes. However, this chapter is no longer leasing the property and upkeep and utility costs for the lodge have reverted back to the Department.

The LaSage Unit is managed for woodland and wetland wildlife and to maintain a hydrologic connection between the river and off-channel aquatic habitats. There is 1 parking area on the property (Map E-6). The service road to the buildings is gated and locked. There is a county-owned boat landing on the east side of the river and a county shoreline fishing area south of CTH S. Recreational activities on this property include shore fishing, bird-watching, hunting, trapping, canoeing/kayaking and boating on the Wolf River, sturgeon watching, hiking, and snowshoeing.

**Table 2.12. Wolf River Bottoms Wildlife Area—LaSage Unit: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	284	58	284	58
<b>Forested Upland</b>				
Aspen	12	2	12	2
<b>Non-forested Wetland</b>				
Emergent Marsh	36	7	36	7
Lowland Brush-Willow/Dogwood	59	12	59	12
Minor Lake	42	9	42	9
<b>Non-forested Upland</b>				
Grassland	52	11	53	11
Upland Brush	1	<1	1	<1
<b>Other</b>				
Developed	1	<1	0	0
<b>Total</b>	<b>487*</b>	<b>100</b>	<b>487*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

### ***Land Use Classification***

The majority of this property is classified as Native Community Management Area. The Lower Wolf and Embarrass River Corridors Native Community Management Area encompasses 184 acres. There is a 94-acre Native Community Management Area consisting of Floodplain Forest and Southern Mesic Forest. A Habitat Management Area encompasses 176 acres, and a 1-acre Special Management Area contains various Department-owned buildings (Map D-6).

### ***Resource Management, Development, and Protection***

#### Lower Wolf and Embarrass River Corridors Native Community Management Area

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15.

#### Habitat Management Area

#### Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives and Aquatic Habitat Overlay Objectives provided in Section One of this chapter.

*Management Prescriptions:*

- Follow the applicable Habitat Management Area Prescriptions, Aquatic Habitat Overlay Prescriptions, and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Pursue necessary reconstruction and repair of dikes, water control structures, and culverts in order to continue managing water levels in the impoundment.

LaSage Bottoms Native Community Management Area (new State Natural Area)

This 94-acre site consists of second-growth Floodplain Forest with the added feature of slightly higher terraces containing many Southern Mesic Forest species. The site's natural communities are mostly recovered from past disturbances and provide habitat for many species requiring conservation. The site also has excellent potential to serve as an ecological reference area for adaptive management of floodplain forests.

*Management Objectives:*

- Maintain a functioning Floodplain Forest ecosystem that contains many older trees and large-diameter trees, snags, coarse woody debris, smaller patches of younger regenerating forest, habitat for the fullest range of Floodplain Forest species as possible, and minimal populations of invasive exotic species.
- Utilize natural processes and active management that mimic natural disturbance.

*Management Prescriptions:*

- Allow development of old-growth characteristics in stands 2, 6, and 15 predominantly through passive techniques.
- In stands 13 and 14, utilize adaptive management techniques that address the compositional and structural features outlined in the first objective, above. Where appropriate and feasible in these stands, use forestry practices to hasten the development of old-growth characteristics and compositional diversity.
- Monitor and control invasive exotic species.
- Avoid the introduction and/or spread of invasive species, particularly reed canary grass, in the understory of this community when conducting silvicultural or other management activities.
- Do not salvage trees after a major wind event, as this is not compatible with the management objectives for this area.

### Special Management Area

This 1-acre Special Management Area contains various administrative buildings originally used for mentored and physically-challenged hunting programs provided by a conservation organization through leasing of the site from the Department. The organization no longer leases the site, and the former hunting lodge/residence is now used only occasionally in support of Law Enforcement activities or an occasional WDNR meeting regarding management of nearby public lands. The buildings are those present at the time WDNR purchased the property. The buildings are near the shoreline of the Wolf River and consist of a two-story, semi-furnished residence which was the former hunting lodge (40 ft. x 33 ft.), a two-story garage (32 ft. x 18 ft.), and a shed/kennel (32 ft. x 14 ft.). The building site is very isolated and it is difficult to monitor or to deter vandalism here.

With the current lack of use and the availability of WDNR-owned residential-type facilities in better condition and on more secure sites north of this location, the buildings here are slated for removal. The building site will be reclaimed to provide designated dispersed camping accessible only from the Wolf River. The users targeted for such camping (by permit) are persons canoeing or kayaking the Wolf River for multiple-day paddling trips. The site has vehicle access for camping area maintenance.

#### Management Objective:

- Reclaim the site and provide a camping area for paddlers making multiple-day float trips on the Wolf River.

#### Management Prescriptions:

- Sell the buildings for salvage, remove the remains, perform environmental restoration as needed, and reclaim the site.
- Following site reclamation, designate a small (~1 acre), dispersed camping area on the former building site grounds. Utilize minimal and modest posting to designate the site for such camping by permit as well as delineate the boundary of the camping area to protect the nearby LaSage Bottoms Native Community Management Area.
- Designate a location for landing canoes and kayaks near the camping area that minimizes erosion, and post as such; maintain as necessary.
- Remove the metal structure at the pond's outlet to the Wolf River to improve access to the camping area by water.
- Maintain the service road (gated) to the camping area for performing maintenance.
- No facilities will be provided and visitors will be expected to remove their trash upon leaving. User regulations will be provided with camping permits.

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Individual Property Elements—Wolf River Bottoms Wildlife Area, LaSage Unit**

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- Management of vegetation at the camping area will be minimal, as needed to ensure visitor safety, control invasive exotic plants, and provide open areas for tent placement.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 1 parking area on the property.

See the Special Management Area section, above, for management prescriptions related to designated dispersed camping.

**Hortonville Bog State Natural Area**

*Current state ownership: 762 acres*

*Current acquisition authority: 1,300 acres*

*Current project boundary: 1,300 acres*

**Hortonville Bog State Natural Area**

***Property Description***

Hortonville Bog is a large insular peatland located in west-central Outagamie County in the Township of Liberty, approximately 4.5 miles north of Hortonville (Map B-6). State ownership currently totals 762 acres. The site features one of the best bogs in southern Wisconsin. The bog is open, ericaceous, with a deep sphagnum layer. Leatherleaf and Labrador-tea are the dominant shrubs and poison sumac also is common. The bog is very spongy but there is no open water. An advancing ring of tamarack and black spruce of all age classes surrounds the bog, and a wet-mesic forest of tamarack and white cedar is found to the south. Several bird species indicative of northern bog communities have been found here, including Canada warbler, Nashville warbler, white-throated sparrow, and Lincoln's sparrow.

A recent acquisition in the southwest corner of the property provides public access. The Department also holds access and water management easements on some 480 acres of private land directly east of Hortonville Bog. These easements provide Department personnel access to the SNA for management, and prevent further filling, draining, or burning of wetlands on the eased acres, thus reducing impacts to the SNA. The easements do not provide public access.

Hortonville Bog is managed as a reserve for Northern Wet Forest and Black Spruce Swamp communities, as a wetland protection site, and as an ecological reference area. Management is passive, allowing natural processes to determine the structure of the forests. The recent acquisition in the southwest corner will allow improvements to the existing parking area, and an adjacent 11-acre oldfield (currently being sharecropped) will be planted to mesic tree species (Map E-6). Hunting, trapping, hiking, snowshoeing/skiing, and wildlife viewing are all permitted on the property. Hortonville Bog is SNA Number 214 and was designated in 1987.

**Table 2.13. Hortonville Bog State Natural Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Black Spruce	262	33	262	33
Muskeg Bog	350	44	350	44
Swamp Hardwoods	55	7	55	7
Tamarack	79	10	79	10
White Cedar	25	3	25	3
<b>Non-forested Wetland</b>				
Lowland Grass	12	2	12	2
<b>Non-forested Upland</b>				
Upland Grass	11	1	11	1
<b>Total</b>	<b>794*</b>	<b>100</b>	<b>794*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

### ***Land Use Classification***

This entire property is classified as Native Community Management Area (Map D-6).

### ***Resource Management, Development, and Protection***

#### Management Objective:

- Maintain the site as a reserve for Northern Wet Forest and Black Spruce Swamp communities, as a wetland protection site, and as an ecological reference area.

#### Management Prescriptions:

- Allow natural processes to determine the structure of the forest.
- Control of invasive exotic species may occur.
- Do not salvage trees, as this is not considered compatible with the management objective for this area.

### ***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

#### Management Prescriptions:

- Improve the existing parking area in the southwest corner of the property.

**CHAPTER 2—Section Two:  
Individual Property Elements—Hortonville Bog State Natural Area**

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- Maintain the existing row of trees running in a line east of the parking area to delineate adjacent private land.

**Wolf River Fishery Area**

*Current state ownership: 193.21 acres*

*Current acquisition authority: 206.88 acres*

*Current project boundary: 206.88 acres*

**Wolf River Fishery Area**

***Property Description***

The Wolf River Fishery Area is located in Mukwa Township in eastern Waupaca County, just west of New London and east of Northport (Map B-7). Current state ownership is 193.21 acres. The property consists of 3 small parcels on the north side of the Wolf River. State Hwy 54 and a railroad corridor traverse the site. Most of the property consists of floodplain forest of silver maple, green ash, and swamp white oak, with a terrace forest supporting some more mesic species such as basswood and red oak. This terrace forest has many understory plants not present in the wetter, silver maple-dominated stands. Other habitats found here include shrub swamp of willows and buttonbush and marsh and sedge meadows consisting of cattail, sedges, and reed canary grass. The FA provides spawning habitat for Northern pike, panfish, and suckers, as well as walleye, especially in high-water years.

The New London bypass ditch runs through the property. Also known as the Rasmussen Canal, this ditch was dug in the 1940's-50's to relieve flooding in downtown New London by allowing water on the Embarrass River to bypass the city and enter the Wolf River downstream of the town. The canal's success at relieving flooding for the city was marginal, but it did create a backwater area on the property which offers some wetland wildlife habitat. There also are several small dug potholes or impoundments on the property.

Currently no developed recreational facilities exist on the property and access is limited (Map E-7). State Hwy 54, which forms the northern border of the property, is closed to parking, making access very difficult. In addition, a railroad corridor that traverses the site essentially divides the property in two from an access perspective, as public trespass is prohibited on the grade. The principal access to the property is from the Wolf River. Main recreational uses on this property are hunting, trapping, fishing, canoeing, and wildlife viewing.

**Table 2.14. Wolf River Fishery Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	87	48	87	48
<b>Non-forested Wetland</b>				
Lowland Brush-Willow/Dogwood	84	46	84	46
Minor Lake	10	6	10	6
<b>Total</b>	<b>181*</b>	<b>100</b>	<b>181*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

### ***Land Use Classification***

This entire property is encompassed by the Lower Wolf and Embarrass River Corridors Native Community Management Area (Map D-7).

### ***Resource Management, Development, and Protection***

#### Lower Wolf and Embarrass River Corridors Native Community Management Area

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15. Below are unique prescriptions for habitats not covered by management of the NCMA.

#### Management Prescriptions:

- Maintain or enhance the connection of the canal to the Embarrass River to provide at a minimum a seasonal spring influx of fresh water to avoid stagnation of the canal.
- Keep the canal relatively clear of downed trees that would block or significantly reduce the flow of water.

### ***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

#### Management Prescriptions:

- Continue to pursue opportunities to improve access and parking.

**Mukwa Wildlife Area**

*Current state ownership: 1,290.60 acres*

*Current acquisition authority: 1,320 acres*

*Current project boundary: 1,320 acres*

**Mukwa Wildlife Area**

***Property Description***

Mukwa Wildlife Area is located in Mukwa Township in southeast Waupaca County, 1 mile west of New London (Map B-7). Currently, 1,290.60 acres are state-owned. The property is bisected by the Wolf River, and the Little Wolf flows in to join the Wolf from the west. One SNA, Mukwa Bottomland Forest, is located within the property. The most extensive plant community here is silver maple-dominated bottomland hardwood forest, varying in condition from highly disturbed to excellent. There are many old oxbows, some of which host high-quality emergent marsh and sedge meadow communities, including beds of wild rice. More open wetlands of bulrushes, spikerushes, burreeds and sedges are found east of the Wolf, some disturbed by ditches and reed canary grass. There also are patches of shrub swamp. The floodplain forest and emergent marsh communities here support rare plants and animals and are considered significant here due to their extent, condition, and connection to the vast bottomlands forests downstream, south of Shaw's Landing. The corridor of the Little Wolf is considered highly significant for aquatic species.

Mukwa WA was a leased public hunting ground from 1948 to 1964. As a result of local interest, it was approved for acquisition by the Wisconsin Conservation Commission in 1964. The intent was to develop a waterfowl area by using an extensive impoundment system, but this development option was abandoned due to various social and economic factors. Since coming into state ownership, hay-cutting permits have been used as a management tool to prevent the encroachment of woody vegetation in open wetlands and to improve walleye spawning marshes, and dugout ponds for waterfowl habitat improvement have been constructed. Department staff stocked the property with state-reared pheasants until 1977, but this was discontinued due to a lack of suitable habitat and trespass issues with adjacent landowners. In recent years, the New London Fish and Game Club has annually released a small number of pheasants on the property through their participation in the State Game Farm's Day-old Chick Program.

The Wolf River Sturgeon Trail is located immediately next to the Wolf River just beyond Mukwa's northern boundary, on CTH X between Mukwa and the Wolf River FA, just west of New London. The Department maintains an easement agreement with Waupaca

**CHAPTER 2—Section Two:  
Individual Property Elements—Mukwa Wildlife Area**

County for maintenance of this trail. The trail is a half-mile fully developed paved trail for viewing the annual sturgeon migration. There are accessible fishing platforms, picnic tables, and a few benches at the trail. A boardwalk with an observation platform extends into a marsh for nature or wildlife viewing.

Mukwa is managed to maintain the bottomland hardwood community by favoring silver maple and swamp white oak and maintaining or restoring sedge meadows where feasible. The property is served by 2 parking areas and there are 3 boat access sites—2 (canoe carry-in sites only) that are located on Mukwa and are maintained by the county as part of the Sturgeon Trail, and 1 maintained by Waupaca County near the southern end of the property at Shaw’s Landing. Approximately 1.3 miles of snowmobile trail, part of a regional network, crosses a portion of the property (Map E-7). One osprey platform has been constructed and is maintained on the southern end of the property.

**Table 2.15. Mukwa Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	665	51	651	50
Swamp Hardwoods	9	<1	9	<1
<b>Forested Upland</b>				
Central Hardwoods	0	0	14	1
<b>Non-forested Wetland</b>				
Emergent Marsh	284	22	284	22
Lowland Brush-Willow/Dogwood	296	23	296	23
Lowland Grass	17	1	17	1
Minor Lake	11	<1	11	<1
Minor Stream	18	1	18	1
<b>Other</b>				
Developed	9	<1	9	<1
<b>Total</b>	<b>1,309*</b>	<b>100</b>	<b>1,309*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property falls within the Lower Wolf and Embarrass River Corridors Native Community Management Area. The 160-acre Mukwa Bottomland Forest SNA forms a separate Native Community Management Area (Map D-7).

*Resource Management, Development, and Protection*

Native Community Management Area

Lower Wolf and Embarrass River Corridors

Follow the description, objectives, and prescriptions for this NCMA on pages 12-15.

Mukwa Bottomland Forest State Natural Area

The 160-acre Mukwa Bottomland Forest SNA is located along the Wolf River at Shirttail Bend. This SNA features a diverse Floodplain Forest dominated by silver maple and swamp white oak on uneven topography dissected by many old channels. Other tree species include red elm, black ash, green ash, bur oak, hackberry, cottonwood, willows, and red maple; a few American elm persist. All age classes are present, from saplings to mature trees, including several measuring over 30 inches in diameter, with the areas of smaller trees appearing natural and without evidence of past disturbance. Buttonbush, prickly ash, wood nettle, Canadian honewort, moneywort, northern bugleweed, tall coneflower, woodland phlox, carrion flower, and bristly greenbriar are found in the understory. Mukwa Bottomland Forest is SNA Number 159 and was designated in 1980.

*Management Objective:*

- Maintain the site as an old-growth Floodplain Forest preserve, aquatic preserve, wetland protection site, and as an ecological reference area, primarily through natural processes.

*Management Prescriptions:*

- Allow development of old-growth characteristics predominantly through passive techniques.
- Sedge meadow management may occur where this community type is present.
- Limit other active management to:
  - Control of invasive exotic species.
  - Development of a strategy to manage black ash if emerald ash borer threatens the swamp hardwoods, which may include release of biological control agents.
- Do not salvage trees after a major wind event, as this is not considered compatible with the management objective for the area.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 2 parking areas on the property.
- Maintain easement agreement with Waupaca County for management and maintenance of the Sturgeon Trail.

**Shaky Lake State Natural Area**

*Current state ownership: 220.3 acres*

*Current acquisition authority: 290.3 acres*

*Current project boundary: 290.3 acres*

**Shaky Lake State Natural Area**

***Property Description***

Shaky Lake is located in southwest Outagamie County in the township of Hortonia, just south of Hortonville (Map B-8). State ownership currently totals 220.3 acres. The site consists of a marl-bottomed bog lake surrounded by wire-leaved sedge meadow, tamarack swamp, and lacustrine forest. Both submergent and emergent plants occur here, including grass-leaved pondweed, chara, yellow pond-lily, hard and soft-stem bulrushes, arrowhead, and cattail. A quaking sedge mat of wire-leaved sedges and many characteristic bog and fen species dominates the lake basin. A narrow band zone of alders and willows create a transition between the sedge mat and the surrounding tamarack and black ash forest.

Shaky Lake has been managed as a reserve for Northern Wet Forest and Northern Sedge Meadow communities, an aquatic reserve, a wetland protection site, and as an ecological reference area. Management has been passive, allowing natural processes to determine the structure of the forests and wetlands. However, more active management of ash may be required in the future should emerald ash borer invade the property. Hunting, trapping, fishing, hiking, snowshoeing/skiing, and wildlife viewing are all permitted on the property. Access is limited but is available at the northeast corner of the property, from Ledge Hill Road. Shaky Lake is SNA Number 180 and was designated in 1983.

**Table 2.16. Shaky Lake State Natural Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Muskeg Bog	72	32	72	32
Swamp Hardwoods	37	16.5	37	16.5
<b>Forested Upland</b>				
Oak	25	11	25	11
<b>Non-forested Wetland</b>				
Emergent Marsh	62	28	62	28
Minor Lake	28	12.5	28	12.5

**CHAPTER 2—Section Two:  
Individual Property Elements—Shaky Lake State Natural Area**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Total</b>	<b>224*</b>	<b>100</b>	<b>224*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Native Community Management Area (Map D-8).

***Resource Management, Development, and Protection***

Management Objective:

- Maintain this marl-bottomed bog lake and associated Northern Wet Forest and Northern Sedge Meadow communities.

Management Prescriptions:

- Protect site hydrology and water quality.
- Allow the sedge meadow to function predominantly through passive techniques.
- Limit active management to:
  - Control of invasive exotic species, especially purple loosestrife and narrow-leaved cattail
  - Winter removal of shrubs along the edges to constrain woody encroachment on the open sedge meadow.
  - Development of a strategy to manage black ash if emerald ash borer threatens the swamp hardwoods, which may include release of biological control agents.
  - Evaluate the oak stand for opportunities to manage for old-growth characteristics, and implement if feasible.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Continue to pursue opportunities to improve access.

**Wolf River Wildlife Area**

*Current state ownership: 1,812.08 acres*

*Current acquisition authority: 2,209.18 acres*

*Current project boundary: 2,209.18 acres*

**Wolf River Wildlife Area**

***Property Description***

Wolf River Wildlife Area is located in northwest Winnebago County in the Town of Wolf River, about 1 mile west of Zittau (Map B-9). Currently, 1,812.08 acres are publicly owned. The site consists of 2 slightly disjunct units dominated by wetlands.

The northern segment, known as Deltox Marsh, was once a wiregrass sedge meadow important to the local rug industry. In the late 19th and early 20th century, the Deltox Rug Company, based in Oshkosh, harvested the sedge meadows of this property and used them to make woven “wiregrass” rugs and packing materials. Beginning in 1947 the Wisconsin Conservation Department leased the property as public hunting grounds, an arrangement which lasted until 1968 at which time the Department purchased the land. A series of ditches bordering and traversing the property were dug prior to Department ownership, and these likely contributed to hydrologic changes to the sedge meadow.

Reed canary grass either was introduced to or invaded the site, and currently Deltox Marsh is dominated by reed canary grass with scattered stands of willow. A portion of the degraded sedge meadow was improved in the early 1990’s when the Department, in partnership with Ducks Unlimited, designed a project to raise the level of a roadbed, reinforce a ditch bank, and install a water control structure. Completed in 1996, this project created 100 acres of emergent marsh that provides habitat for waterfowl and many other wetland wildlife species.

The southern segment, Metzsig Marsh, is located at the confluence of the Wolf and Rat Rivers. It consists of a large sedge meadow-shrub carr marsh complex, with cattails in the wetter areas. Stands of silver maple and brush occupy the narrow ridges of alluvial deposits along the Wolf River channel and oxbows and on some of the spoilbanks bordering old ditches. Nearly 3.5 miles of level ditches and several dug potholes were constructed on the property prior to WDNR acquisition, which began in 1978.

Current management on both segments focuses on maintaining and restoring the extensive sedge meadow habitat. There is a 180-acre waterfowl refuge on the Metzsig

**CHAPTER 2—Section Two:  
Individual Property Elements—Wolf River Wildlife Area**

Marsh segment. Two parking areas serve the property (Map E-9). The main recreational uses are hunting, fishing, trapping, canoeing, and wildlife observation.

**Table 2.17. Wolf River Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	29	2	29	2
<b>Non-forested Wetland</b>				
Emergent Marsh	95	5	95	5
Lowland Grass	402	22	0	0
Sedge Meadow	1,207	66	1,625	88
Water	89	5	89	5
<b>Non-forested Upland</b>				
Agriculture	16	<1	0	0
<b>Other</b>				
Right of Way	1	<1	1	<1
<b>Total</b>	<b>1,839*</b>	<b>100</b>	<b>1,839*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Habitat Management Area (Map D-9).

***Resource Management, Development, and Protection***

Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives and Aquatic Habitat Overlay Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions, Aquatic Habitat Overlay Prescriptions, and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Marsh hay cutting may be used as a management tool in some areas.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 2 parking areas on the property, and develop an additional 4-car parking area.
- Maintain 180-acre closed area on the Metzsig Marsh segment as a waterfowl refuge (NR 11.03(11)(a), Wis. Admin. Code).
- Evaluate the effectiveness of the closed area in retaining waterfowl use on this property for the benefit of waterfowl hunting in the general area. Propose changes to or elimination of the closed area based on this evaluation.

**Rat River Wildlife Area**

*Current state ownership: 4,554.27 acres*

*Current acquisition authority: 5,136.70 acres*

*Current project boundary: 5,136.70 acres*

**Rat River Wildlife Area**

***Property Description***

Rat River Wildlife Area is located in Clayton, Winchester, and Wolf River Townships in north-central Winnebago County, 2 miles north of Winchester (Maps B-9 and B-10). It is the second-largest state property in the LWRBNRA, with 4,554.27 acres in public ownership. It is a long, narrow property made up two large segments and several smaller ones scattered along the Rat River, which runs east to west through the disjunct segments. Open wetlands are the major habitat feature. Much of the property has been aggressively invaded by reed canary grass, with dense stands of cattail predominating in wetter sites, but there are areas containing other sedge meadow and emergent marsh species such as tussock sedges, lake sedges, bulrushes, arrowheads, and wetland forbs such as swamp milkweed and joe-pye-weed. Shrub swamps of alder, willow, dogwood and sedges are present, as well as stands of hardwood swamp consisting of black and green ash, silver maple, swamp white oak, bur oak, basswood, and white cedar. There also are a few upland fields and small remnant patches of upland mesic forest.

Historically, this area was important to local businesses, which used sedges cut annually from the vast sedge meadows and marshes that existed here to make “wiregrass” rugs, packing material, and livestock bedding. However, much of the habitat was invaded by reed canary grass over time due to disturbances such as ditching, grazing, and logging. The Rat River WA was originally established as a Fisheries Management property in 1963, and became a Wildlife property in 1978. Past management focused on waterfowl habitat—creating potholes, managing cattails to increase diversity, planting nesting cover in upland fields, and cutting marsh hay to control woody encroachment. Although there may still be some potential for this type of management, it is likely limited due to the low, nearly-level topography and probable effects on surrounding privately-owned lands.

Current management emphasizes maintaining swamp hardwoods and maintaining or restoring sedge meadows, marshes, and shrub swamp. Although marsh hay is no longer cut on a large scale, some hay cutting still occurs by permit and is used as a management tool for brush control and to provide migratory stopover habitat for waterfowl and shorebirds. The property is served by 7 parking areas. Approximately 1.3 miles of snowmobile trail traverse a portion of the property (Maps E-9 and E-10). This trail is

part of a larger regional network and is maintained by a local snowmobile club. Hunting, trapping, canoeing, and bird-watching are the main recreational uses.

**Table 2.18. Rat River Wildlife Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Bottomland Hardwoods	171	4	171	4
Swamp Hardwoods	495	11	495	11
White Cedar	80	2	80	2
<b>Forested Upland</b>				
Aspen	4	<1	4	<1
Northern Hardwoods	18	<1	18	<1
<b>Non-forested Wetland</b>				
Emergent Marsh	1,412	31	1,412	31
Lowland Brush-Alder	315	7	315	7
Lowland Brush-Willow/Dogwood	327	7	327	7
Lowland Grass	588	13	0	0
Sedge Meadow	863	19	1,451	32
Water	35	<1	35	<1
<b>Non-forested Upland</b>				
Agriculture	2	<1	2	<1
Grassland	264	6	264	6
<b>Total</b>	<b>4,574*</b>	<b>100</b>	<b>4,574*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Habitat Management Area (Maps D-9 and D-10).

***Resource Management, Development, and Protection***

Management Objective:

- Management will be in accordance with the general Habitat Management Area Objectives and Aquatic Habitat Overlay Objectives provided in Section One of this chapter.

Management Prescriptions:

- Follow the applicable Habitat Management Area Prescriptions, Aquatic Habitat Overlay Prescriptions, and Management Prescriptions by Cover Type in Section One of this chapter, unless prescribed otherwise in the site-specific prescriptions below.
- Marsh hay cutting may be used as a management tool in some areas.

**CHAPTER 2—Section Two:  
Individual Property Elements—Rat River Wildlife Area**

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- This property has limited potential to expand aspen. Maintain existing small stands of aspen and scattered small clones to convert to other types.
- Evaluate the potential for filling or reshaping ditches to restore hydrology in the wetlands along Shady Lane.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Maintain 7 parking areas on the property.

**Winchester Meadow New State Natural Area**

*Current state ownership: 441.92 acres*

*Current acquisition authority: Not applicable—gift property*

*Current project boundary: Not applicable—gift property*

**Winchester Meadow New State Natural Area**

***Property Description***

This parcel is located in the Town of Winchester in Winnebago County, about 15 miles northwest of Oshkosh (Map B-9). It was donated to the Department in 2008 by Northeast Wisconsin Land Trust. The site contains very high quality Northern Sedge Meadow and Emergent Marsh communities dominated by blue-joint grass and tussock sedge in some areas and cattail-bulrush in others, and is remarkably devoid of significant invasion by exotic species such as reed canary grass and purple loosestrife. These communities provide habitat for many wetland birds, mammals, amphibians, and reptiles, including beaver, muskrat, otter, Northern harrier, sandhill crane, American bittern, Virginia rail, yellow rail, Blanding’s turtle, and wood turtle.

This site is formally designated as a State Natural Area to protect the functioning high-quality wetland communities present.

**Table 2.19. Winchester Meadow New State Natural Area: Current and Desired Future Cover Types for Existing State Property.**

Cover Type	Current		Predicted 50 year	
	Acres	% cover	Acreage Objective	Future % cover
<b>Forested Wetland</b>				
Swamp Hardwoods	6	1	6	1
<b>Non-forested Wetland</b>				
Emergent Marsh/Sedge Meadow	440	99	440	99
<b>Total</b>	<b>446*</b>	<b>100</b>	<b>446*</b>	<b>100</b>

\*Cover type acreages are extracted from the Wisconsin Forest Inventory and Reporting System (WisFIRS) GIS spatial database and may vary from the acreage represented in the property deed legal description.

***Land Use Classification***

This entire property is classified as Native Community Management Area (Map D-9).

***Resource Management, Development, and Protection***

Management Objective:

- Protect the functioning Northern Sedge Meadow and Emergent Marsh communities present.

Management Prescriptions:

- Allow the site to function predominantly through passive techniques.
- Limit other active management to:
  - Control of invasive exotic species.
  - Winter removal of shrubs along the edges to constrain woody encroachment on the open sedge meadow.
  - A prescribed burn conducted occasionally (approximately every 25 years) to rejuvenate the sedge meadow nutrient cycling system.
  - Pursue opportunities to restore hydrology where feasible.

***Public Use Management and Development***

The following prescriptions support the general public use objectives presented in the Universal Plan Section at the beginning of this chapter.

Management Prescriptions:

- Continue to pursue opportunities to improve access.

**Other Department-owned Lands**

The LWRBNRA boundary contains a number of parcels scattered throughout the plan area acquired through various statewide programs that permit purchase of small-acreage sites outside of existing property project boundaries (e.g., Remnant Fish Habitat; Statewide Public Access; Extensive Wildlife Habitat Protection) (Map B). These parcels are acquired to protect important fish and wildlife habitat and/or to provide public access for recreation. The current acreage of these parcels in the plan area is 1,817 acres.

499 acres of these parcels are classified as Habitat Management Area. These acres will be managed in accordance with the general Habitat Management Area objectives and prescriptions, Aquatic Habitat Overlays, and Management Prescriptions by Cover Type provided earlier in this chapter (see pages 15-36). 1,318 acres of the parcels are encompassed by the Lower Wolf and Embarrass River Corridors Native Community Management Area and will be managed according to the description, objectives, and prescriptions for this NCMA detailed earlier in this chapter (see pages 12-15).

**White Lake Waterfowl Closed Area**

The Department does not manage any public lands on or near White Lake (Waupaca County), but does maintain a small open-water closed area (NR 11.06) in which no person may hunt or disturb waterfowl during waterfowl hunting season. This closed area is maintained with cooperation of several lake residents, but the effectiveness of the area to hold waterfowl is limited at times due to boating and fishing traffic and the relatively small size of the refuge. The Department should evaluate the effectiveness of the closed area in retaining waterfowl for the benefit of waterfowl hunting in the general area. Any changes should be implemented by working with lake residents, hunters, and adjacent landowners. The Department will initiate a discussion with White Lake stakeholders in this regard.

## **CHAPTER THREE: BACKGROUND AND SUPPORTING INFORMATION**

Material for this chapter is taken from the LWRBNRA Feasibility Study (WDNR 2002a) and Regional-Property Analysis (WDNR 2007). Additional details on the ecological and socio-economic context of the LWRBNRA and its state properties can be found in these documents as well as in the Wolf River Basin Biotic Inventory (WDNR 2002b).

### **INTRODUCTION**

This Master Plan covers the Lower Wolf River Bottomlands Natural Resources Area (hereafter referred to as “the LWRBNRA” or “the plan area”), a landscape-scale project approved in 2002, encompassing 214,000 acres along and adjacent to the lower Wolf River and its tributaries in a 4-county area of east-central Wisconsin (Map A).

The LWRBNRA was established in recognition of this area’s significant ecological and recreational resources, and the need to connect and protect larger blocks of habitat to maintain or restore functioning communities and ecosystems. While numerous state properties exist here, the vast majority of land in the plan area is in private ownership. The project combines management of these existing state properties with outreach, education, and land protection and stewardship activities on private lands through collaborations with landowners, local governments, and partner organizations.

Within this larger plan area, the LWRBNRA Feasibility Study (WDNR 2002a) identified Focus Areas—ecologically or recreationally significant tracts outside of existing state properties (Map C). These areas are being targeted for acquisitions and easements, with acquisition authority for 45,000 acres, to connect the approximately 31,000 acres of existing state-owned lands scattered throughout the plan area and extend protection and management to important habitats. The approach on remaining lands in the plan area, neither currently in state ownership nor within the Focus Areas, emphasizes management agreements and other stewardship collaborations with landowners and partners.

### **PROPERTY DESIGNATIONS AND AUTHORITY**

#### **State Habitat Area**

The land within the LWRBNRA project boundary, excluding existing wildlife, fishery, and natural area properties, is formally designated as a State Habitat Area. Habitat Areas (HAs) are designated “in order to enhance wildlife-based recreation in this state, including hunting, fishing, nature appreciation and the viewing of game and nongame species” (23.092(1m), Wis. Statutes). The Department has acquired 3,428.14 acres within the LWRBNRA since its establishment in 2002. These parcels are part of the 45,000-acre acquisition goal for identified Focus Areas.

### **CHAPTER 3: Background and Supporting Information**

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The existing state properties covered by this Master Plan include 10 Wildlife Areas, 1 Fishery Area, and 4 State Natural Areas. Although contained within the larger boundary of the plan area, these properties retain their individual designations, approved boundaries, and acquisition goals. There also are other state-owned lands scattered in small parcels throughout the plan area. These parcels were acquired through various statewide programs that permit purchase of small-acreage sites outside of existing property project boundaries (e.g., Remnant Fish Habitat; Statewide Public Access; Extensive Wildlife Habitat Protection) (Map B).

#### **State Wildlife Areas**

State Wildlife Areas are acquired and managed “for the purpose of providing areas in which any citizen may hunt, trap or fish.” (Sec. 23.09(2)(d)3 and 15, Wis. Statutes). Other recreational activities (e.g., skiing, snowshoeing, nature study, berry picking, etc.) can be accommodated where they are compatible with, and do not detract from, this primary objective.

The 10 Wildlife Areas (WAs) are:

- Navarino (14,712.64 acres)
- Deer Creek (1,490.46 acres)
- Maine (720 acres)
- Wolf River Bottoms—Herb Behnke Unit (2,554.68 acres)
- Outagamie (997.37 acres)
- Mack (1,357.9 acres)
- Wolf River Bottoms—LaSage Unit (486.05 acres)
- Mukwa (1,290.60 acres)
- Wolf River (1,812.08 acres)
- Rat River (4,554.27 acres)

#### **State Fishery Area**

State Fishery Areas are acquired and managed “for the purpose of providing areas in which any citizen may hunt, trap or fish.” (Sec. 23.09(2)(d)3 and 14, Wis. Statutes). Other recreational activities (e.g., skiing, snowshoeing, nature study, berry picking, etc.) can be accommodated where they are compatible with, and do not detract from, this primary objective.

The 1 Fishery Area (FA) is:

- Wolf River (193.21 acres)

### **State Natural Areas**

A State Natural Area (SNA) “is an area of land or water which has educational or scientific value or is important as a reservoir of the state’s genetic or biologic diversity and includes any buffer area necessary to protect the area’s natural values”. SNAs are “areas which largely escaped unnatural environmental disturbance or which exhibit little evidence of recent environmental disturbance so that recovery of natural conditions has occurred.” SNAs are “important as a reserve for native biotic communities” and often “provide habitat for endangered, threatened or critical species or for species of special concern to scientists” (Sec. 23.27(1)(e), Wis. Statutes). SNAs are considered the state’s best examples of native biodiversity and are managed to protect and enhance these natural communities and associated species. Other recreational uses are permitted if they do not threaten these natural values.

The 4 State Natural Areas (SNAs) are:

- Wolf River Bottoms (56 acres)
- Hortonville Bog (762 acres)
- Mukwa Bottomland Forest (160 acres; within Mukwa WA)
- Shaky Lake (220.3 acres)

### **SIGNIFICANCE OF THE LWRBNRA**

The lands within the LWRBNRA collectively contain an ecologically significant assemblage of natural communities, some extensive and of high quality, associated with the floodplain of a large, free-flowing river and its tributaries. The floodplain of the Lower Wolf is the largest and most intact of any river in eastern Wisconsin, and stands out in a surrounding landscape that is largely dominated by agriculture and where urban and suburban development is increasing. It is also connected to extensive northern forested landscapes such as the Menominee Forest and the Nicolet National Forest, providing a corridor for dispersal and migration of southern species northward in response to changing climates and shifting forest composition. The LWRBNRA was established in recognition of this ecological significance and with a goal of providing permanent protection of these ecological values by connecting existing state properties in the plan area through intervening lands that currently lack protection or management.

Of particular significance are the aquatic communities, including floodplain forest, emergent marsh, sedge meadow, shrub carr, and warm-water rivers and streams, which host a rich diversity of birds, herptiles, fish, and invertebrates, including many rare species. Twelve species of rare plants and 108 species of rare animals have been documented within the LWRBNRA, including 28 vertebrate and 64 invertebrate Species of Greatest Conservation Need (see Regional Biological Resources and Ecological Capability section below for a definition of SGCN).

### **CHAPTER 3: Background and Supporting Information**

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The Lake Winnebago system population of the globally rare lake sturgeon, the largest self-sustaining one in North America, depends on critical spawning areas along the Wolf River. The entire plan area has been identified as a Wisconsin Important Bird Area (Steele 2007) due to its significance for breeding birds of extensive bottomland forests and emergent marshes, including numerous species of high conservation priority, as well as its importance as a migratory corridor and stopover site for landbirds, waterfowl, and shorebirds. There are 5 known bat hibernacula within approximately 65 miles of some portion of the plan area (well within commuting distance), including the largest in Wisconsin and possibly the Midwest. The north-south orientation of the Wolf and its tributaries, their proximity to the Lake Michigan shoreline, and the complex of high-quality habitats associated with their floodplains make them critically important as migration corridors for both birds and bats. These floodplain habitats likely are vital foraging areas for bats, and the forests important for tree-roosting species. The plan area also provides important habitat for a great many common species, including game animals such as walleye, white bass, northern pike, white-tailed deer, ruffed grouse, waterfowl, muskrat, and rabbit. Over 40% of the state's native plant species occur in the plan area, and approximately 60% of the state's breeding bird species nest here.

While extensive wetlands prevent or severely restrict certain types of recreational uses, the LWRBNRA also has high recreational value. Its proximity to several large population centers in the Fox Valley and Green Bay areas makes it very popular for a variety of outdoor recreational activities, particularly hunting, fishing, trapping, and wildlife viewing, all activities for which the state properties offer the greatest opportunity. These properties protect numerous fish spawning areas, and fishing is especially popular. The annual spring white bass and walleye runs attract anglers from around the state. The annual sturgeon migration also draws many visitors. Several properties offer boat access to the Wolf River.

The state properties also are open to non-motorized activities like hiking, snowshoeing, cross-country skiing, and wildlife watching. Five properties, Navarino, Deer Creek, Maine, Mukwa, and Rat River WAs have snowmobile trails that link to larger regional trails, but motorized recreation generally has not been offered on most of the properties. Most of the LWRBNRA state properties have few public facilities beyond small gravel parking lots. Navarino WA is the exception, having a nature center, picnic area, restrooms, and maintained trails. In general, the recreational importance of the state properties is in providing a remote, wildlife-based outdoor experience. A variety of other recreational activities (e.g., golf, horseback riding, camping, ATV trails, etc.) are available at private, county, and municipal facilities throughout the plan area.

## **ANALYSIS OF THE REGIONAL CONTEXT**

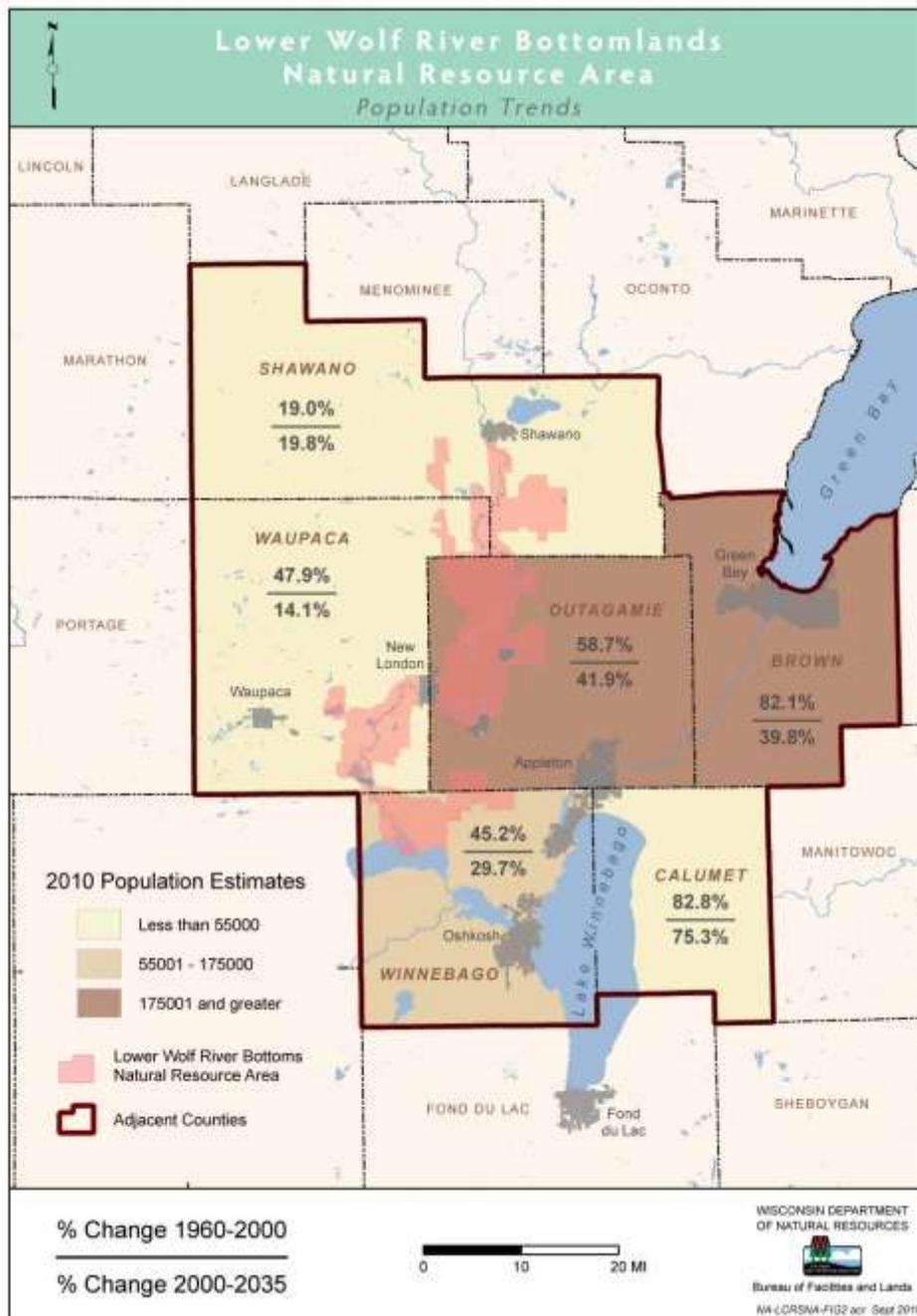
The LWRBNRA is located within the 4 east-central Wisconsin counties of Shawano, Outagamie, Waupaca, and Winnebago (Map A). This region is largely open and dominated by agriculture, with floodplain forests and associated wetlands along the river corridors. The plan area encompasses approximately 100 miles of the Wolf River and portions of 3 main tributaries—the Embarrass, Little Wolf, and Waupaca rivers—as well as some 20 smaller tributaries and several minimally developed lakes. While still mostly rural in character, there is a trend towards increasing residential development in the plan area, especially in the southeastern portion.

The region has a good network of roads, including US Highways 10 and 45, State Highways 22, 54, 76, and 156, and many county roads.

### **Population and Land Use Trends**

The main population centers in the region are in the Fox Valley and Green Bay areas, all within a half-hour to one hour drive from the LWRBNRA, and all have seen steady growth in the past several decades. The Appleton-Oshkosh-Neenah area grew by 14% in the 1990s, with almost 360,000 people by 2000. The Green Bay area population grew by 17% during the 1990s, with most of the growth in suburban areas, and had reached almost 227,000 by 2000. This growth is expected to continue, with Brown, Outagamie, and Winnebago counties projected to be among the 10 Wisconsin counties with the largest populations in 2035. Calumet County, which has experienced recent suburban growth near Appleton, is projected to increase its population at a rate of 75% (Figure 3.1). Much of this growth will be driven by increases in existing population centers, notably Green Bay and Appleton, which are projected to be Wisconsin's third and fifth most populous cities in 2030, with growth rates of 16.2% and 20.8%, respectively (Egan-Robertson et al. 2008).

Figure 3.1. Population Trends for the LWRBNRA.



The majority of land in the plan area, representing some 182,000 acres, is privately owned. Agriculture remains a dominant land use, though the amount of land in the 4-county area used for farming has declined over the past decade, with Outagamie and Waupaca counties showing the highest rates of decline (USDA 1999, 2004, 2009). These trends are linked to population growth in surrounding towns and cities that in turn increases pressure for development. Towns in the southeastern portion of the

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LWRBNRA are seeing more high-density housing developments, while business, residential, and cottage or second home developments are moving into rural areas along the Wolf and Embarrass rivers.

In the past, many landowners were enrolled in the federal Conservation Reserve Program (CRP). This program pays farmers to convert marginal cropland or other environmentally sensitive acreage to vegetative cover that will provide wildlife habitat and improve water quality. In recent years, most precipitously since 2007, there has been a decline in CRP enrollments due to record high commodity prices and an increasing market for corn-based ethanol, and resumption of active rowcrop production on those acres. Projections prepared in 2007 for loss of CRP acres in Wisconsin predicted losses of between 1,000 and 5,000 acres in Winnebago, Outagamie, and Waupaca counties, and between 250 and 1,000 acres in Shawano County, between 2007 and 2010, which represents a significant percentage of total CRP enrollments in each of those counties (USDA 2007). This decline represents a loss of wildlife habitat, particularly grasslands.

The majority of land that is not developed or cultivated is forested, and many forest landowners are enrolled in the state's Managed Forest Law (MFL), a program offering property tax reductions in exchange for using sustainable forestry practices. Other private lands are owned by hunt clubs. The LWRBNRA is home to the largest concentration of private hunt clubs in northeast Wisconsin. Many of these lands are along the Wolf River. While they are managed to provide hunting, fishing, and trapping opportunities for their members, secondary benefits for wildlife include maintenance of wetlands and tracts of land that are undeveloped and unfragmented by many smaller ownerships. Numerous private tracts along the Wolf contain ecologically significant habitats (particularly marshes, sedge meadows, and floodplain forest) which serve as corridors connecting the various state-owned properties. These tracts, if managed to protect these ecological values, have the potential to enhance wildlife habitat values on state lands.

#### **Regional Biological Resources and Ecological Capability**

The LWRBNRA falls mainly within the **Southeast Glacial Plains** and **Central Lake Michigan Coastal** Ecological Landscapes (ELs), with a small area falling within the **Northern Lake Michigan Coastal** EL (Figure 3.2). ELs are regions of the state that have unique combinations of physical and biological characteristics such as climate, soils, and vegetation and so differ from each other in ecological attributes and management opportunities (WDNR 2006a).

The southern one-third of the plan area falls into the Southeast Glacial Plains EL. This region is characterized by level to gently rolling topography and rich silt loam or organic soils. Agriculture is the dominant cover type, interspersed with extensive wetland complexes of sedge meadow, marsh, wet prairie, bottomland forests, and shrub swamp, with smaller areas of upland maple-basswood and oak forest, savanna, and swamp conifers. This region contains many old oxbows as well as most of the lakes that are in the plan area.

**Figure 3.2. Ecological Landscapes of the LWRBNRA.**



The majority of the remaining plan area falls within the **Central Lake Michigan Coastal EL**, which is characterized by level to rolling topography and clay soils. Bottomland forests of silver maple, ash, and swamp white oak atypical of forests in the rest of the EL dominate the river corridor, interspersed with more open wetland types, and agriculture is prevalent in the landscape around the river floodplain.

The bottomland forests in the small portion of the northernmost plan area that falls within the **Northern Lake Michigan Coastal EL** also are not typical of forests throughout the rest of the EL, which are dominated by maple-basswood with smaller amounts of aspen-birch and lowland conifers. Very little state-owned land falls within this EL, and the plan area offers very limited opportunity for the natural communities that are important in this region.

The ecological characteristics of the LWRBNRA also are influenced by its location within the Tension Zone (Curtis 1959), a border running roughly from the northwest south, across the center of the state, and then down to the southeast, dividing the state into northern and southern floristic provinces based on where the largest number of plant species reach the limits of their ranges. The Tension Zone contains species characteristic of both northern and southern Wisconsin, a fact reflected in the high diversity of vegetation found in the plan area historically and which is still present to a lesser degree. The plan area's location within the Tension Zone and the connectivity of its habitats to extensive northern forest landscapes such as the Menominee Forest and the Nicolet National Forest make it a significant place for exchange of genetic material between northern and southern species, as well as a corridor for dispersal and migration of southern species northward in response to changes in climate and forest composition.

The Wolf River is a unifying physical and ecological element of the plan area, traversing all 3 ELs. The LWRBNRA encompasses the final 100 miles of the Wolf, from the Shawano Dam to Lake Poygan, one of the longest free-flowing warm-water river reaches in the upper Midwest. The river floodplain is the largest and most intact in eastern Wisconsin. It is mostly broad and flat (though narrowing somewhat at the north end of the plan area just below the Shawano Dam) and accommodates natural processes such as

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meandering of the river channel and periodic connection with adjacent wetland habitats. Extensive, largely intact complexes of forested and open wetlands are present along virtually the entire river corridor, hosting many rare species of birds, fish, herptiles, and invertebrates.

The upland forests (oak; beech-maple-oak; hemlock-maple-birch-pine) that dominated the plan area in pre-settlement times have been almost entirely replaced by agriculture and development. Current forest cover on private lands is dominated by bottomland hardwoods. On the state-owned lands, aspen predominates (34%) followed by bottomland hardwood (silver maple, green ash, swamp white oak, elm, cottonwood, hackberry; 29%) and swamp hardwood (black ash, red maple, elm; 12%).

Forest composition changes from the northern portion of the plan area to the south. Aspen and other upland forest types are more prevalent in the northernmost portion of the plan area where the river is narrower, particularly at Navarino WA, where much of early-successional forest on the state-owned lands occurs. Bottomland and swamp hardwoods become more common from about Leeman south, and dominate the forest cover as the river floodplain broadens. Most of the forest consists of young and medium-aged stands, with aspen dominating the younger age-classes and bottomland hardwoods the medium age-classes. Older stands more typical of mature or old-growth forest are not well-represented in the plan area.

The Wisconsin Wildlife Action Plan (WDNR 2005) identified management opportunities for natural communities by Ecological Landscape. Different ELs present different opportunities to sustain various natural communities. Sustaining a natural community means ensuring that it will be present with a high probability of maintaining its composition, structure, and function over the long-term (e.g., 100 years). An EL presents a “major” opportunity for a natural community when that community is represented by many significant occurrences within the Landscape or when major restoration activities for that community are likely to be successful. An “important” opportunity indicates that while the community type is not extensive or common in that Landscape, one to several significant intact occurrences are present that are important to sustaining that community in the state; or that the community is restricted to only one or a few Landscapes and should be considered for protection and management because of this limited distribution.

Table 3.1 lists major and important opportunities in the 3 ELs for natural communities that are present within the LWRBNRA. Due to its limited representation within the plan area, opportunities for the Northern Lake Michigan Coastal EL were combined with those for Central; where opportunity for a particular community differs between Northern and Central, the table displays the opportunity for Central. The right-most column indicates management opportunities for communities specifically within the plan area; these are designated as either significant (S) or local/regional (L/R) and are distinct from the “major” and “important” designations, which refer to management opportunities for a community across an entire EL. In general, the plan area shares more similarities in terms of natural community management opportunities with the Southeast Glacial Plains

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than with the other two landscapes. Communities with significant (S) opportunity in the plan area are:

- Floodplain Forest
- Southern Hardwood Swamp
- Submergent Marsh
- Emergent Marsh
- Emergent Marsh—Wild Rice
- Southern Sedge Meadow
- Shrub Carr
- Warmwater Rivers
- Warmwater Streams

A number of other communities have local or regional (L/R) management opportunities, including several northern forest and wetland types as well as some grassland communities. While not extensive, these communities should be given consideration because of their quality, limited statewide distribution, or because they provide habitat for rare species. The diversity of communities with management opportunity in the plan area, including both southern and northern types, reflects its location in the transitional Tension Zone and underscores its importance in protecting examples of regionally rare habitats.

**Table 3.1. Management Opportunity for Natural Communities in the LWRBNRA by Ecological Landscape.**

Natural Community	EL Opportunity: MAJOR*		EL Opportunity: IMPORTANT*		LWRBNRA Opportunity†
	Southeast Glacial Plains	Central & Northern Lake Michigan Coastal	Southeast Glacial Plains	Central & Northern Lake Michigan Coastal	
<b>Southern Forests</b>					
Floodplain Forest	x			x	S
Southern Hardwood Swamp			x		S
Southern Tamarack Swamp	x				L/R
Southern Mesic Forest			x	x	L/R
Southern Dry-mesic Forest	x			x	
Southern Dry Forest	x				
<b>Northern Forests</b>					
Northern Hardwood Swamp			x	x	
Northern Wet Forest			x	x	
Northern Wet-mesic Forest			x	x	L/R
Northern Mesic Forest				x	L/R
Northern Dry-mesic Forest				x	L/R
<b>Oak Savanna</b>					
Oak Woodland	x				
Oak Opening	x				
<b>Grasslands</b>					
Wet Prairie			x		L/R
Wet-mesic Prairie	x				L/R
Mesic Prairie	x				

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Natural Community	EL Opportunity: MAJOR*		EL Opportunity: IMPORTANT*		LWRBNRA Opportunity†
	Southeast Glacial Plains	Central & Northern Lake Michigan Coastal	Southeast Glacial Plains	Central & Northern Lake Michigan Coastal	
Dry-mesic Prairie	x				
Dry Prairie	x				
Sand Prairie					L/R
Surrogate Grasslands	x			x	L/R
<b>Open &amp; Shrub Wetlands</b>					
Submergent Marsh			x	x	S
Emergent Marsh	x			x	S
Emergent Marsh—Wild Rice			x		S
Southern Sedge Meadow	x			x	S
Northern Sedge Meadow			x	x	L/R
Shrub Carr	x			x	S
Alder Thicket					L/R
Ephemeral Pond			x	x	
Open Bog/Bog Relict	x				L/R
Muskeg					L/R
<b>Aquatic Communities</b>					
Warmwater Rivers	x	x			S
Warmwater Streams	x	x			S
Impoundments/Reservoirs	x				L/R
Inland Lakes	x				L/R

\* See text for explanation of “Major” and “Important” EL opportunities.

† S = Significant opportunity exists because of community’s extent, quality, or condition within the plan area.  
L/R = Community type is not extensive within the plan area but a local or regional management opportunity exists because of the community’s rarity statewide, its quality or condition, and/or because it provides habitat for locally or regionally rare species.

The diversity of landscapes and natural communities found in the plan area supports a great variety of plants and animals, including numerous species of conservation priority. The Wisconsin Wildlife Action Plan (WDNR 2005) has identified Species of Greatest Conservation Need (SGCN), including birds, fish, mammals, herptiles, and invertebrates, that are associated with each EL. SGCN are species in need of conservation action because they are:

- already listed as endangered or threatened;
- at risk because of threats to their life history needs or habitats;
- declining in adjacent states or nationally, though stable in Wisconsin;
- of unknown status in Wisconsin and suspected to be vulnerable.

The Wildlife Action Plan Ecological Priorities Tool (WDNR 2006b) generates a list of vertebrate SGCN of highest priority for a given combination of natural community and Ecological Landscape. This prioritization is based on: the probability that a species will occur in a given landscape; the degree to which a species is associated with a particular natural community; and the degree to which an EL presents opportunities to sustain a particular natural community. Table 3.2 lists the high-priority vertebrate SGCN for the 9 communities that have significant opportunity in the LWRBNRA according to these

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natural community-EL associations for the 3 ELs of the plan area. This is not a complete list of SGCN for the plan area, but represents those species for which the plan area offers the greatest actual or potential management opportunity.

**Table 3.2. Natural Community Associations for High-Priority Vertebrate SGCN in the LWRBNRA.** An ‘x’ indicates that a species is either significantly or moderately associated with a natural community in one or more of the ELs of the plan area.

Species of Greatest Conservation Need	Floodplain Forest	Southern Hardwood Swamp	Submergent Marsh	Emergent Marsh	Emergent Marsh—Wild Rice	Southern Sedge Meadow	Shrub Carr	Warmwater Rivers	Warmwater Streams
<b>Birds (41)</b>									
Acadian Flycatcher	x								
American Bittern				x		x			
American Golden-Plover				x					
American Woodcock							x		
Bald Eagle								x	
Bell's Vireo							x		
Black Tern			x	x	x				
Black-billed Cuckoo	x						x		
Blue-winged Teal	x		x	x	x	x			
Blue-winged Warbler	x						x		
Bobolink						x			
Canvasback			x		x			x	
Cerulean Warbler	x								
Common Tern				x					
Dunlin				x				x	
Eastern Meadowlark						x			
Forster's Tern			x	x					
Golden-winged Warbler							x		
Great Egret	x			x				x	
King Rail				x		x			
Least Flycatcher	x								
Lesser Scaup			x		x			x	
Marbled Godwit				x					
Northern Harrier						x			
Osprey								x	
Prothonotary Warbler	x								
Redhead			x	x	x				
Red-headed Woodpecker	x								
Red-necked Grebe				x					
Red-shouldered Hawk	x								
Rusty Blackbird	x	x		x			x		
Short-billed Dowitcher				x					
Short-eared Owl						x	x		

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<b>Species of Greatest Conservation Need</b>	<b>Floodplain Forest</b>	<b>Southern Hardwood Swamp</b>	<b>Submergent Marsh</b>	<b>Emergent Marsh</b>	<b>Emergent Marsh—Wild Rice</b>	<b>Southern Sedge Meadow</b>	<b>Shrub Carr</b>	<b>Warmwater Rivers</b>	<b>Warmwater Streams</b>
Solitary Sandpiper	x			x					x
Veery	x						x		
Whooping Crane			x	x		x			
Willow Flycatcher						x	x		
Wilson's Phalarope			x	x					
Wood Thrush	x								
Yellow-billed Cuckoo	x	x					x		
Yellow-crowned Night-Heron	x	x	x	x			x	x	
<b>Fish (15)</b>									
Black Buffalo								x	
Gravel Chub								x	
Greater Redhorse								x	x
Lake Sturgeon								x	
Least Darter								x	x
Longear Sunfish								x	x
Ozark Minnow									x
Pugnose Shiner									x
Redfin Shiner								x	x
Redside Dace									x
River Redhorse								x	
Shoal Chub (Speckled Chub)								x	
Slender Madtom									x
Starhead Topminnow								x	x
Western Sand Darter								x	
<b>Herptiles (7)</b>									
Blanding's Turtle	x	x	x	x	x	x	x	x	x
Four-toed Salamander	x	x		x		x	x		
Mudpuppy								x	
Northern Ribbon Snake							x		
Pickering Frog	x	x	x	x		x	x	x	x
Queen Snake			x	x		x	x	x	x
Wood Turtle	x					x	x	x	x
<b>Mammals (4)</b>									
Eastern Red Bat	x	x	x	x		x	x	x	x
Hoary Bat	x		x	x		x	x	x	x
Northern Long-eared Bat	x	x	x	x		x	x	x	x
Silver-haired Bat	x		x	x		x	x	x	x

The LWRBNRA also is home to numerous invertebrate SGCN, although the Wildlife Action Plan does not provide natural community associations for these. Table 3.3 contains a list of invertebrate SGCN for the plan area.

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**Table 3.3. Invertebrate SGCN in the LWRBNRA.**

<b>Common Name</b>	<b>Scientific Name</b>
<b>Arthropods</b>	
<b>Mollusks: Bivalves</b>	<b>Mollusca: Pelecypoda</b>
Buckhorn	<i>Tritogonia verrucosa</i>
Round Pigtoe	<i>Pleurobema sintoxia</i>
Salamander Mussel	<i>Simpsonaias ambigua</i>
Snuffbox	<i>Epioblasma triquetra</i>
<b>Non-insect Arthropods</b>	
<b>Crustaceans: Shrimps, Crayfish, etc.</b>	<b>Crustacea: Decapoda</b>
White River Crayfish	<i>Procambarus acutus</i>
<b>Insects</b>	
<b>Insects: Mayflies</b>	<b>Insecta: Ephemeroptera</b>
An Armored Mayfly	<i>Baetisca obesa</i>
A Small Minnow Mayfly	<i>Paracloeodes minutus</i>
A Primitive Minnow Mayfly	<i>Parameletus chelifer</i>
A Common Burrower Mayfly	<i>Pentagenia vittigera</i>
A Small Minnow Mayfly	<i>Plauditus cestus</i>
A Flat-headed Mayfly	<i>Pseudiron centralis</i>
<b>Insects: Dragonflies &amp; Damselflies</b>	<b>Insecta: Odonata</b>
Dark Rubyspot	<i>Hetaerina titia</i>
Pygmy Snaketail	<i>Ophiogomphus howei</i>
<b>Insects: Grasshoppers, Locusts, etc.</b>	<b>Insecta: Orthoptera</b>
Ash-brown Grasshopper	<i>Trachyrhachys kiowa</i>
Northern Marbled Locust	<i>Spharagemon marmorata</i>
<b>Insects: True Bugs</b>	<b>Insecta: Heteroptera (Hemiptera, Homoptera)</b>
A Velvet Water Bug	<i>Hebrus buenoi</i>
A Velvet Water Bug	<i>Hebrus burmeisteri</i>
A Water Boatman	<i>Hesperocorixa semilucida</i>
A Water Measurer	<i>Hydrometra martini</i>
A Water Scorpion	<i>Nepa apiculata</i>
A Creeping Water Bug	<i>Pelocoris femorata</i>
A Water Scorpion	<i>Ranatra nigra</i>
<b>Insects: Beetles</b>	<b>Insecta: Coleoptera</b>
A Water Scavenger Beetle	<i>Agabetes acuductus</i>
A Predaceous Diving Beetle	<i>Agabus bicolor</i>
A Predaceous Diving Beetle	<i>Agabus inscriptus</i>
A Predaceous Diving Beetle	<i>Agabus wasastjernaee</i>
A Predaceous Diving Beetle	<i>Celina hubbelli</i>
Little White Tiger Beetle	<i>Cicindela lepida</i>
A Tiger Beetle	<i>Cicindela patruela huberi</i>
A Tiger Beetle	<i>Cicindela patruela patruela</i>
A Predaceous Diving Beetle	<i>Copelatus glyphicus</i>
A Water Scavenger Beetle	<i>Cymbiodyta acuminata</i>
A Water Scavenger Beetle	<i>Cymbiodyta minima</i>
A Dubiraphian Riffle Beetle	<i>Dubiraphia bivittata</i>
A Water Scavenger Beetle	<i>Enochrus consortus</i>
A Water Scavenger Beetle	<i>Enochrus perplexus</i>

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<b>Common Name</b>	<b>Scientific Name</b>
A Water Scavenger Beetle	<i>Enochrus sayi</i>
A Predaceous Diving Beetle	<i>Graphoderus manitobensis</i>
A Crawling Water Beetle	<i>Haliphus canadensis</i>
A Crawling Water Beetle	<i>Haliphus pantherinus</i>
A Velvet Water Bug	<i>Hebrus buenoi</i>
A Velvet Water Bug	<i>Hebrus burmeisteri</i>
A Water Scavenger Beetle	<i>Helocombus bifidus</i>
A Water Scavenger Beetle	<i>Hydrochara leechi</i>
A Water Scavenger Beetle	<i>Hydrochara spangleri</i>
A Predaceous Diving Beetle	<i>Hydroporus badiellus</i>
A Predaceous Diving Beetle	<i>Hydroporus vittatus</i>
A Predaceous Diving Beetle	<i>Ilybius discedens</i>
A Predaceous Diving Beetle	<i>Ilybius ignarus</i>
A Predaceous Diving Beetle	<i>Ilybius incarinatus</i>
A Water Scavenger Beetle	<i>Laccobius agilis</i>
Cantrall's Bog Beetle	<i>Liodessus cantralli</i>
A Predaceous Diving Beetle	<i>Liodessus flavicollis</i>
A Predaceous Diving Beetle	<i>Lioporeus triangularis</i>
A Predaceous Diving Beetle	<i>Matus bicarinatus</i>
A Predaceous Diving Beetle	<i>Neoscutopterus hornii</i>
A Predaceous Diving Beetle	<i>Rhantus sinuatus</i>
A Water Scavenger Beetle	<i>Sperchopsis tessellatus</i>
A Riffle Beetle	<i>Stenelmis antennalis</i>
A Riffle Beetle	<i>Stenelmis bicarinata</i>
A Riffle Beetle	<i>Stenelmis fuscata</i>
<b>Insects: Caddisflies</b>	<b>Insecta: Trichoptera</b>
A Netspinning Caddisfly	<i>Hydropsyche bidens</i>
A Long-horned Casemaker Caddisfly	<i>Triaenodes nox</i>
<b>Insects: Butterflies &amp; Moths</b>	<b>Insecta: Lepidoptera</b>
Columbine Dusky Wing	<i>Erynnis lucilius</i>

The Wildlife Action Plan did not identify plant SGCN. However, a biotic inventory of the Lower Wolf River basin (WDNR 2002b), which included the LWRBNRA, documented 11 species of rare plants in the plan area, including 2 state-threatened species. One additional species has been documented since then, for a total of 12. These are listed in Table 3.4.

**Table 3.4. Rare Plants of the LWRBNRA.**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Wisconsin Status*</b>
Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	SC
Common Bog Arrow-grass	<i>Triglochin maritima</i>	SC
Cuckooflower	<i>Cardamine pratensis</i>	SC
Deam's Rockcress	<i>Arabis missouriensis var deamii</i>	SC
Handsome Sedge	<i>Carex formosa</i>	THR

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Common Name	Scientific Name	Wisconsin Status *
Indian Cucumber-root	<i>Medeola virginiana</i>	SC
Large Roundleaf Orchid	<i>Platanthera orbiculata</i>	SC
Leafy White Orchis	<i>Platanthera dilatata</i>	SC
Marsh Valerian	<i>Valeriana sitchensis ssp. uliginosa</i>	THR
Northern Bog Sedge	<i>Carex gynocrates</i>	SC
Northern Yellow Lady's-slipper	<i>Cypripedium parviflorum var. makasin</i>	SC
Showy Lady's-slipper	<i>Cypripedium reginae</i>	SC

\* SC = Special Concern; THR = Threatened

In addition to these rare species and habitats, the LWRBNRA hosts a wide variety of more common wildlife, including game and non-game species. The river and associated wetlands provide spawning habitat and feeding areas for many species of warm-water game fish, including northern pike, walleye, perch, smallmouth bass, largemouth bass, white bass, rock bass, bluegill, black crappie, pumpkinseed, channel catfish, flathead catfish, bullhead, and lake sturgeon. Wood duck, wild turkey, ruffed grouse, American woodcock, mallard, bald eagle, great blue heron, green heron, and several species of rail can be found in the forests and marshes of the plan area. Annual flooding, which creates temporary breeding ponds and deposits large woody debris, benefits amphibians such as red-backed salamander, spring peeper, wood frog, and American toad. Common reptiles include Eastern garter snake, Northern water snake, brown snake, Northern red-bellied snake, Eastern hognose snake, Western fox snake, smooth green snake, common map turtle, painted turtle, snapping turtle, and Eastern spiny softshell turtle. Muskrat, otter, mink, and beaver are common mammals of riverine and wetland habitats. White-tailed deer make extensive use of floodplain forest areas in fall and winter.

**Regional Recreational Resources, Use, and Demand**

The LWRBNRA is rich in outdoor recreational opportunities. Its abundant natural resources give it an important place in the region's cultural and economic life. There is a well-established and long-standing tradition of outdoor recreational activities in the plan area, particularly fishing, hunting, trapping, boating, and wildlife viewing, which draw many visitors and contribute significantly to local economies. Other popular activities in the plan area are hiking, bicycling, cross-country skiing, snowmobile/ATV riding, and horseback riding. The plan area's public lands are particularly important for providing hunting and fishing opportunities, but private lands also support these pursuits. An abundance of hunt clubs in the plan area provides many such opportunities to members.

Fishing and boating are especially popular. The many high-quality fisheries, particularly the spring walleye and white bass runs and annual sturgeon spawning migration along the Wolf and its tributaries, draw anglers and visitors from around the state and contribute substantially to the local economy. A 2006 survey of the economic impact of angling on the Lake Winnebago system found that angling adds \$155.5 million annually in direct spending to the 5-county region, and this direct spending supports 3,500 jobs. Additional indirect and induced impacts increase the total economic contribution to \$234 million and

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4,300 jobs (UWEX 2007). Motor boating is heaviest on the larger southern reaches of the Wolf, especially between Fremont and Lake Poygan, while other reaches and tributaries provide canoeing and kayaking opportunities. Several state properties offer boat access to the Wolf River, and additional access areas are available on county and private lands; access to smaller streams often is limited to road crossings. The lakes of the plan area—Partridge, Partridge Crop, Cincoe, and White (Waupaca County)—also are popular for fishing, ice fishing, and boating, as well as waterfowl hunting.

Hunting opportunities abound for white-tailed deer, waterfowl, woodcock, grouse, turkey, pheasant, and small game. State properties experience especially high use during opening weekend of waterfowl hunting and the gun deer season. There are trapping opportunities for coyote, muskrat, otter, fox, raccoon, mink, and beaver.

Bird-watching and other wildlife viewing have greatly increased in popularity over the past few years. Tundra swan migration in the spring and sandhill crane and Canada goose migrations in the fall regularly attract visitors. Many public properties and other areas throughout the LWRBNRA are featured in the Great Wisconsin Birding and Nature Trail, Central Sands Prairie Region (see <http://www.wisconsinbirds.org/trail/>) and in *Wisconsin's Favorite Bird Haunts* (Tessen 2009), a locally produced guide to birding spots throughout the state. Wildlife viewing opportunities also are available on the Wiouwash State Trail, which extends 22 miles from Oshkosh to Hortonville and 16 miles from Tigerton to Birnamwood, and on the Wolf River Sturgeon Trail. This is a half-mile paved trail located west of New London on County Highway X, across from the Mukwa WA, which offers good viewing for the spring sturgeon run and also includes fishing platforms, a picnic shelter, a boardwalk, and several interpretive signs. The Sturgeon Trail is one of the LWRBNRA's three designated Watchable Wildlife sites (Judd 1995). The other two are along Van Patten Drive (formerly known as Bishcoff Road) on the LWRBNRA DOT Mitigation Site parcel and on Navarino WA near the Navarino Nature Center. The plan area's one Rustic Road, R-61, offers general scenic viewing opportunities. It is located on 3.3 miles of County Highway MM in Outagamie County between Stephenville and Hortonville.

Hiking, skiing, and snowshoeing are permitted on all wildlife areas and state natural areas, but the majority of state properties in the plan area do not mark or groom trails for these activities. The exception is Navarino WA, which offers several miles of trails including an interpretive trail and some groomed ski trails. Various county parks and the Wiouwash State Trail offer additional trail opportunities, including for bicycling and horseback riding which are not permitted on the state properties. Another state trail, the 23-mile Newton-Blackmour State Trail, currently is under construction along a former railroad grade and will offer additional opportunities when open. It will be operated by Outagamie County and will connect the communities of New London, Shiocton, Black Creek, and Seymour. Networks of snowmobile trails exist throughout the plan area. Navarino, Deer Creek, Maine, Mukwa, and Rat River WAs have snowmobile trails that link to these larger regional networks, but for the most part the state properties are not open to motorized recreation. The state lands also do not offer any camping

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opportunities; camping in and around the plan area is provided by private campgrounds and one or two county parks.

Two nature centers in the plan area offer educational as well as recreational opportunities. Mosquito Hill Nature Center is located on 430 acres adjacent to the Wolf River, east of New London. Navarino Nature Center is located on the Navarino WA. Both offer interpretive displays and educational resources, recreational activities and amenities such as maintained trails, picnic areas, and restrooms, and a wide variety of workshops, classes, and programs for both school groups and the general public.

The *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) is the primary source of information on outdoor recreation in Wisconsin. The SCORP periodically evaluates status, trends, demand, and needs for outdoor recreation throughout the state using a variety of public surveys, interviews, and listening sessions. The current plan is for the period 2005-2010 (WDNR 2006c). The plan divides Wisconsin into 8 planning regions, each representing a particular combination of demographic trends, tourism influences, and environment types. The LWRBNRA falls within the Lake Winnebago Waters region, which covers 10 counties in east-central Wisconsin and is characterized by the Winnebago pool lakes, a major recreational resource in the region, and by the Fox Valley cities where urban and suburban development continues to encroach on undeveloped areas and public lands.

While participation rates for many outdoor recreational activities are fairly consistent across the state, they are higher in the Lake Winnebago Waters region for several water-based activities (warm-water fishing, rafting, visiting a non-beach waterside area), biking activities (bicycling, mountain biking), and off-road vehicle activities (driving off-road, ATV riding, off-road motorcycling), as well as horseback riding, primitive camping, disc golf, and visiting outdoor theme/water parks. The SCORP also reports on the most common recreational issues and needs identified by the public in each region. Issues identified for the Lake Winnebago Waters region include:

- Increased ATV usage and associated impacts
- Increasing multiple-use recreation conflicts
- Increasing noise pollution from motorized activities
- Invasive species
- Loss of public access to lands and waters
- Conflicts between silent sport and motorized user groups
- Overcrowding
- Poor water quality impairing recreation

The SCORP divides recreational supply shortages into 2 categories—nature-based and developed setting. Nature-based activity shortages in the Lake Winnebago Waters region that are common to many other regions are:

- Carry-in boat launches
- Campgrounds

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- Trails (cross-country ski; hiking; horse; mountain bike; and snowmobile)

Other nature-based shortages identified by the public for this region include:

- Better maps/signage for trails
- More geo-caching sites on public lands
- More hunting opportunities
- More kayaking opportunities

State-owned lands are the primary providers of public nature-based recreation within the LWRBNRA. Counties, cities, and towns do maintain some public recreation lands but most of these are community parks and boat access areas. Private facilities in the region also offer outdoor recreation opportunities, but these tend to be in a more developed setting (e.g., golf courses, developed campgrounds, etc.). Remote, wildlife-based outdoor opportunities largely are available only on the state lands. With projected increases in population and development in and around the plan area, demand and pressure on these lands is expected to increase. The *Wisconsin Land Legacy Report* (Pohlman et al. 2006), which identifies those places most important to meeting the state's conservation and recreation needs over the next 50 years, gives the Lower Wolf River Bottomlands its highest rating for both conservation significance and recreation potential. Careful management and monitoring will be needed to ensure that both recreational resources and ecological values are maintained into the future.

## **DESCRIPTION OF THE LWRBNRA PLAN AREA AND STATE PROPERTIES**

The following section provides additional details on the physical characteristics of the plan area and state properties, including land and water resources, recreational developments, and historical/cultural resources. Material for this section is taken from the LWRBNRA Feasibility Study (WDNR 2002a) and Regional-Property Analysis (WDNR 2007), as well as the Wolf River Basin Biotic Inventory (WDNR 2002b).

### **Surface Geology and Soils**

The topography and drainage of the LWRBNRA have been strongly influenced by Pleistocene glacial erosion and deposition. The underlying bedrock consists of Precambrian crystalline igneous rock in the northern and western portions of the plan area, while Paleozoic dolomite and sandstone overlie the Precambrian rocks in the south and east. Glacial deposits associated with the Wisconsinian glacial advance of some 11,000 years ago cover the entire area to a depth of 100-200 feet, resulting in only limited bedrock exposure. These deposits vary widely and include glacial till (a mixture of clay, sand, and gravel) in the north and lake deposits (clay and sand) in the south, with pockets of gravelly stream deposits occurring throughout. The resulting topography includes rolling hills, sand ridges along glacial lake margins, and flat areas in former lakebeds.

Soils of the plan area range from mucky and wet soils to silts and loams to pockets of sandy, dry soils. Sandy, dry soils are particularly found in the northern portion of the plan area on uplands that are nearly level to moderately steep. These soils range from excessively well drained to somewhat poorly drained, and can be susceptible to wind erosion depending on slope, moisture levels, and land uses. Wet, mucky soils are found in upland depressions and in floodplains, generally parallel to the river. These usually are nearly level, very poorly drained, and subject to periodic flooding or ponding, sometimes for long periods. Lands between the Wolf and Embarrass rivers are nearly level to gently sloping, with somewhat poorly drained to moderately well drained soils. Fine sand deposits underlie some areas. The southern portion of the plan area features nearly level to gently rolling topography with somewhat poorly drained to poorly drained clayey soils. A very poorly drained, rich silt loam is found in areas around the mouth of Lake Poygan, along the shore of Lake Winneconne, and along the Rat River.

The soils of the LWRBNRA present some management limitations, particularly for recreational facility development. The most abundant soils are wet, poorly drained types, often located adjacent to rivers and subject to periodic flooding. These soils are best suited for forested or open wetland vegetation such as floodplain forest, emergent marsh, or shrub swamp. Areas with better drained or sandy soils often occur on steep slopes where erosion potential may preclude development of roads or trails. A soil suitability study performed for the plan area examined characteristics such as slope, flood frequency, and drainage in order to identify the most suitable sites for structures or trails (see LWRBNRA Soil Suitability Map in Appendix C). Over half (55%) of the plan area, including most of the state properties, is poorly drained, flat to steeply sloped, and experiences occasional to frequent flooding, making it unsuitable for development. Well-

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suited areas (well to excessively drained, flat to moderately sloped, and rarely or occasionally flooded), representing 40% of the plan area, are mostly on private lands. Only 5% of the plan area is moderately suited for development—well to excessively drained, moderately sloped, and occasionally or frequently flooded. These areas occur in the northern portion of the plan area on both public and private lands.

#### **Water Resources and Aquatic Habitats**

The Wolf River is the plan area's largest watercourse, with some 100 free-flowing miles from the Shawano dam to Lake Poygan. Its main tributaries are the Shioc, Embarrass, Little Wolf, and Waupaca rivers. There also are numerous smaller tributaries and sloughs or bayous. The principle lakes of the LWRBNRA are all found in Waupaca County in the southern portion of the plan area. Partridge, Partridge Crop, and Cincoe lakes are all connected to the Wolf. White Lake is isolated, having only small marsh drainage channels and an intermittent outlet. Game fish populations are present in all these waters and fishing is popular. Canoeing is popular on the Waupaca and on the North and South branches of the Little Wolf. The lakes are also used for trapping and waterfowl hunting. Partridge, Partridge Crop, and White Lakes are used for ice fishing but Cincoe's small size and shallowness usually results in no or limited winter fishery there.

The rivers harbor many important aquatic habitats. The northernmost 10-mile segment of the Wolf is distinct from the remaining 90 miles in the plan area, being relatively narrow, steep-sided, and having a gravel and cobble substrate that supports diverse aquatic species, including mussels, insects, crustaceans, and fish. Several species found here are much less common downstream or absent altogether. The lower 90 miles of the Wolf also are rich in aquatic communities and rare species of grass shrimp, dragonflies, mussels, and fish. High, sandy banks found at several sites along this segment provide nesting areas for kingfishers, bank and Northern rough-winged swallows, and riverine turtles. The Embarrass River downstream from the Pella dam hosts a high diversity of aquatic insects, crustaceans, mussels, and fish usually restricted to larger rivers, as does the Little Wolf from the dam at Manawa south to its confluence with the Wolf. This segment also features stretches of rapids and fast water, habitats that are rare in the Lower Wolf basin. Important spawning areas for walleye, lake sturgeon, and other fish are found throughout these river corridors.

Open wetland habitats such as emergent marsh, sedge meadow, and shrub carr are abundant in the plan area, and vary greatly in size and quality. Especially extensive and high quality examples are found in the southern portion of the plan area. There also are pockets of more northern types such as northern sedge meadow, tamarack swamp, and open bog.

Wetland and riverine communities are threatened by encroaching development, reduced water quality (turbidity, siltation, excessive nutrients) from point and non-point sources, hydrologic alterations due to ditching, diking, and water control structures, shoreline erosion, invasive species, and lack or loss of vegetative buffers. The main stem of the

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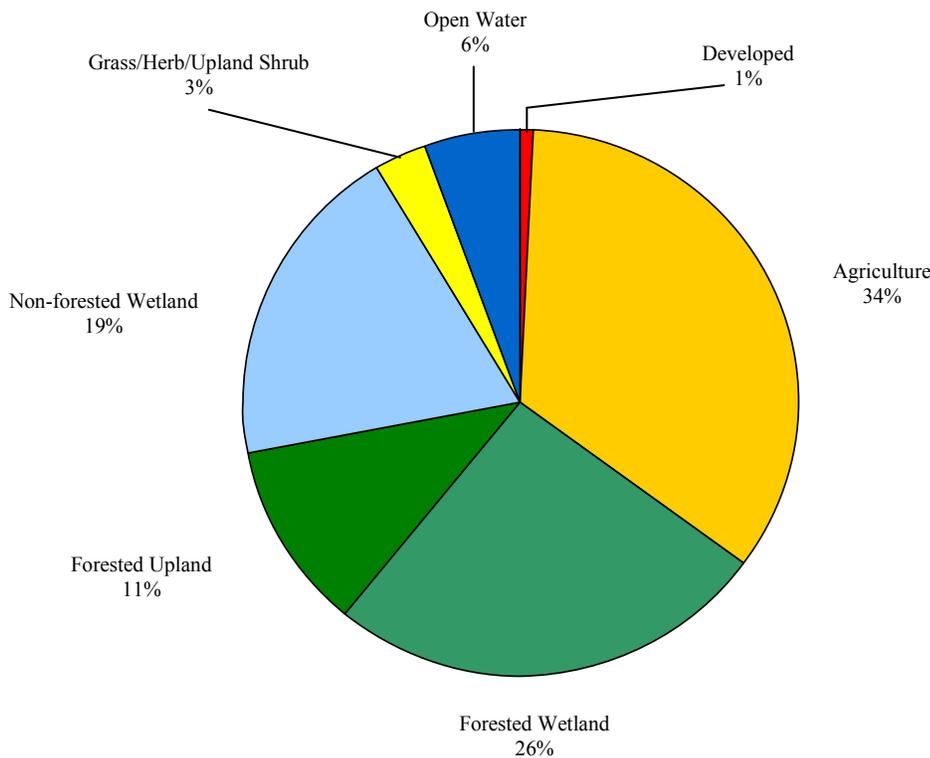
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Wolf River throughout the entire plan area is classified as an Impaired Water under Section 303(d) of the Clean Water Act due to excessive nutrients, sedimentation, and contamination with PCBs and mercury, and the entire portion of the Rat River within the plan area is classified as Impaired due to excessive nutrients (WDNR 2010).

**The Vegetative Landscape**

The LWRBNRA was predominantly forested in pre-settlement times. Lowland hardwoods and open wetlands, including sedge meadows, marshes, wet prairie, and lowland shrubs, were more prevalent in the Southeast Glacial Plains portion of the plan area, interspersed among swamp conifers, oak opening, and oak forest. Swamp conifers (white cedar, black spruce, tamarack) and forests of beech, hemlock, sugar maple, basswood, yellow birch, and oaks were found throughout the central and northern portions of the plan area, along with some lowland hardwoods. The Northern Lake Michigan Coastal portion also had some small areas of white and red pine forest and jack pine-oak barrens.

**Figure 3.3. Current General Land Cover within the LWRBNRA.**



Agriculture and residential development have largely replaced these forests today. Extensive floodplain forest and hardwood swamp still exist, along with open wetlands, but only a few tamarack-dominated conifer swamps remain. Upland forests are still primarily of the maple-beech-basswood type but have been reduced to a

few pockets scattered throughout the plan area. Figure 3.3 shows the proportions of general land cover types for the plan area (data from 2010 DNR forest reconnaissance for state-owned lands and 2001 National Land Cover Database for private lands). Land cover maps are shown in Map Series F.

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Bottomland hardwood is the most common forest type on private lands in the plan area, while aspen, bottomland hardwood, and swamp hardwood are the dominant forest types on state lands. Upland forest management on state-owned lands has focused on regenerating aspen and increasing the oak component to benefit game species such as deer, turkey, ruffed grouse, and woodcock. Floodplain forests and hardwood swamps have been managed with selective harvest. This management generally has resulted in forests dominated by young and medium age classes. Older stands more typical of mature forest are currently underrepresented in the plan area.

The following natural communities have significant opportunity in the plan area due to their extent or quality.

- **Floodplain Forest:** this lowland hardwood community typically occurs along large rivers that flood periodically, and is best developed in southern Wisconsin although it also is found in the north. The Floodplain Forests of the LWRBNRA are regionally significant, the most extensive and high-quality in all of eastern Wisconsin. Especially large stands occur along the Embarrass River and along the Wolf between Fremont and New London, where the largest contiguous tract of Floodplain Forest in the entire plan area is found. Silver maple is the most common canopy dominant in the Floodplain Forests of the plan area, particularly on the lower terraces, while swamp white oak can dominate stands on more elevated terraces. Common associates are green ash, basswood, bur oak, and formerly, American elm. Cottonwood and river birch, which are important floodplain trees elsewhere, are virtually absent here. Common herbs are Virginia wild rye, wood nettle, sedges, cardinal flower, fowl manna grass, cut-grass, calico aster, sensitive fern, and reed canary grass in disturbed areas. Buttonbush is a locally dominant shrub that can form dense thickets on the edges of oxbow lakes, sloughs, and ponds.
- **Southern Hardwood Swamp:** this deciduous forested wetland community is found in insular basins with seasonally high water tables; the best examples are in glaciated southeast Wisconsin. In the plan area, successional stage and level of past disturbance affect the species composition of this community. Early-successional or disturbed sites often have low canopy cover and small-diameter cottonwood, green ash, red maple, and silver maple. Standing dead trees may be common. Disturbed sites often have abundant shrub cover of dogwood, willows, and prickly ash and may have dense, monotypic stands of reed canary grass. Later-successional, closed-canopy sites are dominated by swamp white oak, bur oak, silver maple, and green ash. Examples of this community are found at Navarino, Maine, Wolf River Bottoms—Herb Behnke Unit, Mack, and Rat River WAs and Shaky Lake SNA
- **Submergent Marsh:** this herbaceous aquatic macrophyte community occurs in lakes, ponds, and rivers, often in deeper water than emergent communities though with considerable overlap. The best-developed stands in the plan area are found along the main stem of the Wolf in sheltered waters of marshy lake edges and abandoned oxbows. Common dominants include pondweeds, waterweed, slender naiad, eel-grass, water milfoils, and bladderworts.

- **Emergent Marsh:** this community is fairly common in the plan area, found in marsh, lake, and riverine habitats, and consists of robust emergent macrophytes, often in pure stands of a single species. Cattail is the overwhelmingly common dominant, particularly on sites disturbed by ditching and diking. Elsewhere, on lake edges, bayous, and abandoned oxbow lakes, other species, including giant reed, bulrushes, common bur-reed, sedges, pickerelweed, and arrowheads can be locally dominant or co-dominant. Especially extensive and high quality examples are found at Wolf River, Rat River, and Mukwa WAs and at Shaky Lake SNA.
- **Emergent Marsh—Wild Rice:** wild rice is the dominant species in this emergent macrophyte community, which can also contain common water-plantain, arrowheads, river bulrush, common reed, and water-parsnip. In the plan area, wild rice beds occur in abandoned oxbows of the Wolf River and sheltered waters of marshy lakes and estuaries, including at Wolf River, Mukwa, Outagamie, and Wolf River Bottoms—Herb Behnke WAs and the LWRBNRA Wilderness parcel in Outagamie County.
- **Southern Sedge Meadow:** this open wetland community is widespread in southern Wisconsin and fairly common throughout the plan area, although undisturbed stands are rare due to impacts of ditching, draining, and diking. Tussock sedge and Canada bluejoint grass are typical dominants though woolly sedge, lake sedge, and bulrushes may be dominants or associates in the plan area. Other common species include water-horehound, paniced aster, blue flag, Canada goldenrod, spotted joe-pye-weed, broad-leaved cattail, and swamp milkweed. Reed canary grass can dominate disturbed stands, and diked stands can rapidly succeed to Shrub Carr.
- **Shrub Carr:** this shrub wetland community is common and widespread throughout southern Wisconsin (also occurring in the north) and many examples are present throughout the plan area. Tall shrubs such as red-osier dogwood, meadow-sweet, and willows dominate, with alder, poison sumac, and bog birch among the associates. Canada bluejoint grass, sedge, cattail, and purple loosestrife are common in the herb layer, though reed canary grass can become dominant in disturbed sites. Absence of fire and hydrologic disruption have often favored Shrub Carr at the expense of sedge meadow, wet prairie, and swamp hardwood communities.
- **Warmwater Rivers and Streams:** these are flowing waters with maximum water temperatures typically greater than 25° C (77° F). The rivers usually have watersheds greater than 500 square miles and mean annual flow rates greater than 200 cubic feet per second, while the stream watersheds and flow rates usually are below these values. These waters often host a rich fish fauna. Natural flood cycles and undammed flow are important characteristics in maintaining a diversity of aquatic life in these waterways, particularly populations of wetland-spawning fish, widely distributed species such as sturgeon, and certain species of mollusks that require wide-ranging fish hosts. The entire stretch of the Wolf within the plan area as well as the Embarrass River below the Pella Dam and the Little Wolf below the Manawa Dam are examples of waterways in the plan area that feature these characteristics.

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The following communities are not extensive within the LWRBNRA but are significant because of their rarity statewide, their condition or quality, or because they provide habitat for regionally rare species. While the plan area offers more limited management opportunity for these communities, they should be considered for the reasons just stated, particularly where they are part of a larger complex of habitats.

- Southern Mesic Forest (maple-basswood or maple-beech forests on terraces above the Wolf River floodplain)
- Northern Dry-mesic Forest (white pine-red oak-red maple)
- Northern Wet-mesic Forest (white cedar)
- Northern Mesic Forest (sugar maple-hemlock-beech-basswood)
- Northern Sedge Meadow (sedges-Canada bluejoint grass)
- Southern Tamarack Swamp (tamarack-Labrador tea-sedges-mosses)
- Alder Thicket (speckled alder-dogwood-willows-Canada bluejoint grass)
- Open Bog (sphagnum mosses-leatherleaf)
- Muskeg (sphagnum mosses-ericaceous shrubs-black spruce-tamarack)
- Wet Prairie (prairie cordgrass-Canada bluejoint grass)
- Wet-mesic Prairie (big bluestem-prairie dock)
- Sand Prairie (little bluestem-junegrass)
- Surrogate grasslands (restored prairie; oldfield)

#### **Invasive Species**

Invasive species threaten the diversity and function of native plant and animal communities. Invasive species are present throughout the LWRBNRA although levels of infestation vary considerably, with some areas relatively free of invasion and others with entrenched populations. Various species can be present in different habitat types, and controlling them and preventing their spread present ongoing management challenges across the plan area.

Riverine systems, which are prevalent in the plan area, are particularly susceptible to invasion by exotic species because of their linear shape, high edge-to-area ratio, and frequent flooding, which can transport animals or seeds from infested areas upstream and facilitate spread into uninvaded areas. Wetland and aquatic invasive plants are some of the most common and problematic invaders in the plan area. These include reed canary grass, common reed (*Phragmites*), flowering rush, purple loosestrife, curly-leaf pondweed, and Eurasian water milfoil. Reed canary grass is among the most aggressive and widespread of these wetland invaders, and also presents a danger in bottomland forests when forest management or some other disturbance opens up the canopy. Other threats to aquatic systems include zebra mussels, viral hemorrhagic septicemia (VHS), a potentially lethal exotic fish disease that can affect a variety of native fish, large-mouth bass virus (LMBV), and spring viremia of carp, which can harm Northern pike.

Forests of the plan area are threatened by garlic mustard, reed canary grass, common and glossy buckthorns, European honeysuckles, moneywort, Japanese barberry, autumn olive,

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European marsh thistle, oak wilt, butternut canker, gypsy moth, and emerald ash borer. Spotted knapweed, leafy spurge, Japanese knotweed, cypress spurge, wild parsnip, burdock, and chicory are problematic in drier upland areas and roadsides.

#### **Opportunities for Biodiversity Conservation**

The LWRBNRA presents several outstanding ecological opportunities for biodiversity conservation, detailed below. It is significant to note that while a moderate amount of the plan area's representative natural communities and rare species are on state lands, ownership is predominantly private. Public lands are scattered along the biologically rich Wolf River corridor and the lack of connecting corridors presents challenges for effective management across the landscape. Intervening lands, often hosting some of the largest and highest-quality sites, are important to consider because they connect existing managed properties, provide dispersal corridors for wildlife movement, and contain critical habitats. Effective conservation will involve managing and linking high-quality sites by engaging private landowners and other partners in management and land protection activities and programs.

Similarly, maintaining the highly significant aquatic communities in the plan area requires more than traditional protection methods such as land acquisition and easements. Protecting or improving water quality necessitates controlling point and non-point pollution throughout the plan area and thus requires close working relationships with private landowners. Other threats to aquatic habitats, such as development and turbidity and erosion associated with excessive boat traffic, also will require more creative approaches such as outreach, education, and landowner agreements.

#### ***Aquatic Habitats***

The plan area's many miles of large, warm-water stream habitat are perhaps its most outstanding ecological feature. These well-connected segments provide habitat for numerous species, many of them rare in eastern Wisconsin. The Wolf River Biotic Inventory (WDNR 2002b) identified and described the following 4 stream segments in the plan area as conservation priorities.

- **Wolf River Corridor—Shawano to CTH CCC:** this segment stretches 10 miles from the Shawano Dam to County Highway CCC north of Navarino WA. It is distinct from the remaining 91 miles of the Wolf in having a narrower floodplain with few off-channel habitats (sloughs, oxbows, etc.), steeper banks, and a predominantly sand and gravel substrate with some areas of cobble and boulders. This segment supports a diverse aquatic community of 20 mussel species, 109 insects and crustaceans, and at least 55 species of fish. Many species are Endangered, Threatened, and Special Concern, including 2 true bugs, 6 dragonflies, 4 fish, 2 stoneflies, 1 mayfly, 6 mussels, and 1 turtle. The population of shoal chub found here is the only one known in the entire Great Lakes basin, and the mussel beds immediately below the Shawano Dam host one of the best populations of the globally imperiled, federally Endangered snuffbox.

- **Wolf River Corridor—CTH CCC to Lake Poygan:** this segment covers the remaining 91 miles of the Wolf River in the plan area, from the County Highway CCC bridge downstream to Lake Poygan. The floodplain here is broader than in the 10-mile segment upstream, and broadens even further in its final 25 miles starting just below the mouth of the Little Wolf. Substrates are sand, silt, and clay, and there are extensive off-channel habitats. This segment, along with the upstream one, comprises one of the largest free-flowing warm-water reaches remaining in the Midwest. A rich aquatic fauna includes 148 insects and crustaceans, 23 mussels, and some 61 fish; 44 of these species are listed as Endangered, Threatened, or Special Concern. Several species found here are otherwise rare or absent in the Wisconsin portion of the Lake Michigan basin, including the Mississippi grass shrimp, elusive clubtail dragonfly, plains clubtail dragonfly, snuffbox mussel, pugnose minnow, river redhorse, and Western sand darter. Areas of high, sandy banks along this segment and the 10-mile segment upstream provide important nest sites for kingfishers, bank and Northern rough-winged swallows, and riverine turtles including the Threatened wood turtle.
- **Lower Embarrass River Corridor:** this segment encompasses the lower 55 miles of the Embarrass from the Pella Dam to the confluence with the Wolf at New London. It hosts an excellent diversity of aquatic species usually restricted to larger rivers, including 95 insects, 14 mussels, and 68 fish. Four beetles, 2 dragonflies, 3 fish, 1 caddisfly, 2 stoneflies, 2 mayflies, and 3 mussels are Endangered, Threatened, or Special Concern; the population of globally imperiled snuffbox mussel below the Pella dam is one of the few that is likely viable. Very high macroinvertebrate diversity is found just upstream of the Pella impoundment.
- **Little Wolf River Corridor:** this segment includes approximately 15 miles from the North Branch of the Little Wolf below the Manawa Dam, which continues as the main stem of the Little Wolf after its confluence with the South Branch, to the confluence with the Wolf. As with the Embarrass segment, this segment harbors a diverse aquatic community usually not found outside large rivers: 69 aquatic insects and arthropods, 2 mussels, and 69 fish, including 1 beetle, 4 dragonflies, 1 mayfly, 3 fish, and 1 mussel that are Endangered, Threatened, or Special Concern. This segment also contains stretches of fast water and rapids, which are uncommon habitats in the Lower Wolf basin.

### ***Floodplain Forest***

The LWRBNRA offers the best opportunity in eastern Wisconsin, in terms of both scale and quality, to protect and manage this lowland forest community. These forests provide critical breeding habitat for prothonotary warbler, a floodplain obligate, interior forest species such as yellow-crowned night-heron, red-shouldered hawk, yellow-billed cuckoo, and cerulean warbler, and many other native plant and animal species. They also provide stopover habitat for migrating landbirds moving through in both spring and fall. Larger, intact stands of older forest are the higher priority, as these provide better habitat for sensitive species; these are most valuable where they are connected to other habitats (marshes, sedge meadows, oxbow ponds, sloughs, etc.). State properties with important

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sites include Navarino, Outagamie, Wolf River Bottoms—LaSage Unit, and Mukwa WAs and the Wolf River FA. Important sites that are predominantly or entirely in private ownership include the river corridor between Shaw’s Landing and Fremont; Mosquito Hill-Liberty Bottoms; Leeman Bottoms; Maine Bottoms; Lower Embarrass River Bottoms; and S&M Bottoms.

#### *Marsh—Emergent and Submergent Types*

These communities—marshes, sedge meadows, and shrub swamps—are well represented in the plan area, particularly in the southern portion but also throughout, including interspersed within tracts of Floodplain Forest. Numerous large and high-quality examples exist. These habitats are critical for spawning fish such as walleye, breeding birds such as Virginia rail, least and American bitterns, black tern, and sedge wren, waterfowl, and many other species. During migration, thousands of tundra swans, Canada geese, and ducks use the wetlands as staging and stopover habitat, and migrating shorebirds can be abundant in areas with exposed mudflats. Important sites on state land are at Outagamie, Mukwa, Rat, and Wolf River WAs, Shaky Lake SNA, and Winchester Meadow new SNA. Important privately owned sites include Mosquito Hill/Liberty Bottoms; the Wolf River corridor between Shaw’s Landing and Fremont, particularly on the margins of Partridge, Partridge Crop, and Cincoe Lakes; Clark’s Point; and Piacenza Marsh.

#### *Uncommon or Rare Communities*

A number of examples of uncommon or rare communities are found throughout the plan area, supporting species not found elsewhere in the basin. It is important to protect and manage these regionally significant communities, many of which are large and in good condition. Examples on state lands include:

- **Navarino WA:** Northern Dry-mesic Forest; Northern Mesic Forest; Northern Wet-mesic Forest; Southern Tamarack Swamp; Northern Sedge Meadow; Sand Prairie.
- **Deer Creek WA:** Muskeg; Open Bog; Southern Tamarack Swamp.
- **Wolf River Bottoms WA—Herb Behnke Unit:** Southern Mesic Forest.
- **Wolf River Bottoms WA—LaSage Unit:** Southern Mesic Forest.
- **Hortonville Bog SNA:** Northern Wet-mesic Forest; Muskeg; Open Bog.
- **Mukwa WA:** Southern Mesic Forest.
- **Shaky Lake SNA:** Northern Wet Forest; Northern Dry-mesic Forest; Southern Mesic Forest; Northern Sedge Meadow.
- **Winchester Meadow new SNA:** Northern Sedge Meadow.

Private lands examples include:

- **Leeman Bottoms:** Southern Mesic Forest; Northern Sedge Meadow.
- **Lower Embarrass River Bottoms:** Southern Sedge Meadow.
- **Wolf River Corridor—Shaw’s Landing to Fremont:** Southern Tamarack Swamp.
- **Piacenza Marsh:** Northern Sedge Meadow.

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***Rare Species and Natural Communities of the LWRBNRA Properties***

Many rare species and examples of high-quality natural communities have been documented in the LWRBNRA. Table 3.5 below lists those that are currently mapped in the Natural Heritage Inventory (NHI) database for the LWRBNRA, by property.

**Table 3.5. Rare Species and Natural Communities of the LWRBNRA, by property.**

Property	Common Name	Scientific Name	Year Last Observed	State Rank*	Global Rank*	State Status*	USA/ESA Status*
<b>Deer Creek Wildlife Area</b>							
	Ash-brown Grasshopper	<i>Trachyrhachys kiowa</i>	1999	S2	G5	SC/N	
	Indian Cucumber-root	<i>Medeola virginiana</i>	1999	S3	G5	SC	
	Osprey	<i>Pandion haliaetus</i>	2008	S4B	G5	SC/M	
	Open Bog		1999	S4	G5	NA	
	Tamarack (Poor) Swamp		1999	S3	G4	NA	
<b>Embarrass River</b>							
	A Flat-headed Mayfly	<i>Pseudiron centralis</i>	1999	S3	G5	SC/N	
	Blanding's Turtle	<i>Emydoidea blandingii</i>	2007	S3	G4	THR	
	Pygmy Snaketail	<i>Ophiogomphus howei</i>	1999	S4	G3	THR	
<b>Hortonville Bog State Natural Area</b>							
	A Water Scavenger Beetle	<i>Cymbiodyta acuminata</i>	1999	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus consortus</i>	1999	S3	GNR	SC/N	
	Canada Warbler	<i>Wilsonia canadensis</i>	2007	S3B	G5	SC/M	
	Cuckooflower	<i>Cardamine pratensis</i>	2005	S3	G5	SC	
	Black Spruce Swamp		2007	S3?	G5	NA	
	Northern Wet-mesic Forest		2007	S3S4	G3?	NA	
	Open Bog		2007	S4	G5	NA	
<b>Jenny Bayou/Colic Slough Remnant Fish Habitat Land</b>							
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
	Lake--Oxbow		1978	SU	GNR	NA	
	Shrub-carr		1978	S4	G5	NA	
<b>LWRBNRA Habitat Area</b>							
Shawano	Longear Sunfish	<i>Lepomis megalotis</i>	1926	S2	G5	THR	
Outagamie	A Long-horned Casemaker Caddisfly	<i>Trienodes nox</i>	2000	S1S3	G5	SC/N	
	Blanding's Turtle	<i>Emydoidea blandingii</i>	2007	S3	G4	THR	
	Columbine Dusky Wing	<i>Erynnis lucilius</i>	1991	S2	G4	SC/N	
	Gorgone Checker Spot	<i>Chlosyne gorgone</i>	1991	S3	G5	SC/N	
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
	Red-shouldered Hawk	<i>Buteo lineatus</i>	2000	S3S4B, S1N	G5	THR	
	Two-spotted Skipper	<i>Euphyes bimacula</i>	1989	S3	G4	SC/N	
	Emergent Marsh - Wild Rice		1999	S3	G3G4	NA	
	Floodplain Forest		2001	S3	G3?	NA	
	Northern Sedge Meadow		1980	S3	G4	NA	
	Northern Wet-mesic Forest		2001	S3S4	G3?	NA	
Waupaca	A Tiger Beetle	<i>Cicindela patruela huberi</i>	1999	S3	G3T3	SC/N	

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Property	Common Name	Scientific Name	Year Last Observed	State Rank*	Global Rank*	State Status*	USA/ESA Status*
	American Bittern	<i>Botaurus lentiginosus</i>	1984	S3B	G4	SC/M	
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Northern Bog Sedge	<i>Carex gynocrates</i>	1931	S3	G5	SC	
	Red-shouldered Hawk	<i>Buteo lineatus</i>	2000	S3S4B, S1N	G5	THR	
	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2000	S3B	G5	SC/M	
	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>	1995	S1B	G5	THR	
	Emergent Marsh		1979	S4	G4	NA	
	Floodplain Forest		2000	S3	G3?	NA	
	Lake--Shallow, Hard, Drainage		1979	SU	GNR	NA	
Winnebago	Blanding's Turtle	<i>Emydoidea blandingii</i>	2000	S3	G4	THR	
	Common Bog Arrow-grass	<i>Triglochin maritima</i>	2000	S3	G5	SC	
	Large Roundleaf Orchid	<i>Platanthera orbiculata</i>	1931	S3	G5	SC	
	Northern Sedge Meadow		2000	S3	G4	NA	
	Wet Prairie		1984	SU	G3	NA	
<b>Mack Wildlife Area</b>							
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Henslow's Sparrow	<i>Ammodramus henslowii</i>	2000	S3B	G4	THR	
	King Rail	<i>Rallus elegans</i>	2000	S1B	G4	SC/M	
	Least Bittern	<i>Ixobrychus exilis</i>	2000	S3B	G5	SC/M	
	Southern Hardwood Swamp		1999	S2	G4?	NA	
<b>Maine Wildlife Area</b>							
	A Predaceous Diving Beetle	<i>Agabus inscriptus</i>	1999	S2S3	GNR	SC/N	
	A Predaceous Diving Beetle	<i>Celina hubbelli</i>	1999	S2S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Cymbiodyta acuminata</i>	1999	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus consortus</i>	1999	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Hydrochara leechi</i>	1999	S1	GNR	SC/N	
	A Water Scavenger Beetle	<i>Laccobius agilis</i>	1999	S2S3	GNR	SC/N	
	Cantrall's Bog Beetle	<i>Liodessus cantralli</i>	1999	S1S2	GNR	SC/N	
<b>Miller's Bayou Remnant Fish Habitat Land</b>							
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
<b>Mukwa Wildlife Area</b>							
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Broad-winged Skipper	<i>Poanes viator</i>	2000	S3	G5	SC/N	
	Cerulean Warbler	<i>Dendroica cerulea</i>	2000	S2S3B	G4	THR	
	Cuckooflower	<i>Cardamine pratensis</i>	1999	S3	G5	SC	
	Osprey	<i>Pandion haliaetus</i>	2000	S4B	G5	SC/M	
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
	Red-shouldered Hawk	<i>Buteo lineatus</i>	2000	S3S4B, S1N	G5	THR	
	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2000	S3B	G5	SC/M	
	Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>	1995	S1B	G5	THR	
	Emergent Marsh		1999	S4	G4	NA	
<b>Navarino Wildlife Area</b>							
	A Long-horned Casemaker Caddisfly	<i>Triaenodes nox</i>	2000	S1S3	G5	SC/N	
	A Predaceous Diving Beetle	<i>Agabus bicolor</i>	1999	S3	GNR	SC/N	
	A Predaceous Diving Beetle	<i>Hydroporus badiellus</i>	1999	S3?	GNR	SC/N	
	A Predaceous Diving Beetle	<i>Ilybius discedens</i>	1999	S3	GNR	SC/N	

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Property	Common Name	Scientific Name	Year Last Observed	State Rank*	Global Rank*	State Status*	USA/ESA Status*
	A Predaceous Diving Beetle	<i>Celina hubbelli</i>	1999	S2S3	GNR	SC/N	
	A Predaceous Diving Beetle	<i>Agabus wasastjerna</i>	2000	S2?	GNR	SC/N	
	A Tiger Beetle	<i>Cicindela patruela huberi</i>	2000	S3	G3T3	SC/N	
	A Tiger Beetle	<i>Cicindela patruela patruela</i>	2000	S2	G3T3	SC/N	
	A Velvet Waterbug	<i>Hebrus buenoi</i>	2000	S1?	G4	SC/N	
	A Water Scavenger Beetle	<i>Cymbiodyta minima</i>	1999	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus consortus</i>	2000	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus perplexus</i>	2000	S2?	GNR	SC/N	
	American Bittern	<i>Botaurus lentiginosus</i>	2000	S3B	G4	SC/M	
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	2003	S4B,S2 N	G5	SC/P	
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Blanding's Turtle	<i>Emydoidea blandingii</i>	2007	S3	G4	THR	
	Broad-winged Skipper	<i>Poanes viator</i>	2000	S3	G5	SC/N	
	Canada Warbler	<i>Wilsonia canadensis</i>	2007	S3B	G5	SC/M	
	Common Moorhen	<i>Gallinula chloropus</i>	2001	S2B	G5	SC/M	
	Henslow's Sparrow	<i>Ammodramus henslowii</i>	2000	S3B	G4	THR	
	Indian Cucumber-root	<i>Medeola virginiana</i>	1999	S3	G5	SC	
	Least Bittern	<i>Ixobrychus exilis</i>	2000	S3B	G5	SC/M	
	Leonard's Skipper	<i>Hesperia leonardus</i>	2000	S3	G4	SC/N	
	Little White Tiger Beetle	<i>Cicindela lepida</i>	2000	S2	G3G4	SC/N	
	Mulberry Wing	<i>Poanes massasoit</i>	2000	S3	G4	SC/N	
	Northern Yellow Lady's-slipper	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	2007	S3	G5T4 Q	SC	
	Osprey	<i>Pandion haliaetus</i>	2008	S4B	G5	SC/M	
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
	Red-shouldered Hawk	<i>Buteo lineatus</i>	2007	S3S4B, S1N	G5	THR	
	Showy Lady's-slipper	<i>Cypripedium reginae</i>	2007	S3	G4	SC	
	Floodplain Forest		2000	S3	G3?	NA	
	Northern Dry-mesic Forest		1999	S3	G4	NA	
	Northern Sedge Meadow		2000	S3	G4	NA	
	Northern Wet-mesic Forest		2007	S3S4	G3?	NA	
	Sand Prairie		1999	S2	GNR	NA	
	Stream--Fast, Hard, Cold		1981	S4	GNR	NA	
<b>Outagamie Wildlife Area</b>							
	American Bittern	<i>Botaurus lentiginosus</i>	2000	S3B	G4	SC/M	
	Bird Rookery	<i>Bird Rookery</i>	2004	SU	G5	SC	
	Black Tern	<i>Chlidonias niger</i>	2004	S2B	G4	SC/M	
	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	2004	S2B	G5	SC/M	
	Blanding's Turtle	<i>Emydoidea blandingii</i>	2007	S3	G4	THR	
	Broad-winged Skipper	<i>Poanes viator</i>	2000	S3	G5	SC/N	
	Cerulean Warbler	<i>Dendroica cerulea</i>	2000	S2S3B	G4	THR	
	Least Bittern	<i>Ixobrychus exilis</i>	2000	S3B	G5	SC/M	
	Mulberry Wing	<i>Poanes massasoit</i>	2000	S3	G4	SC/N	
	Osprey	<i>Pandion haliaetus</i>	2008	S4B	G5	SC/M	
	Emergent Marsh		1999	S4	G4	NA	
	Floodplain Forest		1999	S3	G3?	NA	
<b>Rat River Wildlife Area</b>							

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Property	Common Name	Scientific Name	Year Last Observed	State Rank*	Global Rank*	State Status*	USA/ESA Status*
	Arctic Shrew	<i>Sorex arcticus</i>	1999	S3S4	G5	SC/N	
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Broad-winged Skipper	<i>Poanes viator</i>	2000	S3	G5	SC/N	
	Handsome Sedge	<i>Carex formosa</i>	2001	S2	G4	THR	
	Least Bittern	<i>Ixobrychus exilis</i>	2000	S3B	G5	SC/M	
	Osprey	<i>Pandion haliaetus</i>	2008	S4B	G5	SC/M	
	Emergent Marsh		1999	S4	G4	NA	
	Northern Mesic Forest		1999	S4	G4	NA	
	Southern Dry-mesic Forest		1978	S3	G4	NA	
	Southern Hardwood Swamp		2001	S2	G4?	NA	
	Southern Sedge Meadow		1999	S3	G4?	NA	
<b>Shaky Lake State Natural Area</b>							
	Acadian Flycatcher	<i>Empidonax virescens</i>	2000	S3B	G5	THR	
	Black Tern	<i>Chlidonias niger</i>	2002	S2B	G4	SC/M	
	Cuckooflower	<i>Cardamine pratensis</i>	1999	S3	G5	SC	
	Wood Turtle	<i>Glyptemys insculpta</i>	1987	S2	G4	THR	
	Hardwood Swamp		1999	S3	G4	NA	
	Lake--Shallow, Hard, Seepage		1987	SU	GNR	NA	
	Northern Sedge Meadow		1999	S3	G4	NA	
	Southern Dry-mesic Forest		1999	S3	G4	NA	
<b>Templeton Bayou Remnant Fish Habitat Land</b>							
	Black Tern	<i>Chlidonias niger</i>	2000	S2B	G4	SC/M	
	Prothonotary Warbler	<i>Protonotaria citrea</i>	2000	S3B	G5	SC/M	
<b>Winchester Meadow New State Natural Area</b>							
	Common Bog Arrow-grass	<i>Triglochin maritima</i>	2000	S3	G5	SC	
	Northern Sedge Meadow		2000	S3	G4	NA	
<b>Wolf River</b>							
	A Common Burrower Mayfly	<i>Pentagenia vittigera</i>	1992	S1S2	G5	SC/N	
	A Flat-headed Mayfly	<i>Pseudiron centralis</i>	1999	S3	G5	SC/N	
	A Predaceous Diving Beetle	<i>Lioporeus triangularis</i>	1999	S1S2	GNR	SC/N	
	A Primitive Minnow Mayfly	<i>Parameletus chelifera</i>	1993	S1?	G5	SC/N	
	A Riffle Beetle	<i>Stenelmis fuscata</i>	1999	S3	GNR	SC/N	
	A Small Minnow Mayfly	<i>Plauditus cestus</i>	1999	S2	G5	SC/N	
	Banded Killifish	<i>Fundulus diaphanus</i>	1974	S3	G5	SC/N	
	Blanding's Turtle	<i>Emydoidea blandingii</i>	2001	S3	G4	THR	
	Buckhorn	<i>Tritogonia verrucosa</i>	2005	S2	G4G5	THR	
	Elktoe	<i>Alasmidonta marginata</i>	1995	S4	G4	SC/P	
	Greater Redhorse	<i>Moxostoma valenciennesi</i>	1974	S3	G4	THR	
	Lake Chubsucker	<i>Erimyzon sucetta</i>	1981	S3	G5	SC/N	
	Lake Sturgeon	<i>Acipenser fulvescens</i>	1991	S3	G3G4	SC/H	
	Pugnose Minnow	<i>Opsopoeodus emiliae</i>	1981	S3	G5	SC/N	
	Pugnose Shiner	<i>Notropis anogenus</i>	1963	S2	G3	THR	
	Pygmy Snaketail	<i>Ophiogomphus howei</i>	1999	S4	G3	THR	
	River Redhorse	<i>Moxostoma carinatum</i>	1981	S2	G4	THR	
	Round Pigtoe	<i>Pleurobema sintoxia</i>	1995	S3	G4G5	SC/P	
	Salamander Mussel	<i>Simpsonaias ambigua</i>	1989	S2S3	G3	THR	
	Snuffbox	<i>Epioblasma triquetra</i>	1995	S1	G3	END	LE
	Striped Shiner	<i>Luxilus chrysocephalus</i>		S1	G5	END	
	Weed Shiner	<i>Notropis texanus</i>	1981	S3	G5	SC/N	
	Western Sand Darter	<i>Etheostoma clarum</i>	1994	S3	G3	SC/N	

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Property	Common Name	Scientific Name	Year Last Observed	State Rank*	Global Rank*	State Status*	USA/ESA Status*
	Wood Turtle	<i>Glyptemys insculpta</i>	2000	S2	G4	THR	
<b>Wolf River Bottoms State Natural Area</b>							
	Buckhorn	<i>Tritogonia verrucosa</i>	2005	S2	G4G5	THR	
	Elktoe	<i>Alasmidonta marginata</i>	1995	S4	G4	SC/P	
	Lake Sturgeon	<i>Acipenser fulvescens</i>	1981	S3	G3G4	SC/H	
	Pickerel Frog	<i>Lithobates palustris</i>	2006	S3S4	G5	SC/H	
	Pugnose Minnow	<i>Opsopoeodus emiliae</i>	1973	S3	G5	SC/N	
	Round Pigtoe	<i>Pleurobema sintoxia</i>	1995	S3	G4G5	SC/P	
	Snuffbox	<i>Epioblasma triquetra</i>	1995	S1	G3	END	LE
	Western Sand Darter	<i>Etheostoma clarum</i>	1994	S3	G3	SC/N	
	Floodplain Forest		2000	S3	G3?	NA	
	Northern Sedge Meadow		1980	S3	G4	NA	
<b>Wolf River Bottoms Wildlife Area—Herb Behnke Unit</b>							
	A Crawling Water Beetle	<i>Haliphus canadensis</i>	1999	S2	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus consortus</i>	1999	S3	GNR	SC/N	
	American Bittern	<i>Botaurus lentiginosus</i>	2000	S3B	G4	SC/M	
	Bird Rookery	<i>Bird Rookery</i>	2004	SU	G5	SC	
	Black Tern	<i>Chlidonias niger</i>	2004	S2B	G4	SC/M	
	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	2004	S2B	G5	SC/M	
	Broad-winged Skipper	<i>Poanes viator</i>	2000	S3	G5	SC/N	
	Common Moorhen	<i>Gallinula chloropus</i>	2000	S2B	G5	SC/M	
	King Rail	<i>Rallus elegans</i>	2000	S1B	G4	SC/M	
	Least Bittern	<i>Ixobrychus exilis</i>	2000	S3B	G5	SC/M	
	Osprey	<i>Pandion haliaetus</i>	2008	S4B	G5	SC/M	
	Southern Mesic Forest		1999	S3	G3?	NA	
<b>Wolf River Bottoms Wildlife Area—LaSage Unit</b>							
	A Predaceous Diving Beetle	<i>Matus bicarinatus</i>	1999	S2S3	GNR	SC/N	
	A Riffle Beetle	<i>Stenelmis fuscata</i>	1999	S3	GNR	SC/N	
	A Water Scavenger Beetle	<i>Enochrus sayi</i>	1999	S3	GNR	SC/N	
	Cerulean Warbler	<i>Dendroica cerulea</i>	2000	S2S3B	G4	THR	
	Handsome Sedge	<i>Carex formosa</i>	1999	S2	G4	THR	
	Red-shouldered Hawk	<i>Buteo lineatus</i>	2005	S3S4B, S1N	G5	THR	
	Floodplain Forest		1999	S3	G3?	NA	
	Southern Mesic Forest		2001	S3	G3?	NA	
<b>Wolf River Fishery Area</b>							
	Floodplain forest		2000	S3	G3?	NA	
<b>Wolf River Wildlife Area</b>							
	American Bittern	<i>Botaurus lentiginosus</i>	2001	S3B	G4	SC/M	
	Black Tern	<i>Chlidonias niger</i>	2001	S2B	G4	SC/M	
	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	2001	S2B	G5	SC/M	
	Cuckooflower	<i>Cardamine pratensis</i>	1999	S3	G5	SC	
	Emergent Marsh		1999	S4	G4	NA	
	Emergent Marsh - Wild Rice		1999	S3	G3G4	NA	
	Floodplain Forest		1999	S3	G3?	NA	

\* For an explanation of state and global ranks and state and USA/ESA status, see <http://dnr.wi.gov/org/land/er/wlist/>

***Role of the LWRBNRA in Implementing the Wisconsin Wildlife Action Plan***

The Wisconsin Wildlife Action Plan Implementation (WDNR 2008) refined and focused the information in the 2005 Plan by prioritizing the more than 1,700 conservation actions listed in the Plan and identifying Conservation Opportunity Areas (COAs), specific places on the landscape where those actions can be implemented most effectively and efficiently. The lower Wolf River was identified as a Continentally Important Resource in this implementation element and as a COA in all 3 ELs of the LWRBNRA for Warmwater River, Floodplain Forest, and wetland communities. The following Priority Conservation Actions apply to the LWRBNRA:

Northern & Central Lake Michigan Coastal:

- Protect and restore habitat in the lower Wolf River to accommodate the habitat preferences of Shoal Chub.
- Maintain and connect large blocks of older floodplain forest to provide habitat for the large number of SGCN that use this habitat while addressing the regeneration difficulties associated with dense stands of reed canary grass.
- Maintain long-term wetland productivity on public properties by mimicking natural hydrologic regimes within an adaptive management framework.
- Protect large insular hardwood swamps from hydrological changes and fragmentation due to road and housing development.
- Develop management and response plans for hardwood swamps to prepare for the probable arrival of emerald ash borer.

Southeast Glacial Plains:

- Preserve and manage all wet-mesic prairie sites, restore degraded sites, and manage the sites in a matrix of surrogate grasslands and other shrub and savanna habitats for area-sensitive species.
- Where possible, promote private land management of small sites by offering incentives to private landowners for preservation or restoration of prairies.
- Monitor wet-mesic prairies to determine whether prescribed burning and other management activities are maintaining invertebrate diversity.
- Preserve and manage all wet-mesic prairie, calcareous fen and tamarack fen sites; restore degraded sites (emphasizing restoration of hydrology), and manage the sites in a matrix of sedge meadow, surrogate grasslands and other shrub and savanna habitats for area-sensitive species.

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- Conduct inventories to better delineate Cerulean Warbler populations on public and private lands.
- Maintain large blocks of open sedge meadow and manage within a complex of associated wetlands such as wet prairie, emergent marsh, shrub-carr, alder thicket and floodplain forest by maintaining hydrology, tree cutting and harvest, prescribed fire and eradicating invasive plant species.
- This landscape has an especially important role for managing shorebird habitat on public lands at flowages and impoundments. Through dikes, water levels can be raised to flood these areas, and through water control structures, water levels can be manipulated to benefit shorebirds. Migration phenology and specific habitat requirements must be considered when managing for shorebirds.
- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide suitable habitat for species that require large areas or are dependent upon a mosaic of interconnected habitats for their long-term survival, and will provide migratory bird stopover habitat.

#### **Recreational Facilities and Use**

The traditional outdoor activities of hunting, fishing, and trapping are the most prevalent throughout the LWRBNRA, with boating and wildlife watching also popular. The state properties are the major providers of wildlife-based recreation land in the plan area. Developed or maintained recreational facilities on the properties are few, mostly limited to parking areas and boat access areas. Navarino WA is the exception, hosting the Navarino Nature Center, a private, non-profit educational facility located on 41.5 acres leased from the state. Other facilities here include a cabin, amphitheatre, outdoor restrooms, picnic shelter, fire ring, pump, and some 15 miles of hiking trails which Nature Center staff groom in the winter for cross-country skiing and snowshoeing.

Navarino, Deer Creek, Maine, Mukwa, and Rat River WAs have snowmobile trails that link to larger regional networks; these trails are maintained and groomed by private snowmobile clubs. Motorized recreation otherwise is not offered on the state properties. Many properties have rough service roads or logging roads that receive minimal maintenance (mowing; clearing of downed trees) to keep them open for management or emergency vehicle access. While these are not maintained as trails for public use, they are used informally by visitors to access the properties on foot. Similarly, the properties have many miles of dikes which are mowed to keep them free of woody encroachment; these also are used to access the properties.

There are 4 areas within the LWRBNRA that are seasonally closed to waterfowl hunting, primarily as refuge areas for waterfowl in order to maintain and enhance the supply

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throughout the hunting season. Closed areas are posted with Department signs. The 4 closed areas are:

- 160 acres of northeast White Lake, Town of Royalton, Waupaca County: “Lake closed area; trapping permitted.” (NR 11.06(3)(a), Wis. Admin. Code)
- 1,000 acres in south-central Navarino WA: “Waterfowl closed area; gun deer hunting permitted.” (NR 11.04(4)(a), Wis. Admin. Code)
- 50 acres in central Outagamie WA: “Waterfowl closed area except gun deer and special goose hunting.” (NR 11.02(8)(a), Wis. Admin. Code)
- 180 acres in southeast Metzsig Marsh segment of the Wolf River WA: “Waterfowl closed area; trapping permitted.” (NR 11.031(11)(a), Wis. Admin. Code)

Remnant fish habitat lands may be posted as “No Entry” areas between March 15 and the first Saturday in May to allow walleye to spawn and eggs to hatch undisturbed.

**Existing Infrastructure**

Existing infrastructure on the LWRBNRA state properties is summarized in Table 3.6, and is shown in Map Series E.

**Table 3.6. Infrastructure Summary for the LWRBNRA State Properties.**

Facility	Description	Properties
Parking areas	93	Deer Creek; Hortonville Bog SNA; LWRBNRA (Outagamie; Shawano; Winnebago); Mack; Maine; Mukwa; Navarino; Rat River; Wolf River Bottoms—Herb Behnke; Wolf River Bottoms—LaSage; Wolf River WA
Boat landings	5 state-owned	LWRBNRA (Shawano); Navarino
Trails	29.9 miles Hiking/ski/snowshoe; Snowmobile	Deer Creek; Maine; Mukwa; Navarino; Rat River
Wildlife viewing structures	3	LWRBNRA (Outagamie); Navarino
Dikes	36 miles	LWRBNRA (Outagamie); Navarino; Outagamie; Wolf River Bottoms—Herb Behnke; Wolf River Bottoms—LaSage; Wolf River WA
Water control structures	82	Deer Creek; LWRBNRA (Outagamie); Navarino; Outagamie; Wolf River Bottoms—Herb Behnke; Wolf River Bottoms—LaSage; Wolf River WA
Buildings	19 Barn; Machine shed; Storage; Vehicle/equipment maintenance shop; Residence/lodge; Pump house	LWRBNRA (Outagamie); Navarino; Wolf River Bottoms—Herb Behnke; Wolf River Bottoms—LaSage

### **CHAPTER 3: Background and Supporting Information**

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Parking areas are mostly small gravel, dirt, or grass lots. Only 2 are paved, both on Navarino WA, and only 3 include boat access—two on Navarino and one on Mukwa WA. Of the 13 boat landings, 2 are carry-in and the rest are ramps. Most of these offer access to the Wolf River but 2 provide access to the Rat River and White Lake (Shawano County).

The only trails formally maintained for public use are hiking trails on the Navarino WA associated with the Navarino Nature Center; these are maintained by Nature Center staff. Several of these trails also are available for cross-country skiing and snowshoeing in winter. The few snowmobile trails on the state properties are maintained by private snowmobile clubs and connect to larger regional trail networks. Portions of some access roads are maintained for public use by Department staff.

The 3 wildlife viewing structures target bird-watching opportunities. Two— at Van Patten Road on the LWRBNRA DOT Mitigation Site parcel in Outagamie County and on Navarino WA near Navarino Nature Center in Shawano County—are existing Watchable Wildlife sites. The Van Patten Road site features a handicap-accessible viewing platform. The Navarino site offers an elevated platform with mounted, handicap-accessible binoculars. The third site, on Navarino at Lindsten Road, consists of a small mound overlooking cropped fields where geese and cranes gather in fall and spring.

Existing buildings are mostly for equipment and vehicle storage. There are 3 residences. The one on the LWRBNRA HA Wilderness parcel in Outagamie County was leased by a former caretaker for a limited term and is now housing Department deer research staff. The other 2 are on the Wolf River Bottoms WA—Herb Behnke Unit and LaSage Unit and are seasonally occupied by Department staff (researchers, interns) and volunteers (e.g., retired wardens during the spring sturgeon guard camp). The residence on the LaSage Unit, known as the LaSage Lodge, 2 outbuildings, and some 20 acres of land were formerly leased for outdoor skills and educational purposes by the Fox Valley chapter of Whitetails Unlimited, who was paying the utilities on the building. That organization is no longer leasing the building and responsibility for upkeep and utilities has reverted back to the Department.

#### **Cultural Resources**

The rich natural environment of the LWRBNRA has long provided a bountiful harvest of plant, animal, and other resources for the human occupants of the region. Reflecting this bounty, hundreds of prehistoric and early historic archaeological sites are recorded within the plan area, and hundreds more are yet to be discovered.

Cultural resource property types found in the LWRBNRA include prehistoric and historic Indian campsites and villages, burial areas including conical and “effigy” or animal shaped mounds, garden beds, and others, with the oldest sites dating back ca. 12,000 years ago. Historic sites associated with Euro-American settlement include fur-trade-era sites, remnant farmsteads, a transportation-related site, historic structures, and others.

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**Background and Supporting Information**

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All sites occurring on public lands are protected against unauthorized disturbance under provisions of various federal and/or state laws, and burial sites (including cemeteries and mound sites) are protected on private lands as well.

Because of these laws, development projects within the LWRBNRA, including those initiated by the Department and/or occurring on Department lands, are subject to Departmental review and approval. Archaeological and other cultural resource investigations may be necessary before a project is approved, and projects should designate funds for required investigations as a component of the project budget.

## **FINDINGS AND CONCLUSIONS**

### **Ecological Significance and Capability**

The lands of the LWRBNRA contain an ecologically significant assemblage of natural communities and associated biodiversity. The 100 miles of the Wolf River encompassed by the plan area represent one of the longest free-flowing warmwater river reaches in the upper Midwest, and the river's floodplain is the largest and most intact in eastern Wisconsin. Aquatic habitats in the Wolf and its tributaries are highly significant to many species of fish, invertebrates, and turtles, including numerous rare species. Extensive, largely intact complexes of forested and open wetlands, including some regionally rare types, are present along virtually the entire river corridor, hosting many species, both rare and common, of mammals, birds, fish, herptiles, and invertebrates. These ecological features exist on both public and private lands in the plan area, and their maintenance and protection entails both appropriate management of state-owned lands and collaborations with private landowners, local governments, other resource agencies, conservation organizations, and other partners.

The plan area offers excellent opportunity to manage for: Floodplain Forest; Southern Hardwood Swamp; Submergent Marsh; Emergent Marsh; Emergent Marsh—Wild Rice; Southern Sedge Meadow; Shrub Carr; and Warmwater Rivers and Streams. There also are smaller examples of regionally rare communities, including several more typical of northern Wisconsin such as Northern Sedge Meadow and Open Bog.

One hundred and twenty rare species (State Endangered, Threatened, or Special Concern) have been documented within the LWRBNRA, including 28 vertebrate and 64 invertebrate SGCN. The entire plan area has been identified as a Wisconsin Important Bird Area for its value to rare breeding birds such as prothonotary warbler and cerulean warbler. The Wolf River, as a major riparian corridor with a north-south orientation, also provides critical migration and stopover habitat for thousands of landbirds, waterfowl, and shorebirds within the Lake Michigan Basin.

In addition to numerous rare species, the diverse habitats of the LWRBNRA lands harbor a great many common plant and animal species. Common game species include walleye, white bass, northern pike, white-tailed deer, American woodcock, waterfowl, muskrat, and rabbit. The plan area is home to 40% of the state's native plants and 60% of the state's breeding birds, as well as many other common species of fish, mammals, birds, and herptiles.

The plan area presents an outstanding opportunity to connect and manage an extensive complex of both terrestrial and aquatic habitats associated with a large, free-flowing river floodplain, including high-quality natural communities that support rare species as well as more common types (e.g., aspen) that are productive for common wildlife species. Such ecological capability is especially significant in this landscape, which has already been highly altered by human activities and is in a region experiencing increasing population growth and development pressure.

Improving water quality, limiting disturbance, and maintaining or restoring hydrology will be important factors in maintaining the quality of both aquatic and terrestrial wetland habitats. There is potential to manage forested communities to promote a larger proportion of older age-classes, currently underrepresented in the plan area, which would benefit rare species that require mature forest. Opportunity exists to improve shorebird stopover habitat through water level manipulations at impoundment or flowages. Invasive species are a current and growing threat throughout the plan area and require ongoing management to control current infestations and limit or prevent their spread.

### **Recreational Significance and Capability**

Hunting, fishing, and trapping are among the most prevalent recreational activities in the plan area. While private lands such as hunt clubs provide some opportunity for these activities, the state properties of the LWRBNRA are the most important purveyors of public land for these traditional outdoor pursuits. Water-based recreation, notably fishing and boating, is extremely popular. Canoeing and kayaking are becoming increasingly more popular, and geo-caching, birdwatching and other wildlife viewing also have greatly increased in popularity in recent years. Other common recreational activities in the plan area include hiking, bicycling, cross-country skiing, snowmobile/ATV riding, and horseback riding. The tradition of outdoor recreation in the plan area is strong and well-established and the many visitors attracted to these opportunities contribute significantly to local economies.

Two important factors frame the issue of the LWRBNRA's current and potential recreational capability. The first is that recreational demand is projected to rise steadily due to increased development in the plan area and population growth in the nearby Fox Valley and Green Bay urban areas, yet significant amounts of new lands will not become open to public recreation with the majority of land in the plan area in private ownership and expected to remain so. The second is that the soils of the plan area, mostly wet, poorly drained, and located adjacent to rivers and subject to periodic flooding, limit, sometime severely, the potential for additional recreational facility development.

Therefore, while the significance of the plan area's state properties—the largest blocks of land open to public recreation—is expected to increase, these properties have limited potential to meet some important recreational supply shortages identified for the region, notably campgrounds and maintained trails. There is some potential on these properties to meet other demands identified for the plan area such as additional wildlife viewing opportunities. Dispersed camping opportunities for paddlers (particularly in the upper reaches of the Wolf and its tributaries, which are not as popular with motor boaters), birding trails, wildlife viewing platforms, and auto tours on existing roads are examples of recreational opportunities on the state properties that are compatible with soil limitations and the properties' primary uses of hunting, fishing, and trapping. There is also the potential to expand environmental education opportunities through collaborations with existing nature centers.

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The LWRBNRA's state lands are the primary providers of remote, wildlife-based outdoor opportunities; these opportunities are not widely available on other lands, so this is the properties' most appropriate recreational use. Higher-impact activities such as ATV use, horseback riding, mountain biking, etc., and more developed facilities such as campgrounds and maintained trails, are best provided for on other public lands (i.e., county, municipal) in the plan area or at private facilities.

**Summary**

The LWRBNRA lands are outstanding for both ecological and recreational values. Managing to protect and connect high-quality natural communities and maintaining and improving key features such as connectivity, hydrology, and water quality will maintain and enhance habitats and populations of both rare and common wildlife species. The remote, outdoor nature-based recreational opportunities so important to the cultural traditions and economic life of local communities are the most compatible with the physical limitations (i.e., soils) of the plan area and with management for ecological values, and are the most appropriate recreational uses of the LWRBNRA state properties.

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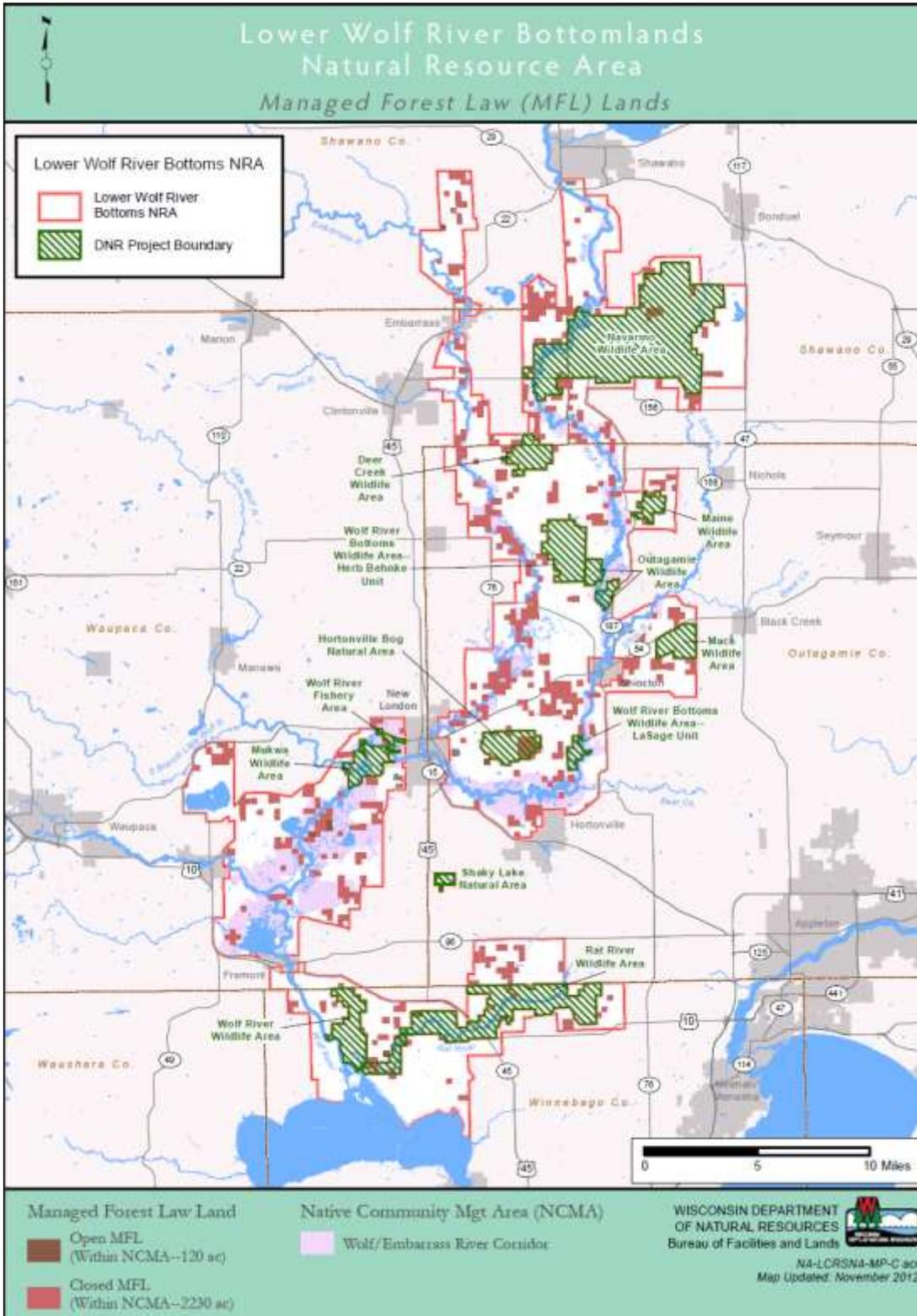
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APPENDIX A: MANAGED FOREST LAW (MFL) LAND



## APPENDIX B: BOTTOMLAND HARDWOOD MANAGEMENT GUIDELINES

### Bottomland Hardwood Management Guidelines and Timber Harvesting Considerations

#### Recommended Silvicultural System: All Age – Group and Irregular Shelterwood:

- Irregular Shelterwood (60-70% crown cover) in 1/10 to 1 acre groups or patches covering 10 to 15% of total stand
- Overstory removal of patches/groups/or gaps with advanced regeneration
- Depending on site conditions, either thin from below between patches to no lower than 90 ft<sup>2</sup> (90% crown closure) but never more than 1/3 of basal area or less than 70% crown closure, using the following order of removal; or leave the area between patches for consideration at the next entry:
  1. Risk – Cut high-risk trees that are likely to die between cutting cycles (unless retained as wildlife trees).
  2. Release crop trees – Cut poor-quality competitors to provide crown growing space around crop trees and promote growth and quality development. For stands with >20% ash, choose non-ash as crop trees to reduce ash component to acceptable levels (see EAB Guidelines).
  3. Vigor – Cut low-vigor trees, based on crown size and condition, crown class, and potential stem decay.
  4. Stem Form and Quality – Cut poorly-formed stems, based on usable log length and potential decay.
  5. Undesirable species.
  6. Improvement of spacing.
- Follow Retention guidelines in Chapter 24 – Silviculture Handbook
- Re-entry cycle: approximately 15 years

#### Important Resource Considerations for Timber Harvesting in Bottomland Hardwoods:

1. Be mindful of a diversity of resource management objectives in this system and maintain communication among affected resource managers (Wildlife, Fisheries, Endangered Resources, Water).
2. Implement a preference of dry-fall or winter logging to prevent negative impacts to nesting/hatching/rearing wildlife during spring and summer seasons. Wait until

**APPENDIX B**  
**Bottomland Hardwood Management Guidelines**

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- after August 1 for logging to commence in “dry” years. If Wood or Blanding’s Turtle are known to be present, or if young raptors are still in the nest, wait until after October 1 to commence logging.
3. Tree Retention: consider retaining snag trees, living cavity trees, and super-canopy trees (for osprey and eagles) in river corridor (refer to Chapter 24 - Silviculture Handbook).
  4. Recruitment of woody debris along and in the river is beneficial for fish and other aquatic life. *Consider no thinning or harvest activities within 35 feet of the bank to allow for natural accumulation of woody debris in the river.*
  5. Protect known walleye spawning marshes (see maps): *If timber harvest is near or in a walleye spawning marsh, contact the local Fish Biologist for specific considerations and identification of the water course for the spawning marsh.*

General considerations for harvesting in or near walleye spawning marshes:

- a. Prevent slash deposition on open marsh area.
  - b. Prevent slash deposition into, or remove from, the channels providing water flow into the spawning marsh.
  - c. Leave low-cut stumps (at or near ground level) in the channels providing flow of water into the spawning marsh to prevent blockage of water flow across marsh area.
6. Address regeneration problems from high deer populations. Consider leaving slash to help protect seedlings from browsing. Consider supplemental planting in gaps to provide a diversity of tree species.

APPENDIX C:  
Mussels of the Wolf River and Their Host Species

APPENDIX C: MUSSELS OF THE WOLF RIVER AND THEIR HOST SPECIES

Mussel Species	Mucket§ <i>Actinonaias ligamentina</i>	Elktoe§ <i>Alasmidonta marginata</i>	Slippershell‡ <i>Alasmidonta viridis</i>	Threeridge <i>Ambelma plicata</i>	Cylindrical Papershell <i>Anodontoides ferussacianus</i>	Purple Wartyback†♦ <i>Cyclonaias tuberculata</i>	Spike <i>Elliptio dilatata</i>	Snuffbox*† <i>Epioblasma triquetra</i>	Wabash Pigtoe <i>Fusconaias flava</i>	Plain Pocketbook <i>Lampsilis cardium</i>	Fatmucket <i>Lampsilis siliquoides</i>	White Heelsplitter <i>Lasmigona complanata</i>	Creek Heelsplitter§ <i>Lasmigona compressa</i>	Fluted-Shell <i>Lasmigona costata</i>	Fragile Papershell <i>Leptodea fragilis</i>	Black Sandshell§ <i>Ligumia recta</i>	Threehorn Wartyback <i>Obliguaria reflexa</i>	Hickorynut <i>Obovaria olivaria</i>	Round Pigtoe‡ <i>Pleurobema sintoxia</i>	Pink Heelsplitter <i>Potamilius alatus</i>	Giant Floater <i>Pyganodon grandis</i>	Pimpleback <i>Quadrula pustulosa</i>	Mapleleaf§ <i>Quadrula quadrula</i>	Salamander Mussel‡ <i>Simpsonaias ambigua</i>	Bankclimber <i>Strophitus undulatus</i>	Lilliput <i>Toxolasma parvus</i>	Pistolgrip (Buckhorn)‡ <i>Tritogonia verrucosa</i>	Fawnsfoot§♦ <i>Truncilla donaciformis</i>	Deertoe <i>Truncilla truncata</i>	Paper Pondshell§ <i>Utterbackia imbecilis</i>	Zebra mussel** <i>Dreissena polymorpha</i>			
<b>Host Species</b>																																		
American Eel	X																																	
Banded Darter												X													X									
Banded Killifish	X											X									X													
Black Bullhead					X	X						X									X				X									
Black Crappie					X		X		X	X		X										X												
Blacknose Dace																							X											
Blacknose Shiner					X																													
Blackside Darter								X																										
Bluegill	X			X	X				X	X	X	X	X			X				X	X				X	X								
Bluntnose Minnow					X						X									X			X		X									
Bowfin														X																				
Brassy Minnow												X																						
Brook Silverside													X								X				X									
Brook Stickleback					X								X								X				X									
Brown Bullhead														X								X					X							
Burbot														X											X									
Central Stoneroller	X													X		X			X		X													
Channel Catfish				X		X															X		X		X									
Common Carp	X											X				X					X				X									
Common Shiner					X						X	X									X				X									
Creek Chub									X					X							X				X									

APPENDIX C:  
Mussels of the Wolf River and Their Host Species

Mussel Species	Mucket§ <i>Actinonaias ligamentina</i>	Elktoe§ <i>Alasmidonta marginata</i>	Slippershell‡ <i>Alasmidonta viridis</i>	Threeidge <i>Amblema plicata</i>	Cylindrical Papershell <i>Anodonta ferrassianus</i>	Purple Wartback†♦ <i>Cyclonaias tuberculata</i>	Spike <i>Elliptio dilatata</i>	Snuffbox*† <i>Epioblasma triquetra</i>	Wabash Pigtoe <i>Fusconia flava</i>	Plain Pocketbook <i>Lampsilis cardium</i>	Fatmucket <i>Lampsilis siliquoidea</i>	White Heelsplitter <i>Lasmigona complanata</i>	Creek Heelsplitter§ <i>Lasmigona compressa</i>	Fluted-Shell <i>Lasmigona costata</i>	Fragile Papershell <i>Leptodea fragilis</i>	Black Sandshell§ <i>Ligumia recta</i>	Threehorn Wartback <i>Obolauaria reflexa</i>	Hickorynut <i>Obovaria olivaria</i>	Round Pigtoe‡ <i>Pleurobema sintoxia</i>	Pink Heelsplitter <i>Potamilus alatus</i>	Giant Floater <i>Pyganodon grandis</i>	Pimpleback <i>Quadrula pustulosa</i>	Mapleleaf§ <i>Quadrula quadrula</i>	Salamander Mussel‡ <i>Simpsoniata ambigua</i>	Bankclimber <i>Strophitus undulatus</i>	Lilliput <i>Toxolasma parvus</i>	Pistolgrip (Buckhorn)‡ <i>Tritogonia verrucosa</i>	Fawnfoot§♦ <i>Truncilla donaciformis</i>	Deertoe <i>Truncilla truncata</i>	Paper Pondshell§ <i>Utterbackia imbecilis</i>	Zebra mussel** <i>Dreissena polymorpha</i>					
Emerald Shiner												X																								
Fantail Darter													X												X											
Fathead Minnow					X																				X											
Flathead Catfish				X									X										X													
Freshwater Drum				X											X						X	X														
Gizzard Shad				X								X	X	X																						
Green Sunfish	X			X					X	X	X	X	X		X							X			X	X										
Iowa Darter					X																	X														
Johnny Darter			X																			X			X	X										
Lake Sturgeon																		X																		
Largemouth Bass	X			X	X					X	X	X		X		X						X			X											
Logperch								X																												
Longnose Dace													X	X				X							X											
Longnose Gar												X										X														
Mimic Shiner												X																								
Mooneye				X																																
Mottled Sculpin			X		X			X																												
Northern Pike				X										X																						
N. Hog Sucker		X		X										X																						
N. Redbelly Dace																				X																
Pearl Dace																						X														
Pumpkinseed				X					X	X				X		X						X			X											
Rainbow Darter														X								X		X												
River Redhorse											X			X																						
Rockbass	X	X		X							X			X		X						X			X											
Rosyface Shiner																X																				
Sand Shiner																										X										

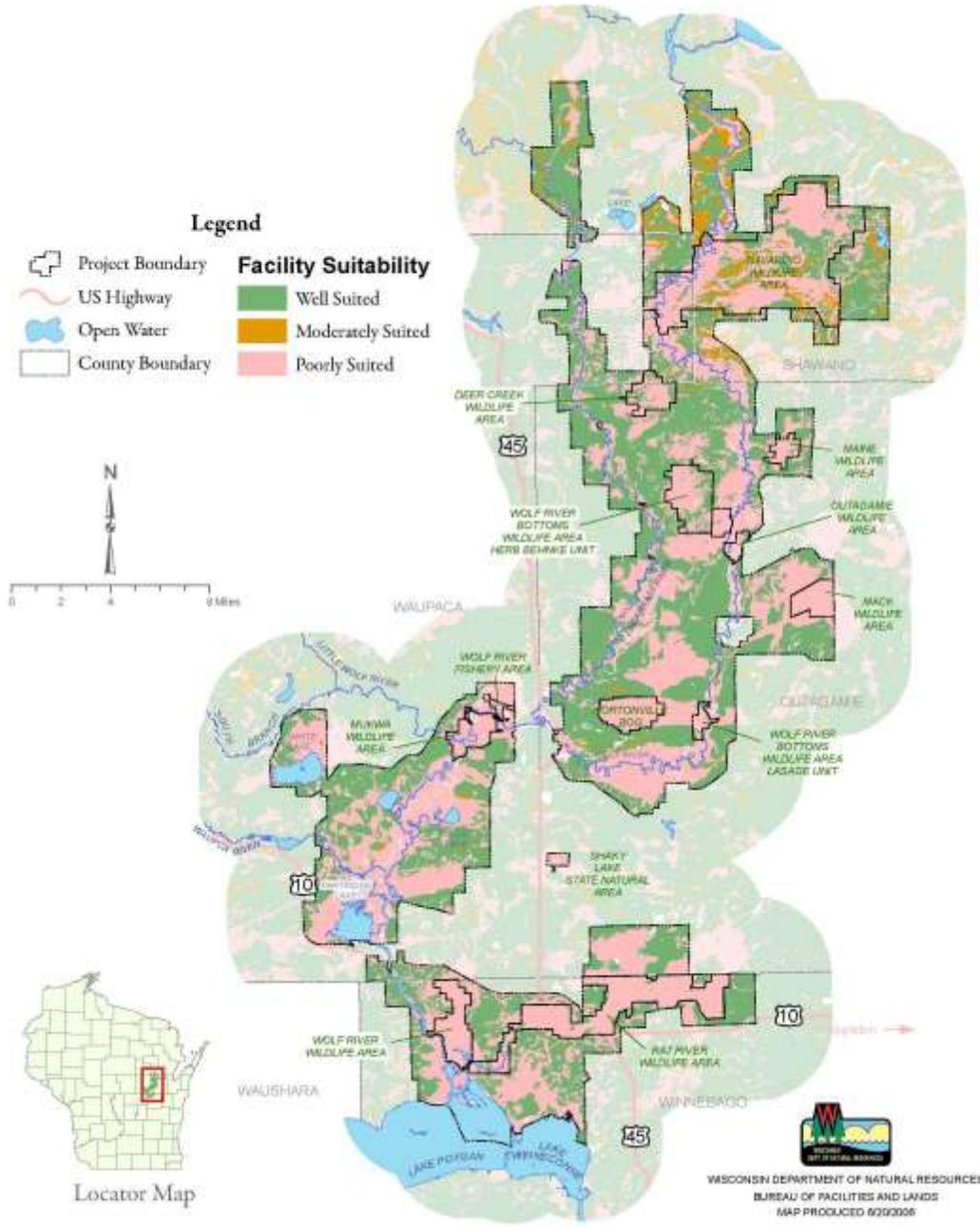
APPENDIX C:  
Mussels of the Wolf River and Their Host Species

Mussel Species	Mucket§ <i>Actinonaias ligamentina</i>	Elktoe§ <i>Alasmidonta marginata</i>	Slippershell‡ <i>Alasmidonta viridis</i>	Threeidge <i>Amblema plicata</i>	Cylindrical Papershell <i>Anodonta ferrassacianus</i>	Purple Wartback†♦ <i>Cyclonaias tuberculata</i>	Spike <i>Elliptio dilatata</i>	Snuffbox*† <i>Epioblasma triquetra</i>	Wabash Pigtoe <i>Fusconaias flava</i>	Plain Pocketbook <i>Lampsilis cardium</i>	Fatmucket <i>Lampsilis silvicoidea</i>	White Heelsplitter <i>Lasmigona complanata</i>	Creek Heelsplitter§ <i>Lasmigona compressa</i>	Fluted-Shell <i>Lasmigona costata</i>	Fragile Papershell <i>Leptodea fragilis</i>	Black Sandshell§ <i>Ligumia recta</i>	Threehorn Wartback <i>Obolauaria reflexa</i>	Hickorynut <i>Obovaria olivaria</i>	Round Pigtoe‡ <i>Pleurobema sintoxia</i>	Pink Heelsplitter <i>Potamilus alatus</i>	Giant Floater <i>Pyganodon grandis</i>	Pimpleback <i>Quadrula pustulosa</i>	Mapleleaf§ <i>Quadrula quadrula</i>	Salamander Mussel‡ <i>Simpsonaias ambigua</i>	Bankclimber <i>Strophitus undulatus</i>	Lilliput <i>Toxolasma parvus</i>	Pistolgrip (Buckhorn)‡ <i>Tritogonia verrucosa</i>	Fawnfoot§♦ <i>Truncilla donaciformis</i>	Deertoe <i>Truncilla truncata</i>	Paper Pondshell§ <i>Utterbackia imbecilis</i>	Zebra mussel** <i>Dreissena polymorpha</i>			
S. Redbelly Dace																			X															
Sauger						X			X		X				X													X	X					
Shorthose Redhorse		X																																
Shortnose Gar				X									X																					
Slenderhead Darter																									X									
Smallmouth Bass	X								X	X		X													X									
Spotfin shiner				X	X														X					X										
Tadpole Madtom											X																							
Walleye									X					X		X								X										
Warmouth		X		X							X															X								
White Bass				X							X																							
White Crappie							X		X	X		X				X						X		X		X								
White Sucker		X			X						X											X												
Yellow Bullhead						X							X								X			X				X						
Yellow Perch										X	X		X	X		X																		
Mudpuppy (amphibian)																																		

- \* Federally Endangered
- † State Endangered
- ‡ State Threatened
- § State Special Concern
- ♦ Species suspected but not positively identified
- \*\* Exotic clam

APPENDIX D: LWRBNRA SOIL SUITABILITY MAP

Lower Wolf River Bottomlands Natural Resources Area  
SOIL SUITABILITY



## APPENDIX E: NAVARINO NATURE CENTER LEASE AND TRAILS AGREEMENTS

AUG 14, 1992

COPY  
for Section  
Fire in A.  
1992

### LEASE

THIS LEASE is effective this 13th day of October, 1988, by and between the Wisconsin Department of Natural Resources, Lessor, and Navarino Nature Center, Inc., Lessee.

WHEREAS, the Lessor and Lessee want to provide an opportunity for a nature center on the Navarino Wildlife Area to be operated by the Lessee;

WHEREAS, providing more environmental education opportunities and outdoor experiences are major goals in the Department of Natural Resources' Strategic Plan for Wildlife Management;

WHEREAS, cooperating with private organizations to achieve Department objectives is another of the goals in the Strategic Plan;

WHEREAS, this lease agreement is a means by which the Department and the Navarino Nature Center, Inc., can jointly work at achieving these goals;

WHEREAS, the stated purpose for the Navarino Wildlife Area is to manage the property for the optimum production of forest and wetland wildlife and to provide compatible uses of the resource including hunting, trapping, fishing, hiking, nature study, and ski touring;

WHEREAS, the stated purpose of the Navarino Nature Center is to develop, maintain, manage and promote a nature education center, and to support the active management of all wildlife resources;

AND WHEREAS, the Department may enter into this lease pursuant to S. 23.09(2). Stats., and S. NR 1.48, Wis. Adm. Code;

NOW THEREFORE, in consideration of ONE DOLLAR (\$1.00) and the covenants herein set forth, the parties agree as follows:

#### I. PREMISES

Lessor leases to Lessee:

The E $\frac{1}{2}$  of the SE $\frac{1}{4}$  of the SW $\frac{1}{4}$  of the SW $\frac{1}{4}$ ; and, the NE $\frac{1}{4}$  of the SW $\frac{1}{4}$  of the SW $\frac{1}{4}$ ; and, the S $\frac{1}{2}$  of the SE $\frac{1}{4}$  of the NW $\frac{1}{4}$  of the SW $\frac{1}{4}$  of Section 14, Township 25 North, Range 16 East, in Shawano County, Wisconsin, containing, in all, approximately 20 acres.

#### II. TERM AND TERMINATION

A) This lease shall terminate:

- 1) Automatically and immediately in the event Lessee dissolves or ceases to use the leased premises for its stated purpose as defined in this lease.
- 2) Thirty (30) days after written notice is sent by Lessor to Lessee, at its last known address, by certified mail, in the event of material violation by Lessee of any of the terms of this lease.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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- 3) Upon thirty (30) days written notice sent by Lessee to Lessor by certified mail, with or without cause, and,
  - 4) Automatically on midnight on the date fifteen (15) years from the effective date of this lease.
- B) This lease may be renewed for additional fifteen (15) year periods and upon the same terms and conditions contained in this lease, but only upon the mutual agreement of the parties hereto. The Lessee agrees that it will acquire no extension of this lease or interest in the leased premises in the event of "hold over" after termination of this lease.

**III. OPERATIONAL POLICY**

The Lessee shall not discriminate against any employee or applicant for employment because of age, race, religion, color, sex, handicap, physical condition, developmental disability as defined in S.51.05(5), Stats., or national origin regarding employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Lessee agrees to take affirmative action to ensure equal employment opportunities. The Lessee agrees to post in a conspicuous place available for employees, applicants for employment and notices to be provided by the Lessor setting forth the provisions of nondiscrimination clause.

**IV. INSURANCE AND PROPERTY DAMAGE**

The Lessee shall be responsible for obtaining property insurance for any and all structures and improvements located on the premises.

The Lessee shall be responsible for the rebuilding, restoring, replacement or substantial repair of any building, appurtenance, fixture, facility, equipment or any part thereof, located on the leased premise and totally or partially destroyed or damaged by fire or by human or natural cause.

**V. LESSEE'S RESPONSIBILITIES**

- A) Lessee shall maintain the grounds within the premises including the mowing of grass on lawn areas, the removal of litter and solid wastes deposited as a result of Lessee's operations or programs, and shall maintain all buildings located on the premises leased hereunder in a neat, safe, sanitary and useable condition.
- B) The Lessee shall maintain appropriate health, safety and welfare conditions at the premises leased hereunder, and it is understood the Lessor will not provide police and fire protections.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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VI. LIMITATIONS ON USAGE

- A) All facilities leased hereunder may be used by Lessee at any time except during legal hunting hours during the Wisconsin gun deer season.
- B) The Lessor reserves the right to manage, control and determine all hunting and trapping rights on the leased premises.
- C) Lessee shall neither construct or erect any building, road, sign, fence or structure, nor alter the landscape of the leased premises in any material manner without the prior written permission of Lessor.
- D) Notwithstanding anything herein to the contrary, Lessor or its agents or representatives may use the leased premises at any reasonable time with reasonable prior notice to Lessee and at no cost.

VII. CAPITAL IMPROVEMENTS BY LESSEE

Any improvements made by Lessee to the leased premises shall become the property of Lessor, excepting, personal property which can be removed from the premises without material injury thereto shall remain the property of Lessee if removed from the premises within thirty (30) days of the effective date of termination of this lease.

VIII REGULATION OF LESSEE'S OPERATIONS

- A) Subject to the terms of this lease, Lessee shall have complete operation, controlling management of the leased premises.
- B) Lessee shall establish and enforce reasonable rules and regulations to control the management and operation of the leased premises. These rules and regulations shall be approved by Lessor.
- C) On or about July 1 of each year, Lessee shall provide Lessor with a Financial Statement accurately reflecting the conditions of its operations. Thereafter, Lessor and Lessee shall meet for the purpose of agreeing to annual work plans. At that meeting, inter alia, Lessee shall report on the previous years projects.

IX. IDENTIFICATIONS OF PREMISES, ADVERTISING, ETC.

- A) All advertising, display material and articles offered for sale by Lessee shall be presented to Lessor for approval prior to usage by Lessee.
- B) Lessee agrees that entrance signs, promotional materials, stationary, and brochures shall clearly identify the leased premises as being property of the State of Wisconsin Department of Natural Resources, under management and control of Lessee.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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C) Stationary and promotional materials of Lessee shall contain the legend: The Navarino Nature Center site is leased from the Department of Natural Resources of the State of Wisconsin to provide public environmental education and outdoor experiences.

X AMENDMENT

This lease may be amended only by written amendment signed by Lessor and Lessee.

XI ASSIGNMENT

This lease shall not be assigned, transferred or sublet without the prior written approval of Lessor.

XII LESSEE/LESSOR RELATIONSHIPS

Any services performed by Lessee or its agents to fulfill its obligations under the terms of this lease or otherwise shall be performed without compensation from Lessor and, further, it is the specific understanding of Lessor and Lessee that Lessee shall not act as employee or agent of Lessor for any purpose whatsoever, and, for purposes of Workers Compensation Lessee shall be deemed an independent contractor.

XIII

The Lessee will indemnify and hold harmless the Lessor against all claims, damages, costs and expenses, including reasonable attorney's fees, arising from the performance of this lease by the Lessee, or from any act of negligence of the Lessee, its agents, contractors, servants, licensees, permittees, or employees at the Premises. In case any action or proceeding be brought against the Lessor by reason of any such claim, the Lessee upon notice from the Lessor, will defend such action or proceeding by counsel reasonably satisfactory to the Lessor.

APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements

IN WITNESS WHEREOF, the parties have signed this agreement this  
13th day of October, 1988.

NAVARINO NATURE CENTER, INC.

By: Judith Harrichson  
its President

STATE OF WISCONSIN  
DEPARTMENT OF NATURAL RESOURCES

By: C.D. Besadny  
its Secretary

STATE OF WISCONSIN )  
COUNTY OF DANE } ss

Personally came before me this 13th day of October, 1988, the  
above named C. D. Besadny, Secretary of the Wisconsin Department of  
Natural Resources, to me known to be the person who executed the forego-  
ing instrument and acknowledged the same in the capacity therein stated  
and for the purposes therein contained.

Greg Delwiche  
Greg Delwiche, Notary Public  
State of Wisconsin  
My commission expires 5-12-91

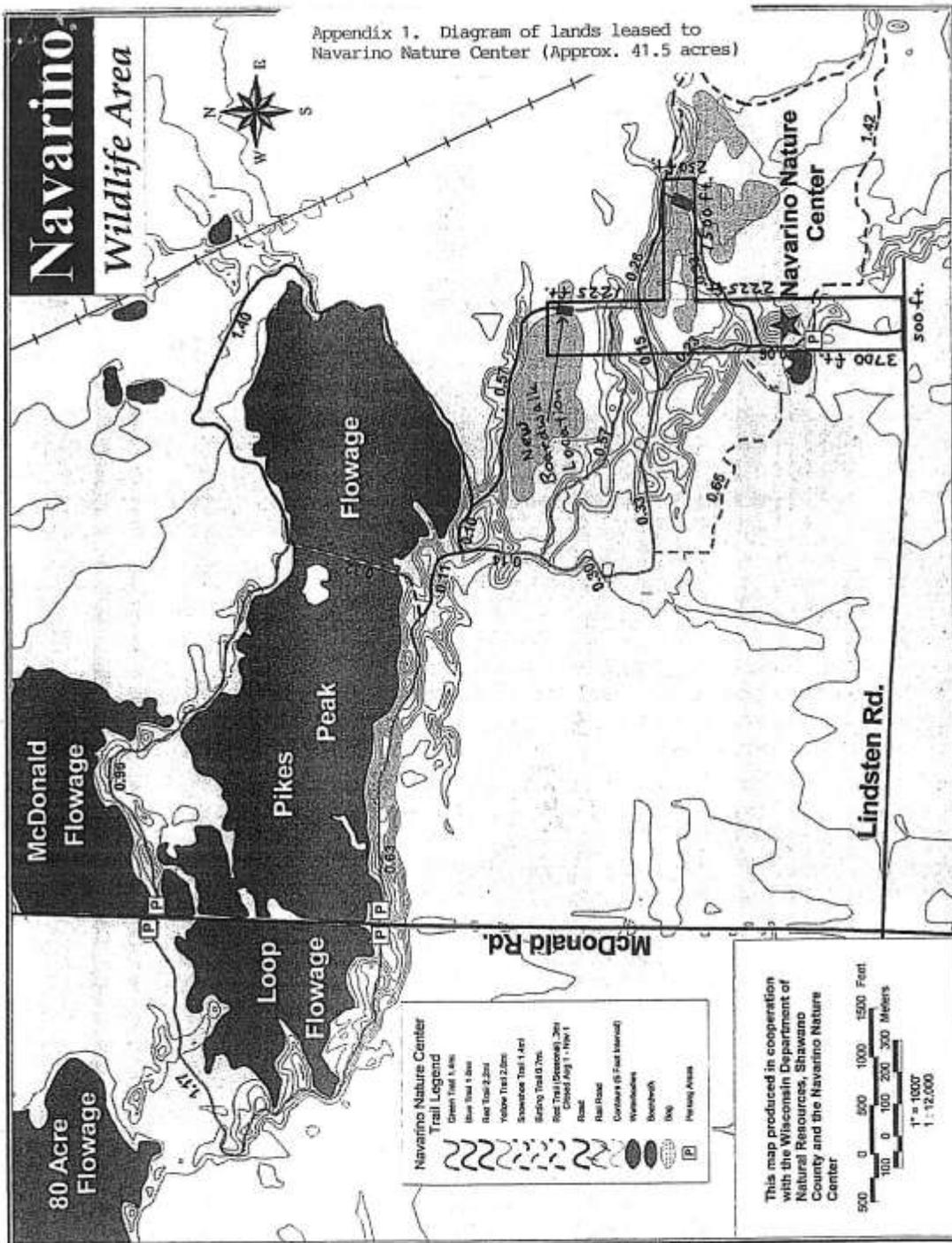
STATE OF WISCONSIN )  
COUNTY OF SHAWANO } ss

Personally came before me this 29th day of September, 1988, the  
above named Judith Harrichson, to be known to be the President  
of Navarino Nature Center, Inc., and in said capacity, executed the  
foregoing instrument and acknowledged the same.



Geraldine V. L. Stephens  
Notary Public  
State of Wisconsin  
My Commission Expires April 9, 1989

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**



**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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LEASE RENEWAL

REFERENCE A LEASE signed on September 29, 1988 by Judith Henrickson, President, of Navarino Nature Center, Inc. as Lessee

AND

fully executed on October 13, 1988 by C.D. Besadny, Secretary, of Wisconsin Department of Natural Resources as Lessor;

WHEREAS, in compliance with paragraph II-B of said Lease, the Lessor and Lessee desire to renew said Lease for an additional period of time;

NOW THEREFORE, in consideration of one dollar (\$1.00) and the covenants herein set forth the parties agree as follows:

- 1: The Lease is hereby extended for an additional eleven (11) year period, until October 13, 2018.
- 2: Upon the mutual agreement of the parties hereto, the Lessee and the Lessor may enter into a new lease for the premises upon the conclusion of this lease renewal.
- 3: All other conditions of said Lease, in full compliance with the Lower Wolf River Bottomlands Natural Resources Area Master Plan, shall remain the same.
- 4: Section I defining the leased premises is deleted and replaced with the following: Lessor leases to Lessee the lands shown on Appendix 1 containing approximately 41.5 acres.

End of conditions.

Next pages are signatures, Appendix 1, and resolution authorizing the President to act in behalf of the Corporation.



**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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IN WITNESS WHEREOF, the parties have signed this agreement this 24 day of September 2007.

STATE OF WISCONSIN  
DEPARTMENT OF NATURAL RESOURCES  
For the Secretary

Richard E. Stoffa

STATE OF WISCONSIN     )  
  ) ss  
COUNTY OF DUNE         )

Personally came before me this 24 day of September, 2007, the above named,  
to me known to be the person who executed the foregoing instrument and acknowledged the same in the capacity therein stated and for the purpose therein contained.

Daniella V. Luss  
Notary Public  
State of Wisconsin  
My commission 11/17/2010

Navarino Nature Center, Inc.

David Pray  
President

STATE OF WISCONSIN     )  
  ) ss  
COUNTY OF Wisconsin     )

Personally came before me this 24<sup>th</sup> day of August, 2007, the above named,  
David Pray, to be known to be the President of Navarino Nature Center, Inc., and in said capacity, executed the foregoing instrument and acknowledged the same.



Sandra K. Nordin  
Notary Public  
State of Wisconsin  
My commission 7-11-10

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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State of Wisconsin

**CORRESPONDENCE/MEMORANDUM**

DATE: 07.10.06  
TO: Mike Lutz-LS/5  
FROM: James Robaidek-WM-Shawano  
SUBJECT: Navarino Nature Center Friends Agreement



Attached should be the final friends agreement between the WDNR and Navarino Nature Center. It only needs Departmental approval. The only changes from the last draft you commented on were two minor word changes. Their board passed a resolution at their last meeting and the president signed this at the meeting. Let me know of any questions or concerns at 715-526-4225. Thanks for all your assistance thru this process.

Cc Kate Zurlo-Cuva

*OK  
Mike Lutz  
7-19-06*



APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements

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AGREEMENT BETWEEN  
THE DEPARTMENT OF NATURAL RESOURCES  
AND THE  
NAVARINO NATURE CENTER, INC.

This agreement (Agreement) between the Department of Natural Resources (hereinafter referred to as the "DNR"), acting through the Secretary, and the Navarino Nature Center, Inc. (hereinafter referred to as "NNC, Inc."), acting through the President of its Board of Directors or the Board's designee.

WITNESSETH:

WHEREAS, it is the purpose of the DNR to preserve, interpret, and manage its properties for the benefit, education, and enjoyment of the people of the state; and

WHEREAS, the DNR desires to extend its program and services at Navarino Wildlife Area (hereinafter referred to as "the property"); and

WHEREAS, one reason NNC, Inc. has incorporated is to assist the DNR in extending its program and services at the property,

WHEREAS, NNC, Inc. desires to enter into an agreement with the DNR to obtain recognition as a Friends Group consistent with the requirements of s. 23.098, Stats.,

NOW, THEREFORE, pursuant to authority contained in Chapter 27, Wis. Stats., and in consideration of the mutual benefits which will accrue to the DNR and NNC, Inc., the parties agree as follows:

1. AUTHORIZATION

The DNR authorizes NNC, Inc. to provide, and NNC, Inc. agrees to provide when able, the hereinafter described services to the visiting public for a period of three years commencing on the day following the ratification of this Agreement by the DNR. The Agreement shall automatically renew for additional consecutive three-year periods, unless reasonable notice of cancellation is given by either party before the date of renewal. The DNR or NNC, Inc. reserve the right to terminate this Agreement or any part thereof, at any time upon 30 days written notice without the necessity of any legal process, after holding a meeting prior to the termination setting forth the reasons for termination.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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An evident and distinct separation shall be maintained between the management and decision-making activities of NNC, INC. and those of DNR. All steps shall be taken to avoid even an appearance that the DNR directs the management or decision-making process of NNC, INC..

The management and operation of NNC, INC. is subject to all applicable Wisconsin Statutes and the Wisconsin Administrative Code.

**2. DNR RESPONSIBILITIES**

The DNR shall allow NNC, INC. to use facilities at the property which are designated for the sale of educational and interpretive items for the benefit of the visiting public.

A. The DNR recognizes existing contracts, lease and agreements, between the DNR and the NNC, Inc. and that nothing herein shall affect those contracts, lease and agreements. The terms of the current lease with the DNR are incorporated by reference.

**B. Facilities**

(1) The DNR reserves the right to design and construct any new facilities, and shall allow NNC, INC. to review and comment on any plans therefore. Construction within the NNC, INC. leased area shall be consistent with the current DNR Master Plan.

(2) The DNR shall provide all general maintenance and repair services for the state-owned buildings.

C. The DNR shall designate the property superintendent or the superintendent's designee as liaison or property coordinator with NNC, INC..

D. Monies donated by NNC, INC. to the DNR shall be expended to support the mission and activities of the property.

E. The DNR shall promote NNC, INC. in publications and announcements where DNR deems appropriate.

**3. FRIENDS RESPONSIBILITIES**

NNC, INC. may use facilities and equipment within the property at the sole discretion of DNR for its programs and activities for the benefit of the visiting public.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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**A. Organization**

- (1) NNC, INC.'s bylaws shall comply with the requirements of the State of Wisconsin. Nonprofit status must be maintained in accordance with state laws and NNC, INC. shall make all such documents available for inspection, at the request of DNR, documents demonstrating nonprofit status. This Agreement shall automatically terminate if nonprofit status is lost, or if the bylaws are amended in such a way as to alter the intent of this Agreement.
- (2) DNR employees may be members of NNC, INC., but shall not serve on the board of directors or as treasurer. DNR employees shall not represent NNC, INC. in any matter between NNC, INC. and the DNR.
- (3) The role of the property liaison is to represent the interests of the DNR and to provide cooperative assistance to NNC, INC.. The liaison's responsibility to NNC, INC. shall be limited to providing assistance to NNC, INC. activities and serving as liaison between the DNR and NNC, INC..

**B. Interpretive Activities**

Interpretive activities engaged in by NNC, INC. must be consistent with the current lease with the DNR.

**C. Facilities**

- (1) NNC, INC. shall exercise reasonable care to prevent damage to any DNR property used by it during its operation and shall, insofar as possible, protect all such property.

**D. Records and Accounting**

- (1) NNC, INC. shall submit to DNR a complete financial report detailing, as a minimum, all income and expenditures to the superintendent, annually within 90 days following the end of NNC, INC.'s fiscal year. The report is not required to include a list of donors or itemized donations.
- (2) The DNR may review and/or audit the records of NNC, INC. at any time during the term of this Agreement with reasonable notice.

**E. Personnel**

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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(1) NNC, INC. personnel are not DNR employees and are not authorized to undertake any DNR function or activity on behalf of the DNR beyond routine visitor information services and participation in interpretive programs. NNC, INC. employees and members shall not engage in activities that would reasonable lead the visiting public to conclude that they are DNR employees. No NNC, INC. employee or member shall wear a DNR uniform.

(2) Where applicable, NNC, INC. shall furnish full worker's compensation coverage for its employees and shall comply with all social security and withholding tax laws and rules. A person claiming that the coverage is not required under Chapter 102, Wis. Stats., shall upon request, provide the basis for such opinion in writing to the DNR.

(3) Nondiscrimination

In connection with the performance of work under this Agreement, NNC, INC. agrees not to discriminate against any employee or applicant for employment because of age, race, religion, color, handicap, sex, physical condition, developmental disability as defined in s. 51.01(5), sexual orientation or national origin. This provision shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

Except with respect to sexual orientation, NNC, INC. further agrees to take affirmative action to ensure equal employment opportunities. If the annual work force is less than 10 employees, NNC, INC. is exempted from this requirement.

4. INDEMNIFICATION AND INSURANCE

A. General

NNC, INC. shall not be required to purchase liability insurance as long as it is engaged only in the sale of books, brochures, and other non-food items related to natural history, or in assisting DNR interpretive programs, or in assisting DNR in minor grounds maintenance projects.

B. Exception

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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Public liability insurance shall be consistent with the active DNR - NNC, Inc. lease agreement.

C. Copyright Infringement

NNC, INC., in selling the articles described herein it shall be consistent with the current DNR – NNC, Inc. lease agreement.

5. ASSIGNMENT

No transfer or assignment of this Agreement or of any part thereof or interest therein, directly or indirectly, voluntary or involuntary, shall be made unless such transfer or assignment is first approved in writing by the DNR Secretary or the Secretary's authorized representative.

6. APPROPRIATIONS

Nothing herein contained shall be construed as binding the DNR to expend any sum in excess of appropriations made by the Legislature, or administratively allocated, for the purpose of the Agreement, or to involve the DNR in any contract or other obligation for the future expenditure of money in excess of such appropriations or allocation.

7. MISCELLANEOUS

A. The rights and benefits conferred by this Agreement shall be subject to the laws of the State of Wisconsin governing the DNR and the rules and regulations promulgated thereunder, whether now in force or hereafter enacted or provided; and the mention of specific restrictions, conditions, and stipulations herein shall not be construed as in any way impairing the general powers of supervision, regulation, and control by the DNR.

B. Both parties agree to keep this Agreement in force when signed by both parties hereto until terminated by mutual agreement or at the option of either party upon 30 days notice given in writing upon any anniversary date hereof. DNR and NNC, INC. shall review the Agreement every three years and at such other times as may be required by either party on 30 days written notice.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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This Agreement is effective between NNC, INC. and DNR with regard to, and only to, the following specified sites, which are collectively referred to throughout this Agreement as "Navarino Wildlife Area" or "the property" or "the property", to wit:

(1) Navarino Wildlife Area

IN WITNESS WHEREOF, the Navarino Nature Center, Inc., has caused this Agreement to be executed this 13 day of June, 2006.

Navarino Nature Center, Inc.

By: Paul Lee  
President, Board of Directors

Attested: Ann Fuge

Position: Treasurer

IN WITNESS WHEREOF, the Department of Natural Resources has caused this Agreement to be ratified this 31<sup>st</sup> day of July, 2006.

Department of Natural Resources

By: Scott Hansen  
Secretary

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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State of Wisconsin  
Department of Natural Resources  
Box 7921  
Madison, Wisconsin 53707

LAND USE AGREEMENT  
Section 23.09(2) Wis. Stats.  
Form 2200-118 Rev. 6-90

**TO WHOM IT MAY CONCERN:**

This agreement, made this 4th day of November, 2008 by and between the State of Wisconsin Department of Natural Resources (Owner), and the Navarino Nature Center, of NS646 Lindsten Rd., Shiocton Wisconsin, 54170, Dave Prey, President, (Permittee), to enter upon and use the following described area located in Navarino Wildlife Area, Shawano County, Wisconsin, (Legal description if applicable)  
Existing trails located in Sections 9,10,11,14,15, and 16 of Township 25 North, Range 16 East. Including a 200 foot board walk located in the NE1/4, SW1/4, Section 14, Township 25 North, Range 16 East.

For the purpose of Nature Trail usage and designation  
In order to accomplish this purpose the Permittee intends to place or construct the following items on the above-described land: Maintain the boardwalks and the existing access Trails to specifications as listed in DNR handbook 2540.5. All trails will be handicapped accessible.  
This agreement shall be in effect for a five ( 5 ) year period commencing the 4th day of November 2008 and ending the 4th day of November 2013 for a rental fee of \$0.00.

Payment for the above use will be made according to the following schedule: With a Nature Center such as this, the DNR is saving money because they are performing a public service we can not afford to do with our budgets.

It is understood by the Owner and the Permittee that this agreement is subject to the following conditions:

1. The Owner may terminate this agreement by written notice if the continued use of this land by the Permittee will interfere with present or future management objectives of the Owner for the above-described area, or the Permittee breaches any terms or condition contained in this agreement.
2. Neither this agreement nor any right or duty in whole or in part by the Permittee under this agreement may be assigned, delegated or subcontracted without the written consent of the Owner.
3. Prior to the effective date of this agreement, the Permittee shall submit for approval to the Owner a plan describing the intended placement and construction of any items on the subject lands. No deviations from this plan shall be allowed except with the prior approval of the Owner. Within ten (10) days after the termination of this agreement, the Permittee shall remove all structures placed on the subject property. If the Permittee's structures remain on the property after 10 days, (1) title to the structure shall vest in the Owner or (2) the Owner may remove the structure and the Permittee shall be responsible for all cost thereof.
4. All stumps, slash, waste materials and other debris shall be disposed of by the Permittee as directed by the Owner.
5. No cutting or trimming of trees shall be done unless approved by the Owner.
6. All signs, postings and other markers shall be approved by the Owner.
7. The Permittee shall maintain the area under this agreement in a safe condition at all times.

**APPENDIX E:  
Navarino Nature Center Lease and Trails Agreements**

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8. The Permittee agrees to save, keep harmless, defend and indemnify the Owner and all its officers, employees and agents, against any and all liability claims, cost of whatever kind and nature, for injury to or death of any person or persons, and for loss of damage to any property (state or other) occurring in connection with or any way incident to or arising out of the occupancy, use, service, operation or performance of work in connection with this agreement or omissions of Permittee's employees, agents or representatives.
9. The Permittee shall not permit grazing on the subject property.
10. This agreement does not give the Permittee, its members or agents, any rights pertaining to hunting, fishing, or trapping. These rights remain under the control of the state of Wisconsin.
11. The Permittee shall not disturb or molest wildlife or wildlife habitat.
12. The area covered by this agreement is open for use to all members of the general public without regard to race, creed, marital status, color, sex, national origin, age, handicap, ancestry, sexual orientation, arrest record or conviction record.
13. In connection with the performance of work under this agreement, the Permittee agrees not to discriminate against any employee or applicant for employment because of age, race, religion, color, handicap, sex, physical condition, developmental disability as defined in s. 51.05(5), Wis. State., sexual orientation, arrest or conviction record or national origin. This provision shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Except with respect to sexual orientation, the Permittee further agrees to take affirmative action to ensure equal employment opportunities. The Permittee agrees to post in a conspicuous place available for employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of the nondiscrimination clause.
- Agreements estimated to be ten thousand dollars (\$10,000) or more require the submission of a written affirmative action plan. Permittees with an annual work force of less than ten employees are exempted from this requirement.
14. This agreement, together with the specifications in the bid request and referenced parts and attachments, shall constitute the entire agreement and previous communications or agreements pertaining to this agreement are hereby superseded. Any contractual revisions including cost adjustments and time extensions must be made by an amendment to this agreement or other written documentation, signed by both parties at least 30 days prior to the ending date of this agreement.
15. Additional conditions specifically pertinent to this agreed land use will be valid if enumerated in the space provided between this condition and closing signature. Every such addition will be initialed by the Permittee and the Owner.
16. This agreement does not allow the permittee to restrict Department or public activity on the Trail System. *tu*
17. This permit allows the use of motorized vehicles on the attached mapped trail system. Vehicles must follow speed limits, lighting requirements and operations procedures outlined in other Department agreements currently in effect. No use of trails are allowed during the gun deer season. *tu*
18. The Navarino Nature Center has Lease agreement, Friends Agreements and Cross-country ski trail agreements with the WDNR. Nothing in this agreement restricts the tenets of these other agreements. *tu*

Navarino Nature Center  
Permittee  
By *David Kay*  
Title

State of Wisconsin  
Department of Natural Resources  
For the Secretary  
By *Thomas G. Meyer*

## APPENDIX F: NAVARINO NATURE CENTER ENVIRONMENTAL EDUCATION PROGRAMS AND SKILL SETS FOR WISCONSIN ACADEMIC STANDARDS



### Navarino Nature Center

#### ENVIRONMENTAL EDUCATION PROGRAMS



- NEW PROGRAMS**  
available by request:
- Renewable Energy and Energy & Society
  - Easy Breathers
  - Give Burn Barrels the Boot
  - All About Birds

W5646 Lindsten Rd.  
Shiocton, WI 54170

Tel: 715-758-6999  
email: [nac@navarino.org](mailto:nac@navarino.org)  
[www.navarino.org](http://www.navarino.org)

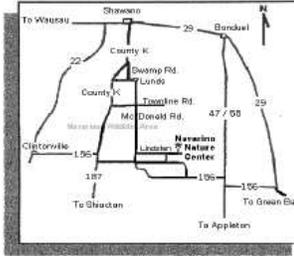
**APPENDIX F:  
Navarino Nature Center Programs and Skill Sets**



Navarino Nature Center is an environmental education facility located within the Wisconsin Department of Natural Resources Navarino Wildlife Area. NNC is equipped with an ALL WEATHER education facility with two classrooms, conference room, great room, renewable energy display area, kitchen, indoor restrooms, office and volunteer area. Also at NNC, a cabin, water pump, amphitheater, restrooms and picnic shelter. The NNC site can accommodate groups of all kinds.

NNC is a non-profit facility organized in 1986 and cooperates with the DNR to provide educational programs. It relies on donations and modest fees to sustain its programming. Besides school programs, NNC offers many public programs focusing on the flora & fauna of the Navarino Wildlife Area.

NNC's many miles of trails wind around and through prairie, forest and wetland communities. This unique educational setting, offers people of all ages and levels of ability the chance to grow and understand our natural environment.



**Directions:** From Hwy 47, take WI 156 (west) to McDonald Road (north) turn east on Lindsten Rd.  
**From Shawano:** take Hwy K (south), turn left onto Townline Rd (east), turn right onto McDonald Rd (south), turn left onto Lindsten Rd. (east)  
**From Clintonville:** take Hwy 156 (east) to McDonald Rd (north), and then turn onto Lindsten Rd (east). The NNC sign is on the north side of Lindsten Road.

**Marvelous Mammals**

Grades: K – 3  
 Limit: 25 students  
 Length: 1 hour

Have you ever wondered what a bear skin feels like? Ever feel a badger's claws? How big are a beavers teeth? Look at and touch study skins, tracks and skulls of our Wisconsin mammals. Make an animal track to paint in class.

**When:** All Year

\*Material Fee



USF & WS by Tom Kelley

**Whitetail Deer**

Grades: 4 – 8  
 Limit: 25 students  
 Length: 1 – 2 hours

Deer populations keep growing. How do managers know the size and age of the herd? What can you learn about a deer from its teeth? Examine how populations change, what types of management are used on herds. Look at some historical uses for deer hides and bones.

**When:** Jan, Feb, Nov, Dec.

**Mammal Box**



USF & WS by Bob Savannah

Grades: 4 – 8  
 Limit: 25 students  
 Length: 1 – 2 hours

Students identify and study a wildlife pelt, skull, track, and information sheet. They will act as wildlife biologists trying to determine a management plan for their animal. Should their animal be hunted or protected? How do they keep wildlife in the balance?

**When:** Jan, Feb, March, Nov, Dec.

**APPENDIX F:  
Navarino Nature Center Programs and Skill Sets**

**Programs offered at NNC or Your School**

**Black Bears**



Grades: 4 – 8  
Limit: 20 – 30 students  
Length: 2 hours

USF & WS by Bob Savannah

What does a bear eat? What sort of hibernation period do they have? First students compare their growth to that of a black bear, and then later they pretend to be bears foraging for food to get through the winter. Students will observe and discuss bear skulls, tracks, and pelts.

**When:** Jan, Feb, March, Dec

**Wisconsin Wolves**



Grades: 4 – 8 USF & WS by Bob Savannah  
Limit: 20 – 30 students  
Length: 2 hours

Was that a wolf or a dog? Discover the differences between dogs, coyotes and wolves. Participate in an activity where students role-play a wolf pack. Write a management plan to help limit human and wolf interactions. Discover whether the wolf is a “big bad wolf”, or just misunderstood by humans.

**When:** Jan, Feb, March, Dec

**Who wants to be a Birder?**

Grades: 2 – 8  
Limit: 25 students  
Length: 1 hour

Find out more about birds & birding by participating in a quiz game? Just like on TV you have a 50/50, Ask the Audience, and Ask the Teacher. We will also look at various birds and hear their calls, and special adaptations that birds have: feathers, hollow bones, beaks / bills, just to name a few.

**When:** All year.

**NNC programs are designed to address the Wisconsin Education Standards.**

Programs will be adapted to Grade level.

Special Programs can be covered given advance notice.

To Schedule a Group  
**Length of Programs:**  
Grades Pre-K to 2nd. Half day 9 am—12 pm  
Grades 3 - 8 Half or Whole Day 9 am—2 pm

**Class Size:**  
NNC will accept only 2 Classes at a time. Total Group size about 50 students. Exceptions may be made with advance notice and planning.

**Fees:**  
Half day \$3 per student  
Whole day \$4 per student  
\*Some programs require an additional \$10 material fee

**Contact:** Tim Ewing, Director / Naturalist  
W5646 Lindsten Rd.  
Shiocton, Wisconsin 54170  
715-758-6999 (NNC)

nnc@navarino.org  
www.navarino.org

**Nature Store:** NNC has a small store with inexpensive items for kids. If interested in visiting the Nature Store after your program, please mention it when signing up.

**APPENDIX F:  
Navarino Nature Center Programs and Skill Sets**

**Programs offered at Navarino Nature Center**

**Forest Study** 

Grades: K – 4  
Limit: 50 students  
Length: 1 – 2 hours or Full Day

Explore the most popular layer of the forest the forest floor. Look for pillbugs, sowbugs, termites, ants, spiders and a host of other decomposers as you dig into leaf litter and fallen logs. Get a feel for decomposition, microhabitats and communities.

**When:**  
April, May, June, Sept, Oct.

**Forestry** 

Grades: 4 – 8  
Limit: 50 students  
Length: 1 – 2 hours or Full Day

Students learn to identify trees by bark, bud, leaves, fruit and nuts. Determine the height of a tree, diameter, crown spread. Also look at which areas of the forest provide the best cover and habitat for wildlife. Find out about historical forestry activities, and use a 2 person cross-cut saw.

**When:**  
April, May, June, Sept, Oct.

**Insects & Invertebrates** 

Grades: 1 – 8  
Limit: 50 students  
Length: 2 – 3 hours

Explore prairie, forest and pond habitats on the wildlife area. Collect and classify various types of insects and invertebrates. Discover what makes insects unique, and how vital they are to many other creatures' existence.

**When:**  
April, May, June, July

**Pond Study** 

Grades: 1 – 8  
Limit: 50 students  
Length: 1- 1 ½ hours

Ponds provide habitat to many aquatic invertebrates. Join in the search for these tiny creatures, collect, study and observe their adaptations to live underwater. How do aquatic invertebrates fit into the web of life?

**When:** April, May, June



**Winter Wonderland**

Grades: K – 4  
Limit: 50 students  
Length: 1 – 3 hours

Look for wildlife tracks in the woods under the blanket of new fallen snow. Tracks often seen include: turkey, otter, mice, deer, rabbit, squirrel and others. Where do the wildlife go during the winter? What do they do? How do they keep warm? Come and find out.

**When:** Dec, Jan, Feb, March

**Winter Ecology** 

Grades: 5 – 8  
Limit: 50 students  
Length: 2 – 3 hours

Everything looks different in the winter. The landscape may look still but the wildlife is very active. Explore and follow various animal tracks, and try to conclude information about the animal's daily routine. Look for signs of insect activity, dormant plants, and frost / ice development. If snow conditions are right, students will study on snowshoes.

**When:** Dec, Jan, Feb, March

**Snowshoeing** 

Grades: 3 – 8  
Limit: 50 students  
Length: 1 – 3 hrs

Learn about the history of snowshoes, how they are made and why we snowshoe. Follow the naturalist through the woods, wetlands and prairies of Navarino on snowshoes. We will search for wildlife, as we float on top of the snow.

**When:** Jan., Feb.

**APPENDIX F:  
Navarino Nature Center Programs and Skill Sets**

**Programs offered at NNC cont'd.**

**Prairie Study** 

Grades: K - 8  
Limit: 50 students  
Length: 2 hours or Full Day

Discover what it is like to stand in the middle of a tall grass prairie with grasses 8 ft tall. Explore and identify the various types of grasses and flowers that make up our prairie. Help to collect seeds. Look for tree frogs, caterpillars and insect galls. Learn about the history, management, and wildlife of the prairie.

**When:** Aug, Sept, Oct

**Seeds** 

Grades: 1 - 4  
Limit: 50 students  
Length: 1 - 2 hours

Seeds are everywhere! Learn about the many forms seeds can take, how seeds travel to new environments. Learn about special adaptations of seeds.

**When:** Aug, Sept, Oct

**Survival Skills** 

Grades: 3 - 8  
Limit: 50 students  
Length: 2 - 3 hours or Full Day

Discover various methods of wilderness survival: how to use a compass, how to tell time without a watch, how to construct emergency shelter, how to locate and make safe drinking water. Discover different methods of fire construction and fire starting.

**When:** April, Sept, Oct, Nov

**Wetland Study** 

Grades: 1 - 8  
Limit: 50 students  
Length: 1 - 2 hours

Explore the various habitats of the Navarino Wildlife Area, including ponds, marshes, bogs and woodland swamps. Observe some of the differences and similarities between the types of wetlands. Find out about the history, value and importance of our wetlands and their future.

**When:**  
April, May, June, July, Aug, Sept.

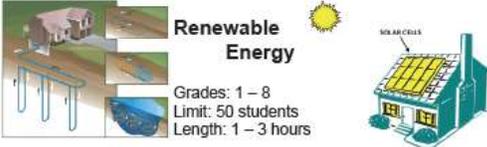
**Water Monitoring** 

Grades: 5 - 8  
Limit: 50 students  
Length: 1 - 1 ½ hours

Why is it necessary to test our water? Bring several water samples and find out yourself by testing them for dissolved oxygen, nitrates, hydrogen sulfide, iron, and phosphates and more. Is your water safe to drink, and safe for wildlife?

**When:** April, May, June, July, Aug, Sept.

\*Material Fee

**Renewable Energy** 

Grades: 1 - 8  
Limit: 50 students  
Length: 1 - 3 hours

Discover the possibilities of renewable energy, we will look at the nature center's photovoltaic solar array, solar hot air heater, solar cooker, and geothermal heating / cooling system. We will also explore renewable energy through a variety of activities and student sized models including: solar cells, wind turbines, hand generators and more. NNC staff will work to help match your renewable energy activities back to classroom lessons. Contact NNC for more information as this is a NEW and growing program.

**When:** All year.

\* Materials purchased by a Wisconsin Environmental Education Board Grant (WEEB)

**APPENDIX F:  
Navarino Nature Center Programs and Skill Sets**

Skill Sets		Navarino Nature Center Onsite Programs										NNC / School Outreach Programs							
		Forest Study	Forestry	Pond Study	Wetland Study	Water Monitoring	Insects & Invertebrates	Prairie Study	Seeds	Survival Skills	Winter Wonderland	Winter Ecology	Snowshoeing	Wisconsin Wolves	Black Bears	Marvellous Mammals	Mammal Box	Whitetail Deer	
Wisconsin Model Academic Standards	EE	Questioning and Analysis	X	X	X	X	X	X	X	X			X						
	EE	Knowledge of Environmental Processes and Systems	X	X	X	X	X	X	X	X			X	X					
	EE	Environmental Issue Investigation Skills					X						X						
	EE	Decision and Action Skills								X									
	EE	Personal and Civic Responsibility																	
	S	Science Connections		X	X	X	X			X	X			X				X	X
	S	Nature of Science		X	X	X	X							X	X				X
	S	Science Inquiry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	S	Physical Science								X			X						
	S	Earth and Space Science	X	X															
	S	Life and Environmental Science	X	X	X	X			X	X	X		X		X	X		X	X
	S	Science Applications		X			X												
	E	Reading and Literature		X		X	X								X	X		X	X
	E	Writing													X	X		X	X
	E	Oral Language		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
	E	Language																	
	E	Media and Technology																	
	SS	Geography									X								
	SS	History		X															
	SS	Political Science and Citizenship																	
	SS	Economics																	
	SS	Behavioral Sciences																	
	M	Mathematical Processes					X				X								
	M	Number Operations and Relationships																	
	M	Geometry																	
	M	Measurement		X			X		X	X		X		X	X	X		X	X
	M	Statistics and Probability																	
	P	Leading an Active Lifestyle	X	X	X			X	X			X	X	X					
P	Physical Skill Development												X						
P	Learning Skills																		
P	Understanding Physical Activity and Well Being	X	X	X			X	X			X	X	X						
P	Health-enhancing Fitness																	X	
P	Respectful Behavior												X						
P	Understanding Diversity																		

EE – Environmental Education, S – Science, E – English, SS – Social Studies, M – Math, P – Physical Education