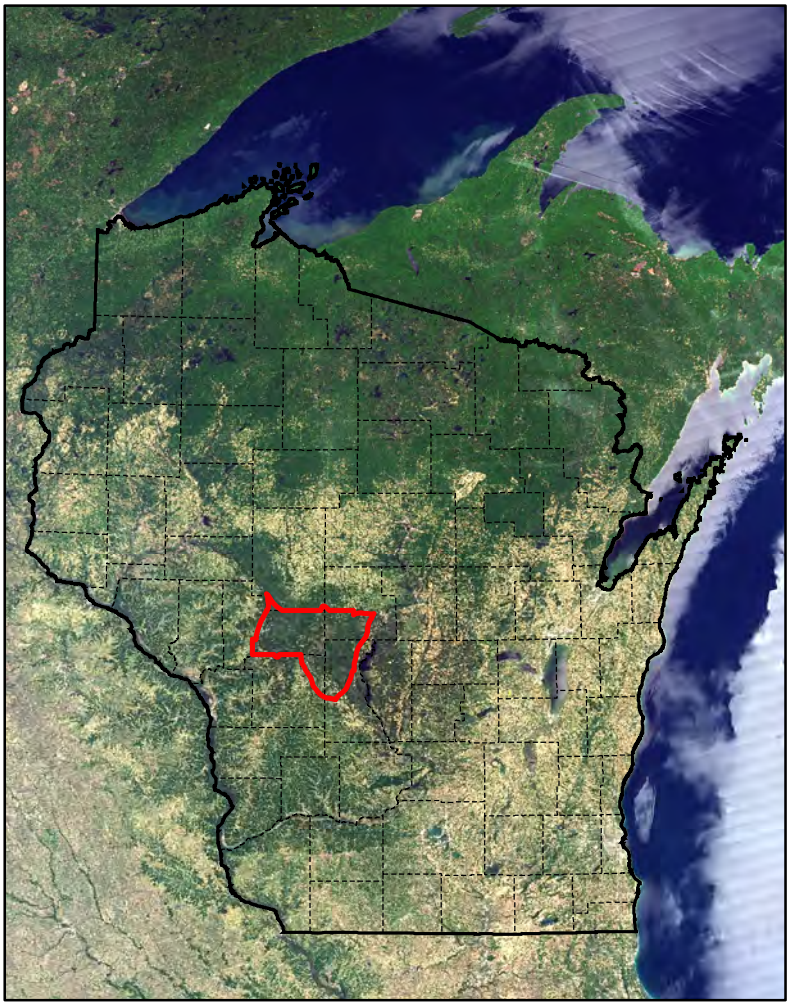

Biotic Inventory and Analysis of the Black River State Forest / Meadow Valley Landscape

A Baseline Inventory and Analysis of Natural Communities, Rare Plants and Animals, Aquatic Invertebrates, and Other Selected Features in Preparation for State Forest Master Planning

April 2005

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Cover Photographs (clockwise from left): MODIS Satellite Image of Wisconsin (acquired June 30, 2003), courtesy of the Environmental Remote Sensing Center, University of Wisconsin-Madison (http://www.ersc.wisc.edu); monarch butterfly on dwarf milkweed (*Asclepias ovalifolia*), DNR files; Central Poor Fen at Wildcat Peatlands, Jackson County, Eric Epstein; ringed boghaunter dragonfly (*Williamsonia lintneri*), Karl Legler.

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Executive Summary

Project Purpose and Objectives

This report presents the results of a multi-year project to inventory and analyze selected biotic resources of the Black River State Forest, the State Wildlife Areas located near the forest (including the Meadow Valley, Wood County, and Sandhill Wildlife Areas), and the surrounding landscape. This project was undertaken by the Natural Heritage Inventory section of the Wisconsin Department of Natural Resources' Bureau of Endangered Resources, in cooperation with the Division of Forestry, to provide baseline information on the rare species, natural communities, and ecology of the study area relevant to the development of a new property Master Plan for the Black River State Forest and the conservation of biological diversity. The state wildlife areas were included in the project to provide information for future master planning efforts and to provide a landscape perspective.

This inventory and analysis is one of a number of assessments identified as critical for developing a new state forest master plan. The information provided in this report consolidates background information useful for property master planning and is intended to be used in conjunction with other master planning assessments and other sources of information to develop overall recommendations for the forest. It is our hope that this information will also be useful to a wider audience that includes managers, administrators, conservation groups, private landowners, and others who have an interest in conserving the biological diversity of this landscape.

The primary objectives of this project were:

- The identification and evaluation of natural biotic communities,
- The identification and evaluation of rare or otherwise significant plant and animal populations,
- The identification and evaluation of selected aquatic features and their associated biotic communities,
- The identification of sites appropriate for the restoration of lost or declining communities or important habitats,
- The identification of especially important protection, management, and restoration opportunities, focusing on both unique and representative natural features of these properties, as well as the surrounding landscape,
- The interpretation and transfer of the information gathered for use by the property master planning team, as well as managers, administrators, and others involved in the implementation of land use decisions on the Black River State Forest and Meadow Valley Landscape properties, as well as the surrounding landscape.

Description of the Study Area

The Black River State Forest / Meadow Valley Landscape (BRSF/MV) is located in Central Wisconsin in the Eastern Broadleaf Forest Province[1] which occupies approximately the southern half of the state (Fig. 3). The study area encompasses 710,180 acres in portions of Clark, Jackson, Juneau, Monroe, and Wood Counties. The boundaries were designed to encompass several major public lands that share similar landscape attributes. In addition to the State Forest and the three State Wildlife Areas mentioned previously, other public lands within the study area include the Necedah National Wildlife Refuge, Jackson County Forest, Wood County Forest, Juneau County Forest, and 10 State Natural Areas (four of these are located within the Black River State Forest).

The study area is contained within a portion of the Central Sand Plains Ecological Landscape characterized by sandy soils and generally flat topography with intermittent sandstone buttes and ridges. Land cover in the study area is primarily forests and wetlands. Once a widespread component of parts of the study area, Pine and Oak Barrens now exist only where restoration of this community type has become a management priority, almost exclusively on public lands such as the Necedah National Wildlife Refuge and Sandhill and Meadow Valley Wildlife Areas. Commercial forestry is a major land use throughout the study area. A highly regionalized industry that is widespread in this

[1] References to southern Wisconsin in this report refer to the Eastern Broadleaf Province (222) in the National Hierarchy of Ecological Units (see Appendix L for more information regarding the ecoregions of the study area).

landscape is the commercial harvest of *Sphagnum* moss from the region's extensive peatlands. The ecological impacts of moss harvest are not well understood and need additional study. Sphagnum moss harvest no longer occurs on Sandhill, Wood County, or Meadow Valley Wildlife Areas.

Historically, this landscape was composed of extensive pine and oak forests on the uplands and numerous tamarack swamps with some "spruce" and "marshes" in the lowlands. Open pine barrens occurred where periodic wildfires removed or reduced the tree canopy. Barrens appear to have been particularly widespread in the western portion of the study area, including locations that are now within the boundaries of the Black River State Forest.

Natural reforestation processes, augmented by tree planting and following the implementation of widespread fire suppression policies, have produced a landscape in and around the public lands of the Central Sands that is currently dominated by forest. The percentage of forest acreage within the study area is high when compared to other parts of the Eastern Broadleaf Forest Province. Although oaks and, to a lesser extent, aspens and red maple are major components of upland forests, conifers are more important here than in any other landscape in southern Wisconsin due to their abundance, opportunities for their protection, sensitive species dependent on these forest types, and certain recreational and economic activities. Plantation-grown pine is common throughout the study area, and natural forests dominated by red pine are extremely rare in this region. Jack pine forests may be experiencing a similar pattern. Several non-forested cover types are also very well represented here, and open wetlands are an important and abundant resource in the study area, including broadly defined natural community types such as Open Bog/Poor Fen, Sedge Meadow, and Emergent Marsh. However, many large wetlands of the study area have been altered extensively to develop flowages and cranberry beds.

Exceptional Characteristics of the Study Area

The study area constitutes a large part of one of Wisconsin's most intact and distinctive landscapes. The characteristics described below are important considerations for state property master planning. They are not listed in order of importance.

- **Large Areas of Natural Vegetation**. Urban and agricultural uses are relatively localized within the study area, with the significant exception of cranberry production, and this area appears much less fragmented by developments than most areas in the southern half of the state (and considerably less than some parts of the north). The human population of the study area is low, especially when compared to other areas in southern Wisconsin. Road density is also lower than most other parts of Wisconsin, particularly in the southern half of the state. The combination of these factors provides this area with unique management opportunities that may not be possible elsewhere in the state.
- **Extensive Public Lands**. Public ownership in the Central Sand Plains is more extensive than in any other location in the southern half of the state. The Black River State Forest is Wisconsin's third largest state property. The study area includes the Black River State Forest, three wildlife areas (Meadow Valley, Wood County, and Sandhill), the Necedah National Wildlife Refuge, portions of three county forests (Jackson, Wood, and Juneau), and 10 State Natural Areas (four of these are located within the Black River State Forest).
- **Restoration Potential**. The potential exists for large-scale restoration projects for globally rare savanna communities such as Pine and Oak Barrens. Restoration of these communities is already a priority on some public lands within the study area such as Necedah National Wildlife Refuge, Sandhill Wildlife Area, and Meadow Valley Wildlife Area.
- **Landscape-scale Management**. Potential exists to manage lands at a landscape (rather than a local, or stand) scale, an opportunity that occurs in few other locations within the Eastern Broadleaf Forest Province due to fragmentation, development, and smaller less contiguous public land holdings.
- **Unique Ecological and Geological Attributes**. Much of the study area is situated within or near the margins of the tension zone and features a mixture of northern and southern vegetation types and animal communities. The area is especially noteworthy for supporting southern outliers of many "northern" animals, plants, and vegetation types. While many of the plant communities occurring within the study area broadly resemble types that have been described elsewhere in either southern or northern Wisconsin, there is a strong regional flavor in both the

community composition and vegetation mosaic. Wetlands are abundant, and the study area is part of a larger central Wisconsin landscape containing the highest concentration of wetlands in the state. The vast sandy plains and extensive wetlands punctuated by sandstone mounds, buttes, and pinnacles create a landscape that resembles no other in the eastern United States.

- **High Species Richness**. The study area is biologically rich and contains a high concentration of rare species that are tracked by the Natural Heritage Inventory Network. The Wisconsin NHI Program has documented **47** rare plants and **120** rare animal species within the study area. Forty-seven of the rare animal species have at least 25% of their statewide occurrences in the study area.
- **Natural Communities**. Peatlands (Poor Fen, Muskeg, and Tamarack-Black Spruce Swamp) are more extensive here than anywhere else in southern Wisconsin. The study area contains a greater acreage of contiguous forest than any other landscape of comparable size in the Eastern Broadleaf Forest Province. There is especially high potential for the protection, management, and restoration of pine-oak barrens, dry pine-oak forests, White Pine-Red Maple Swamp, peatlands (Poor Fen, Muskeg, Tamarack-Black Spruce Swamp), and shrub swamps. The Wisconsin NHI Program has documented **196** occurrences of **26** natural community types in the study area.
- **Exceptional Habitat Management Opportunities**. Plants, animals, and natural communities that are geographically limited and highly localized in Wisconsin are well represented within the study area. For some of these, the best statewide management opportunities occur here. Area-sensitive species such as large predators, forest interior birds, and many grassland birds are present and can be maintained with appropriate management. Barrens remnants support many rare and declining species and some of the most extensive opportunities to maintain barrens habitats occur here. The Central Wisconsin peatlands support many species that are rare or absent from similar habitats in northern Wisconsin. Many northern mammals, birds, invertebrates, and plants occur here at or near their southern range limits.
- **River Corridors**. Major river corridors support significant occurrences of natural communities, support many rare species, and afford the opportunity to maintain connections with other southern Wisconsin landscapes. Unimpounded stretches of the headwater streams originating in the peatlands of this region provide habitat for a number of rare invertebrate species.

Summary of Biotic Inventory Results

Rare Vascular Plants

Forty-seven rare plants, including the State Endangered reticulated nutrush (*Scleria reticularis)* and sand violet (*Viola fimbriatula*), as well as the State Threatened dwarf milkweed (*Asclepias ovalifolia)*, pale green orchid (*Platanthera flava* var. *herbiola)*, bog bluegrass (*Poa paludigena)*, prairie parsley (*Polytaenia nuttallii*) and algae-like pondweed (*Potamogeton confervoides*) have been documented in the study area within the last 30 years. Many (**338**) new records of rare plant populations were added to the NHI database as a result of this project. Four additional endangered or threatened species were historically known from the study area but could not be relocated: woolly milkweed (*Asclepias lanuginosa)*, large water-starwort (*Callitriche heterophylla)*, brittle prickly-pear (*Opuntia fragilis)*, and spotted pondweed (*Potamogeton pulcher)*. The BRSF/MV has some of the largest populations in the state of several rare species and important populations of many others. There are several plants here that are disjunct from their main ranges, especially those that have their main concentrations on the Atlantic coastal plain of the eastern United States. Other rare plants in the study area have strong affinities to prairies or savannas, cliffs, wet forests, open wetlands, or aquatic environments.

Rare Animals

One hundred twenty rare animal species have been documented in the study area including **11** state endangered and **16** state threatened species in the last 30 years. **Eighty-six** of these species have been found since 1997 as a result of the current inventory. One additional Federally Endangered species was historically known from the study area: American burying beetle (*Nicrophorus americanus*). For many rare animals, the BRSF/MV study area has the only Wisconsin population(s), the most viable populations, or simply the majority of the documented populations in Wisconsin. These include **12** globally rare species, **six** federally listed or candidate species and **27** state listed species. There are also a number of both rare and common animals in the study area that are either disjunct from

northern Wisconsin or have the study area as the southern limit of their distribution. As with the rare plants, there are certain species that are disjunct from range centers in the Atlantic Coastal Plain of the eastern US. One species found in the study area is endemic to western Wisconsin and northeastern Iowa, another subspecies is endemic to central Wisconsin, and several are restricted to certain specialized habitats. Perhaps the most striking aspect of the animal fauna in the study area is the presence of a large number of species that require either extensive unfragmented habitat or intact watersheds.

Natural Communities

One hundred and ninety-six natural community occurrences have been surveyed within the study area. These include both rare and representative community types: **112** forests, **19** savannas, **8** shrub swamps, **45** open wetlands, **5** upland herbaceous types (prairies), and **7** miscellaneous types. (*See Appendix I for brief descriptions of the community types documented within the study area*).

Among the surveyed natural communities are:

- formerly widespread but currently rare types such as Pine (and Oak) Barrens and Sand Prairies,
- types with geographically limited ranges such as Coastal Plain Marsh and White Pine-Red Maple Swamp, and
- types of wider statewide distribution such as Northern Dry Forest, Northern Dry-mesic Forest, and Southern Dry-mesic Forest.

Classification of the communities in this region remains problematic, as many of the occurrences have a strong regional flavor and may contain unusual mixtures of species with ranges that are either primarily southern or primarily northern. BER staff continue to collect vegetation plot data from the study area and at other locations within the Central Sands Ecological Landscape. Opportunities to maintain viable examples of most of these types are very good owing to the large acreage of public lands and the extent of natural vegetation. Shifts in management emphasis may be needed to ensure that there is adequate representation of fire dependent types, large community patches, and under-represented developmental stages (such as the very early and the very late stages). Many of the surveyed communities support rare species populations and it is potentially far more effective – and far less expensive – to manage at the community or landscape scales rather than to attempt to accommodate each species individually.

Aquatic Features

The study area is especially notable for the number and nature of aquatic and wetland animal species. Both common and rare species characteristic of a number of major and minor habitat types are found here. The aquatic fauna includes elements of large warm southern rivers, fast flowing medium sized streams of northern Wisconsin, warm backwaters and oxbows associated with larger streams, small, cool or cold headwater streams, slow marshy streams, large open sedge- and moss-dominated wetlands, and microhabitats such as springs, spring runs, wet cliffs, and seeps.

Priority Opportunities for Biodiversity Conservation

The priority opportunities for biodiversity conservation for the study area emerged primarily from our analysis of the data collected during the recent field inventory (1997-1999 and supplemented with information collected through 2004). We also included relevant information from past studies and utilized tools that permit an effective analysis of large landscapes. These included: satellite imagery and associated interpretations such as WISCLAND; Geographic Information Systems (GIS); the NHFEU (see Appendix L); various analyses of pre-European settlement vegetation data; and Forest Inventory and Analysis (FIA) data summaries (WDNR 1996). The priority opportunities reflect inventory and assessment of the natural features both within and around the BRSF/MV. Conservation opportunities are not equivalent throughout the study area, and we have emphasized those sites (locations) that contain the best examples of rare and representative native ecosystems, aquatic features, and sensitive species populations, based on our inventory findings. For plants and animals, priority opportunities include the largest and potentially most viable populations on the NHI Working List. For communities, priority opportunities were determined by identifying

community occurrences that are 1) least modified from a natural condition 2) that occur in a context which is compatible with maintaining that community over time, and 3) which are represented by relatively large stands. To conserve and manage for diversity efficiently, both rare and representative community types were evaluated.

The following lists provide an overview of the priority opportunities for biodiversity conservation at the landscape scale. Significance of individual sites and opportunities for conservation at the site level are also covered in this report (under "Primary Site Significance").

Protection and Management Opportunities

1. Maintain or re-establish large blocks of contiguous forest, barrens, and wetland communities
2. Maintain or re-establish connections between patches of habitat to avoid negative isolation effects
3. Protect, manage, and maintain viable examples of native communities, aquatic systems, and geological features throughout the study area. Community priorities include rare types, large patches, and missing or diminished successional stages
4. Maintain the ecological integrity of the major river corridors identified as Stream Segment Sites (Appendix F): the Black, East Fork of the Black, and the Yellow. Extend this protection to ecologically important tributaries of these rivers
5. Manage at a landscape scale – consider stand level opportunities within the larger context of the landscape
6. Protect and/or restore the hydrology of wetland and aquatic systems
7. Protect, manage, and maintain viable habitat for rare or otherwise sensitive plants and animals
8. Focus protection efforts on those sensitive species, natural communities, and aquatic systems that are especially characteristic of the Central Sands ecoregion or that offer opportunities not present elsewhere in Wisconsin. For less extensive or geographically restricted community types, some of the best management opportunities in the state occur here.
9. Boundary adjustments merit consideration during state property master planning as one means of extending protection to key sites containing valuable natural features. Examples include the Black River corridor, Lower Halls Creek, the East Fork of the Black River, Yellow River Bottoms corridor from Babcock to Necedah, and large wetlands in the bed of Glacial Lake Wisconsin.

Restoration & Management Opportunities and Needs

1. Increase management capacity to use prescribed fire as a forest, barrens, and, as appropriate, a wetlands management tool
2. Increase management capacity to control invasive species
3. Identify means to increase cooperation and coordination across administrative boundaries since certain management issues cannot always be effectively addressed on an individual property basis (examples include wide-ranging species, area-sensitive species, riparian corridors, species that are distributed as "meta-populations," and management of disturbance events that can occur at very large scales). Management interest and emphasis varies among federal, state, county, tribal, and private land ownerships.
4. Working with private groups and individuals interested in conserving the region's resources should continue to be a focal point for the agencies responsible for managing public lands within the Central Sands (important interest groups include cranberry growers, the Ho-Chunk Nation, Wisconsin Bird Conservation Initiative, Sharp-tailed Grouse Society, Black River Basin team)
5. Develop incentives for various ownerships to maintain or re-establish diminished or declining resources

Primary Sites: Significance and Summaries

Eighty-one sites (several of which have been grouped into **three** larger "macrosites") were identified during the course of this project. Termed "Primary Sites," they generally include the best examples of both rare and representative natural communities, aquatic features, and rare species populations that were documented within the BRSF/MV. The significance of each site was evaluated at three scales: the Black River State Forest, the Central Sands Plain Ecological Landscape, and the state as a whole. The location of each Primary Site is shown on Figure 36. In addition, site summaries are provided in Appendices B-G of this report. Each site summary contains a description of the site, element occurrence information, site significance, management considerations, and a site map.

Future Inventory, Monitoring & Research Needs

Future inventory and monitoring of the biotic resources of the BRSF/MV will be ongoing and periodic, based on needs identified in the master plan and elsewhere, with adjustments made to accommodate new information using the principles of adaptive management. This report outlines needs in three basic areas: future inventory, monitoring, and research.

Inventory is an ongoing endeavor with new efforts adding information to the established baseline. For example, stand specific inventories resulting from annual planning meetings have resulted in the documentation of several new natural communities and rare species. However, there remain several inventory needs for the study area, including a need for a basic inventory of bryophytes of the central Wisconsin peatlands. Another identified need is conducting a status survey of species that may be restricted to habitats where mosses are harvested. Such inventory work would help us better understand the effects of *Sphagnum* harvest on natural communities and rare plant and animal species. A project was initiated in 2004 (with an estimated completion date of 2008) to help address these questions.

Monitoring can help detect changes in biological systems that arise from natural environmental variability as well as those from management activities. The Department is limited in its ability to undertake these actions immediately, but it is important to identify issues now within the context of a new planning cycle. These suggestions should be factored into master planning to develop an overall monitoring plan. Final priorities should reflect the preferred alternative selected through master planning.

For the long-term, it would be valuable to assemble an interdisciplinary working group of scientists and land managers to address monitoring needs for this landscape in a more comprehensive way. At a minimum, the expertise represented should encompass forest ecology, wetlands, disturbance ecology, hydrology, soils, rare species, invertebrates, and "lower" plants. One need is to design a monitoring project to measure changes in populations over time for a selected subset of rare, sensitive, highly specialized, or otherwise appropriate plant and animal species which are important in the BRSF/MV. Another important need is to develop a coarse scale monitoring protocol that will measure changes over time in patch size distribution, cover type representation, successional stage representation, and development in and around the BRSF/MV.

In addition to the inventory and monitoring needs identified above, this report outlines several basic research questions relevant to the study area. Research may require greater allocation of resources, both time and money, and cooperation across a variety of disciplines. In general, the research needs and information gaps outlined in this report will not have significant impacts on the development of a new Master Plan for the state forest. For example, research on the central Wisconsin peatlands should include a component on fire disturbance history as well as the burn frequency and severity of the wetlands in the study area and its impacts to flora and fauna. Additionally, invasive species are becoming an increasingly important management issue, both in the study area and the state. It is important to develop effective and practical control measures to address present and future problems associated with the spread of invasive species (such as glossy buckthorn and leafy spurge). Investment in effective control measures today could result in significant savings in limited management resources in the future.

Introduction

Project Purpose and Objectives

This report presents the results of a multi-year project to inventory and analyze selected biotic resources of the Black River State Forest, the State Wildlife Areas located near the forest (including the Meadow Valley, Wood County, and Sandhill Wildlife Areas), and the surrounding landscape. This project was undertaken by the Natural Heritage Inventory section of the Wisconsin Department of Natural Resources' Bureau of Endangered Resources, in cooperation with the Division of Forestry, to provide baseline information on the rare species, natural communities, and ecology of the study area relevant to the development of a new property Master Plan for the Black River State Forest and the conservation of biological diversity. The state wildlife areas were included in the project to provide information for future master planning efforts and to provide a landscape perspective.

This inventory and analysis is one of a number of assessments identified as critical for developing a new state forest master plan. The information provided in this report consolidates background information useful for property master planning and is intended to be used in conjunction with other master planning assessments and other sources of information to develop overall recommendations for the forest. It is our hope that this information will also be useful to a wider audience that includes managers, administrators, conservation groups, private landowners, and others who have an interest in conserving the biological diversity of this landscape.

The primary objectives of this project were:

- The identification and evaluation of natural biotic communities,
- The identification and evaluation of rare or otherwise significant plant and animal populations,
- The identification and evaluation of selected aquatic features and their associated biotic communities,
- The identification of sites appropriate for the restoration of lost or declining communities or important habitats,
- The identification of especially important protection, management, and restoration opportunities, focusing on both unique and representative natural features of these properties, as well as the surrounding landscape,
- The interpretation and transfer of the information gathered for use by the property master planning team, as well as managers, administrators, and others involved in the implementation of land use decisions on the Black River State Forest and Meadow Valley Landscape properties, as well as the surrounding landscape.

Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of an international network of NHI programs. The defining characteristic of this network, and the feature that unites the individual programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers was established by The Nature Conservancy and is currently coordinated by NatureServe, an international non-profit organization (see www.natureserve.org for more information).

Natural Heritage Inventory programs focus on rare plant and animal species, natural communities, and other natural features, referred to as elements of biodiversity. Elements tracked by the Wisconsin NHI Program are listed on the Wisconsin NHI Working List (see Appendix K). The Working List is the official list of Endangered, Threatened and Special Concern (see Appendix K) plants, animals and natural communities for Wisconsin. This list changes over time as the populations of species change (both up and down) and as knowledge about species status and distribution increases. The most recent Working List for the State of Wisconsin, as of this writing, was printed January 2004 and is available on the Internet through the WDNR Endangered Resources Program (www.dnr.state.wi.us/org/land/er/).

The Wisconsin NHI program has utilized a standard approach for biotic inventory work that supports master planning. Generally, the approach involves data collection and development, data analysis, and report writing as shown in Figure 1. Details of standardized NHI methodology can be found at NatureServe's Web site[2]. Of particular interest to master planning is the assignment of ranks for occurrences of natural communities and rare species. Appendix A contains additional information on the methodology used by the Wisconsin NHI program.

Field surveys for the Black River/Meadow Valley biotic inventory projects were conducted primarily between 1997 and 1999 and supplemented with information collected by NHI and others through 2004. Staff employed a coarse filter – fine filter inventory approach (Appendix A). Coarse filter surveys conducted during the first year identified those natural communities, aquatic features, and rare species that warranted more detailed inventory. Fine filter inventory, initiated in Year 1998, focused on more intensive surveys conducted by experts targeting high priority species. A limited number of surveys were conducted in 1999 to fill information gaps for high priority sites, taxa, and natural communities. Table 1 summarizes the individual surveys conducted along with the principal investigator(s) for each survey and the scope of each survey.

Standard methods were used for surveying each taxa group. For some species groups, such as aquatic insects and mussels, surveys covered the entire suite of species present at a given survey site, given the difficulty of identifying species in the field and the ongoing process of determining what is rare for these lesser known taxa. Broader information for other taxa was also gathered through data collection on species that have been found to be associated with rare species. Other species, such as most tree species, game species, and other common species were not covered by this inventory. There is currently little known about some organisms such as the aquatic bug, *Nepa apiculata*; for these species we cannot provide definitive information useful for master planning at this time.

Many sources were consulted to aid in the identification and prioritization of survey sites within the BRSF/MV. Our basic references included the Division of Forestry stand reconnaissance data, interpretations of local and regional land cover from recent aerial photographs and satellite imagery, the original land survey notes for the Central Sands region, and habitat type information newly derived from available data on landforms, vegetation, and soils. We also drew upon the NHI database for previous records from this landscape.

Following completion of fieldwork and processing of collected data, NHI staff analyzed inventory data conducted a ranking workshop to assess the significance of the rare plants, rare animals, and natural communities documented during the inventory process, and developed site boundaries. Participants in this workshop were leaders for the NHI botany, zoology, and ecology programs. Staff from the Division of Forestry, the Bureau of Facilities and Lands, and the Bureau of Science Services also participated in the process (see Epstein et al. 1999 for more information on the ranking process).

Figure 1

General Methodology for Natural Heritage Inventory Biotic Inventories

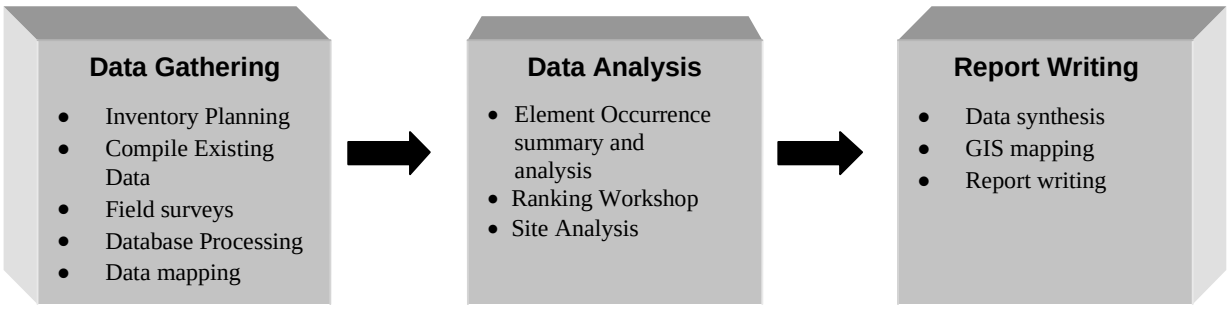


Table 1: Field surveys conducted during 1997-1999.

Survey	Biologist(s)	Scope of Taxa Surveyed*
Aquatic insects	Richard Bautz , Colin Dovichin, Dr. William Hilsenhoff (taxonomy), Rebecca Schroeder, Dr. Kurt Schmude, William Smith, and Wayne Steffens	All species sampled were documented.
Birds	Eric Epstein , Randy Hoffman , Rebecca Schroeder, Dennis Kuecherer, and Elizabeth Spencer	Bird counts documenting all species encountered and targeted surveys for select species on the Working List
Botany	Andy Clark, June Dobberpuhl, Eric Epstein, Rebecca Schroeder, and Dr. Emmet Judziewicz	Targeted surveys for Working List species. All species encountered during these surveys were documented.
Herptiles	James Burnham and Gary Casper	Targeted surveys for Working List species
Mussels	David Heath, Rebecca Schroeder, Lisie Kitchel, and Bill Smith	Comprehensive surveys (all species documented).
Natural communities	Eric Epstein, Dr. Emmet Judziewicz, Elizabeth Spencer, and Dan Spuhler	All plant species encountered during these surveys were documented as part of the community description.
Peatland dragonflies	William Smith and Timothy Vogt	Targeted surveys for Working List species
Small mammals	Richard Bautz	All species sampled were documented.

* For "targeted" surveys, sites were chosen based on likely habitat for rare species, although associated species were also noted.

Background on Past Efforts

The NHI program has compiled records on the occurrences of rare plants, animals and intact natural community remnants in many areas throughout the state of Wisconsin, but a comprehensive biotic inventory had not been conducted for most of these elements within the BRSF/MV. In addition, although various individuals, agencies, and institutions have conducted surveys for a variety of reasons within the study area, most of the past work was limited to specific properties, natural communities, and/or specific taxa. However, various large-scale research and planning efforts have identified a number of locations within the BRSF/MV as being ecologically significant. The following are examples of such studies and the sites that were identified and described by the studies.

The Wisconsin Grassland Bird Study

The WDNR Bureau of Integrated Science Services (formerly Bureau of Research) conducted the Wisconsin Grassland Bird Study from 1985-1997. The statewide study focused on grassland bird distribution and abundance, community composition, habitat preferences, habitat requirements, population trends, and response to land use changes. A report was published (Sample and Mossman 1997) for natural resource managers that identified *Priority Landscapes* for grassland bird habitat. The *Priority Landscapes* detailed in the report represented "unique opportunities for landscape-scale grassland management that should not be missed." Two areas within the BRSF/MV study area were listed as *Priority Landscapes*: Bear Bluff Wetlands and Necedah Barrens. See Sample and Mossman (1997) for more information about these areas.

Nature Conservancy Ecoregional Planning

The Nature Conservancy (TNC) completed an ecoregional plan (TNC 2001) for the Prairie-Forest Border Ecoregion (an area that encompasses most of southern Wisconsin and portions of Minnesota, Iowa, and Illinois). The resulting portfolio of Ecologically Significant Areas represents viable natural community types, globally rare native species, and other selected features. Two of these areas, the Black River-Meadow Valley-Bear Bluff area and the Lemonweir River comprise most of our study area (Fig. 2).

- The **Black River-Meadow Valley-Bear Bluff Landscape** (the majority of the BRSF/MV study area is included in this landscape) was designated by TNC as a *Functional Landscape,* indicating that it was "selected for both

coarse-scale plant community and aquatic ecological system targets, as well as rare species targets." *Functional Landscapes* are considered to have viable targets represented, but some degree of restoration activity may be required to perpetuate them and ensure their future viability.

- The **Lemonweir River** site in the southern portion of the BRSF/MVL study area was listed by TNC as a *Functional Site* (meaning that is was "selected for one or more small-patch or large-patch plant communities, or an aquatic ecological system target and may or may not include rare species targets).

Figure 2
"Portfolio Sites" from The Nature Conservancy's Prairie-Forest Border Ecoregional Plan (TNC 2001).

Land Legacy Study

At the request of the Wisconsin Natural Resources Board, the WDNR undertook a study, entitled the Land Legacy Study, to identify places that will be critical in meeting both conservation and recreation needs through 2050. (The criteria used by the Land Legacy Study for identifying critical places are broader than those used in this report and include recreational uses). The sites were ranked for different categories, including "Conservation Significance." A draft of the Wisconsin Land Legacy Report (WDNR 2002) was released November 2002. The land legacy study identified the following "Legacy Places" within the BRSF/MV study area and described them as follows:

- **The Black River** – The Black River Corridor itself was identified due to its biological diversity, wildlife habitat, its function as a dispersal corridor, and the opportunity it provides to link several other significant public lands.
- **Central Wisconsin Forests** – The combination of the Black River State Forest and the Jackson, Wood, and Clark county forests together comprise more than 330,000 acres, a significant portion of the largest block of public ownership in southern Wisconsin.
- **Bear Bluff** is a vast, relatively unpopulated and undeveloped complex of wetlands interspersed with sandy upland ridges. This area contains some of the largest remaining wetlands in southern Wisconsin and supports many rare species. Much of the land is privately owned, with cranberry production an important land use.
- **Sandhill-Meadow Valley-Wood County Wildlife Areas** contain more than 80,000 acres of diverse habitats that support abundant wildlife, including rare species.
- **Necedah National Wildlife Refuge** is a mosaic of oak-dominated hardwood forests, wetlands, and extensive flowages managed primarily for waterfowl. An important barrens restoration project is underway here, and this portion of the study area is rich in sensitive species. This site is being used as a focal point for the reintroduction of the Trumpeter Swan and Whooping Crane, two globally rare species that had been extirpated from Wisconsin.
- **Yellow River** – This is an extensive, mostly undeveloped, forested river corridor that contains significant stands of relatively intact floodplain forest, shrub swamp, and wet meadow, and supports numerous sensitive species.

Description of the Study Area

Location

The Black River State Forest / Meadow Valley Landscape (BRSF/MV) is located in Central Wisconsin in the Eastern Broadleaf Forest Province which occupies approximately the southern half of the state (Fig. 3). The study area is west of the Wisconsin River, in portions of Clark, Jackson, Juneau, Monroe, and Wood counties (Fig. 4). The study area boundaries were designed to encompass major public lands that share similar landscape attributes. The study area stretches from the Black River on the west, east as far as the Yellow River floodplain, and north a short distance beyond the East Fork of the Black River. The southwestern boundary is at the interface of the central sand plain and the highly dissected ridge and coulee terrain of the Driftless Area. One site, Gullickson's Glen, occurs just outside of the study area boundary, a few miles to the west. It is included here because stewardship responsibility rests partially with staff of the Black River State Forest.

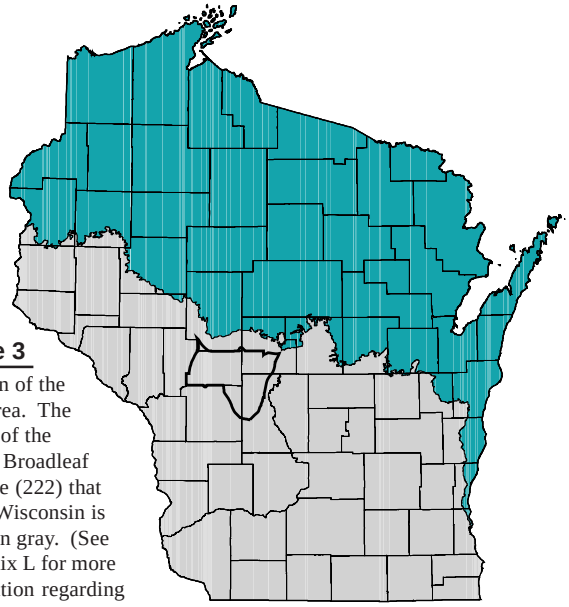


Figure 3
Location of the study area. The portion of the Eastern Broadleaf Province (222) that covers Wisconsin is shown in gray. (See Appendix L for more information regarding ecoregions).

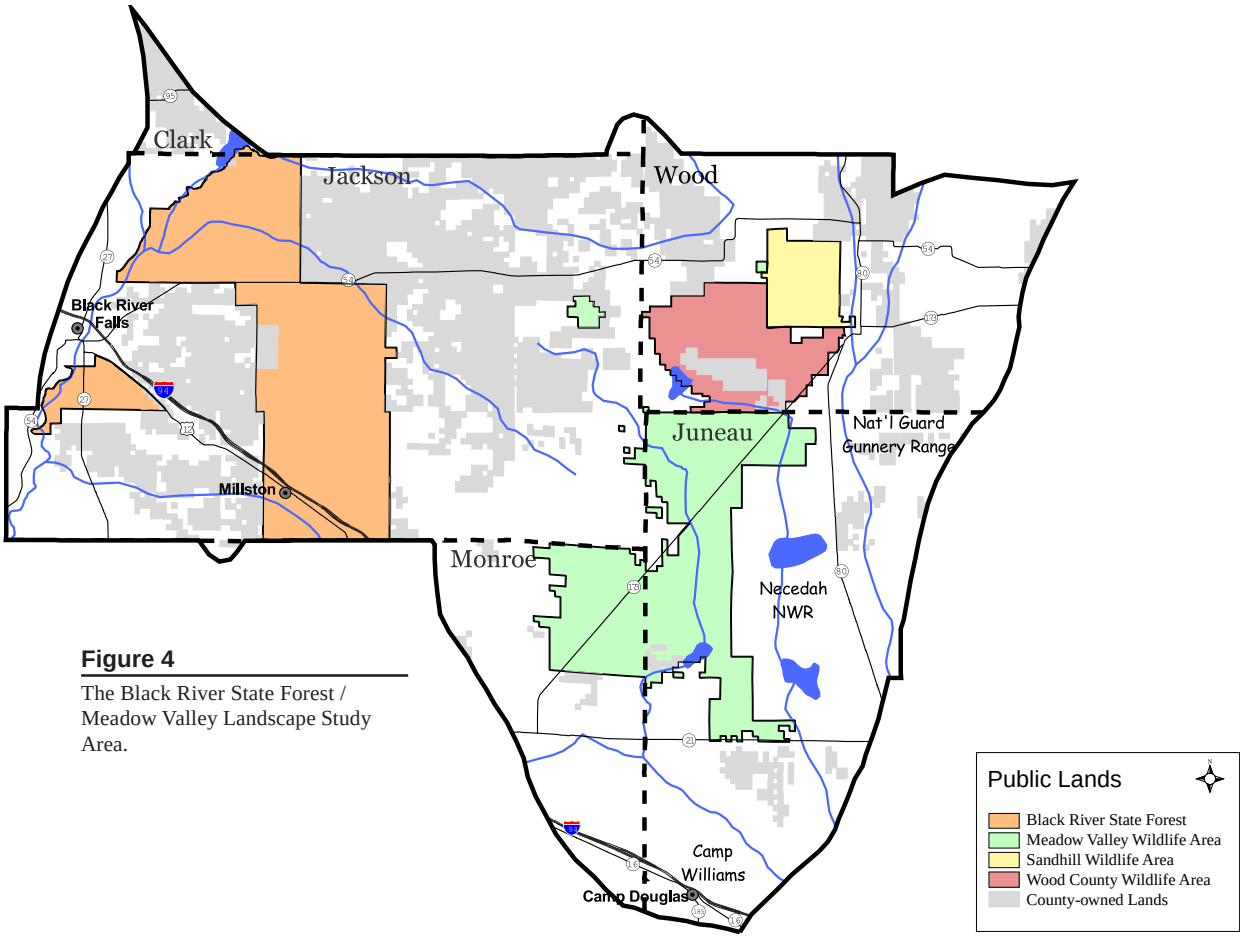


Figure 4
The Black River State Forest / Meadow Valley Landscape Study Area.

Ecoregions

Ecoregions are areas of similar ecological potential and geography. The WDNR has mapped the state into a set of ecoregions called Ecological Landscapes based on aggregations of smaller ecoregional units (subsections) from a national system known as the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et al. 1994). This system delineates landscapes of similar ecological pattern and potential across the state in a way that is meaningful and useful to resource administrators, planners, and managers. The study area is entirely within the **Central Sand Plains** Ecological Landscape (Fig. 5). From the NHFEU, the units most relevant to this study are Subsections 222Ra (Central Wisconsin Sand Plain) and 222Rb (Neillsville Sandstone Plateau), and the more numerous Landtype associations (LTAs) – the finer scaled polygons that make up each subsection. A discussion of the ecoregions that comprise the study area, including maps and descriptions of subsections and LTAs, may be found in Appendix L**.**

Size

The study area encompasses 710,180 acres. The combination of state, federal and county lands comprise over 342,600 acres – nearly one-half of the study area. State and state-managed properties make up approximately 19 percent of the study area (Table 2). An additional 29 percent of the study area consists of county or federally owned lands.

Public Lands

Public ownership in this area is more extensive than in any other location within the southern half of the state (Fig. 6). The Black River State Forest is Wisconsin's third largest state property. In addition to the three wildlife areas mentioned previously, other public lands within the study area include the Necedah National Wildlife Refuge, Jackson County Forest, Wood County Forest, and Juneau County Forest. There are 10 State Natural Areas located within the study area; four of these are located within the BRSF.

Other Ownerships

Large tracts of privately owned land within the study area are dedicated to cranberry production. While these operations can greatly affect ecosystem functions, they do maintain large blocks of land in a relatively undeveloped state. The Ho-Chunk Nation and individual tribal members also own property in the study area, though it is not a Reservation. The remainder of the land within the study area is owned by other private landowners whose holdings vary considerably in size. Housing density is low in this area compared to other parts of the state (Fig. 7).

General Land Use

One striking aspect of the BRSF/MV is the low human population density. Several townships within the study area have no permanent human residents (US Census Bureau 2001). This is a unique situation for the southern half of Wisconsin (and is now quite rare in the north, as well), as illustrated in Figure 8. Urban and agricultural land uses are relatively low (Table 3) with the significant exception of cranberry production. This area appears much less fragmented than most areas in the southern part of the state (and considerably less than some parts of the north). The relatively intact nature of this landscape is evidenced by the presence of numerous animals that require extensive unfragmented habitats (see Fauna sections). Finally, the density of roads is lower than many other parts of the state (Fig. 9). The combination of these factors provides this area with unique management opportunities that are not likely to be possible elsewhere in the state.

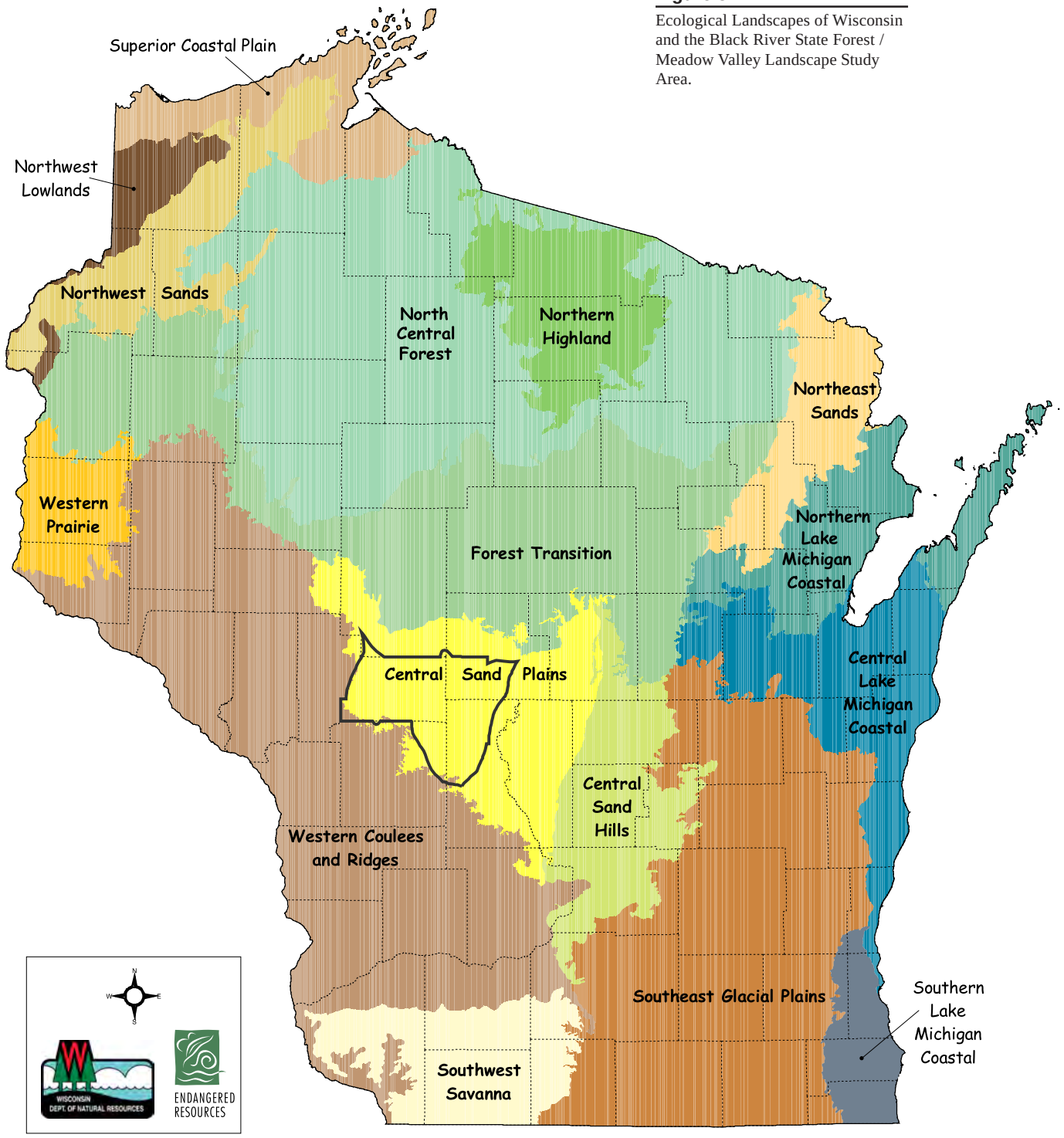
Table 2. Publicly owned lands within the Black River State Forest / Meadow Valley Complex.

Property	acres
State owned lands	
Black River State Forest	67,069
Meadow Valley Wildlife Area*	57,612
Wood County Wildlife Area	1,079
Sandhill Wildlife Area	9,455
County and Federally owned lands	
Clark County Forest	6,719
Jackson County Forest	113,300
Juneau County Forest	8,318
Monroe County Forest	1,708
Wood County Forest	33,717
Necedah National Wildlife Refuge	43,696

* 1,212 acres of the Meadow Valley Wildlife Area are owned by the State; the remainder is on lease from the Federal Government. Data are from 2004.

Figure 5

Ecological Landscapes of Wisconsin and the Black River State Forest / Meadow Valley Landscape Study Area.



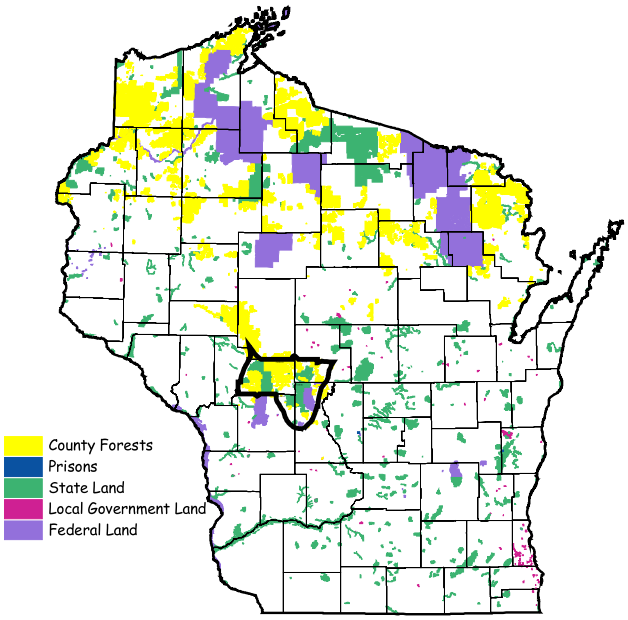


Figure 6

Publicly owned lands in Wisconsin, as of 2004.

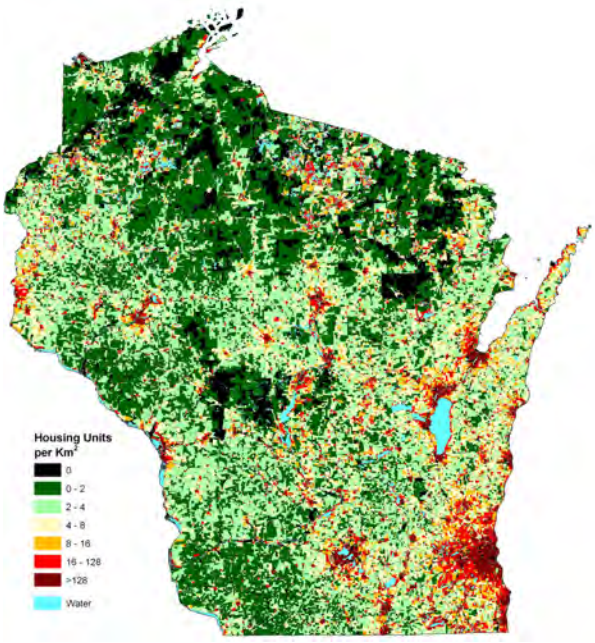


Figure 7

Housing Density Census Block 2000. Graphic courtesy of R. Hammer and V. Radeloff, University of Wisconsin, Madison.

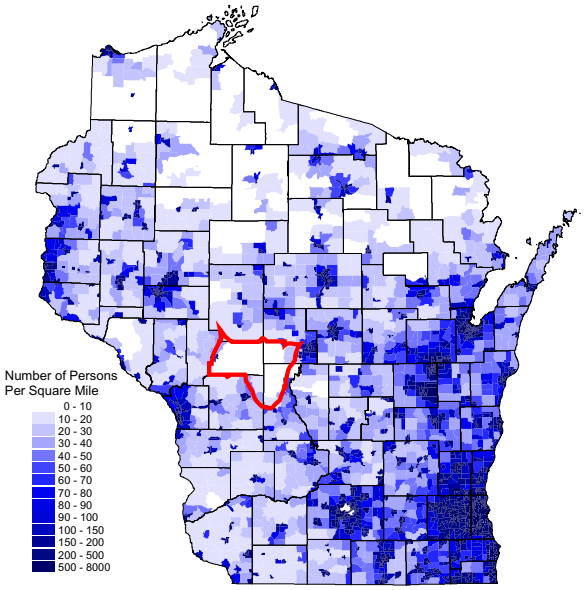


Figure 8

2000 Human Population Density (Data are from US Census Bureau)

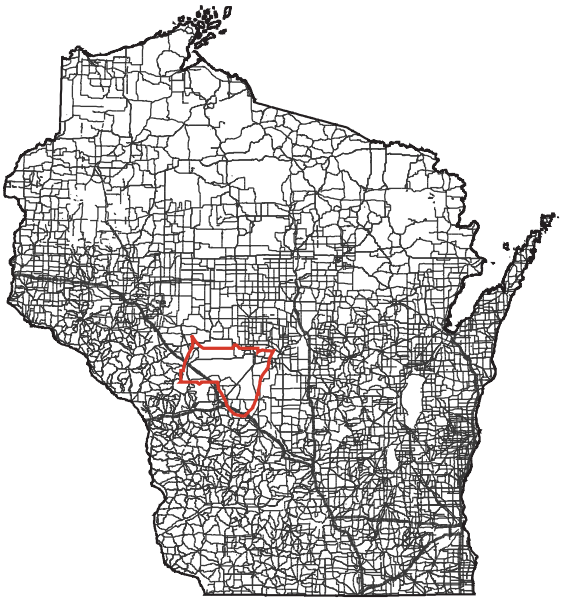


Figure 9

Wisconsin Federal, State and County Highways.

Table 3. General land use for the Black River State Forest; Meadow Valley, Sandhill, and Wood County Wildlife Areas; the Central Sands Ecoregion; and the southern half of the state (based on the Eastern Broadleaf Forest Province*). Data are from the WDNR WISCLAND GIS coverage.

	Black River S.F.		Meadow Valley W.A.		Sandhill W.A.		Wood County W.A.		Central Sands (222R)		E. Broadleaf Forest (222)	
Cover Classification	ac.	% of total	ac.	% of total	ac.	% of total	ac.	% of total	sq. mi.	% of total	sq. mi.	% of total
Urban	27	0	0	0	0	0	0	0	39	1	638	2
Agricultural Land	455	1	218	0	62	1	189	1	537	16	11392	42
Grassland	4435	6	1662	3	555	6	862	4	404	12	3623	14
Forested Upland	52885	68	20811	36	2496	27	6876	30	1434	42	7224	27
Open Water	2245	3	2406	4	597	6	736	3	133	4	899	3
Non-forested Wetland	9838	13	24554	42	4614	49	12022	52	455	13	1744	7
Forested Wetland	6968	9	6947	12	930	10	1810	8	333	10	911	3
Bare Land	836	1	48	0	11	0	0	0	47	1	304	1
Shrubland	0	0	1533	3	93	1	540	2	37	1	84	0

* See Appendix L for a discussion of the ecoregions that include the BRSF/MV.

Land cover is primarily forest and non-forested wetland. Barrens, once extensive here, exist only where restoration of this community type has become a management priority, almost exclusively on public lands such as Necedah National Wildlife Refuge, Sandhill Wildlife Area, and Meadow Valley Wildlife Area. Commercial forestry is a major land use throughout the study area. Other important land uses include recreation (such as cross-country skiing, wildlife viewing, hunting and ATV riding), wildlife conservation and restoration, and cranberry farming. A specialized industry that continues to be widespread is the commercial harvest of *Sphagnum* moss from the region's extensive peatlands. The moss is used to pack the roots of trees and shrubs to prevent desiccation during shipping and for decorative use by the floral industry. However, the ecological impacts of moss harvest are not well understood and will require additional study.

Extensive wetland alteration has occurred throughout the study area. Historically, many of the wetlands were drained in attempts to convert the land to agricultural use. Most of these attempts failed with the notable exception of cranberry farming. Based on the WDNR's 24k Hydrological Coverage (June 2003 release), approximately 55% of Wisconsin's 8200 acres of cranberry beds occur within the study area (Fig. 10).

Physical Environment

Geography

The study area is centered on the Central Plain Geographical Province of Martin (1916) and includes a very small acreage of the Western Uplands Province along the western edge. The Central Plain is composed of sandy deposits (alluvium, outwash, and lakebed) with occasional sandstone-cored hills and ridges. Much of this area is poorly drained and features extensive wetlands, typically with a peat substrate composed of partially decomposed *Sphagnum* mosses and sedges. This concentration of wetlands within the bed of extinct Glacial Lake Wisconsin comprises the "Great Swamp of Central Wisconsin," the largest wetland in the state. The Western Uplands Province is characterized by high Cambrian sandstone (or dolomite) ridges separated by deep valleys, and is often referred to as the "Driftless Area" because the

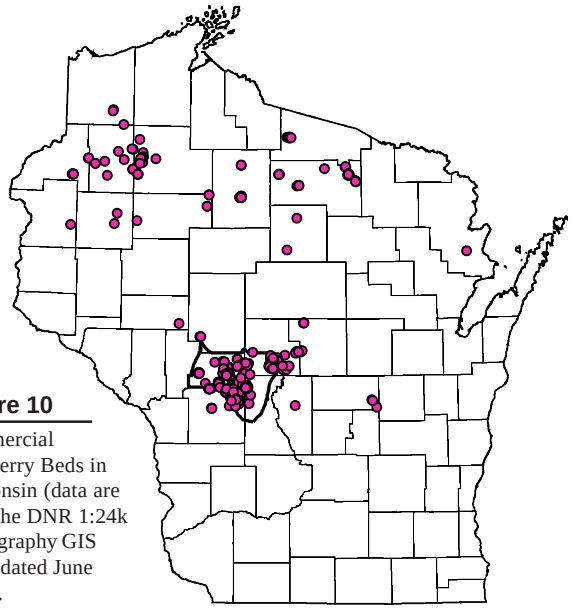


Figure 10
Commercial Cranberry Beds in Wisconsin (data are from the DNR 1:24k hydrography GIS layer, dated June 2003).

surface is not covered by materials derived from glacial action. Two main watershed systems, the Black River and the Wisconsin River, drain the study area.

Climate

The "tension zone" (Fig. 11) is a climatic transition area that crosses Wisconsin from northwest to southeast, and separates the conifer-hardwood forests of northern Wisconsin from the mosaic of prairie, savanna, and mainly deciduous forests of the south (Curtis 1959). Much of the study area is situated within or along the margins of the tension zone, and, as a result, features a mixture of northern and southern vegetation types. The area is especially noteworthy for supporting southern outliers of many "northern" species and vegetation types (see Sections on Flora and Fauna below for further information). The climate of central Wisconsin is one of the major factors that have influenced both past settlement and present land use patterns. Climate is somewhat different in areas contained within the former Glacial Lake Wisconsin than the surrounding areas, and unlike areas elsewhere in the southern half of the state. Conditions within the study area are unfavorable for most agricultural practices. Frosts can occur at virtually any time of year, and the growing season is relatively short. For example, there are 4333 degree growing days at Blair, located immediately to the west of Jackson County and outside of the study area but only 2175 degree growing days at Mather, located near the center of the study area (NRCS 2001). This may further be illustrated by Figure 12, which shows the presence of a prominent cold spot within the study area, based on weather station averages.

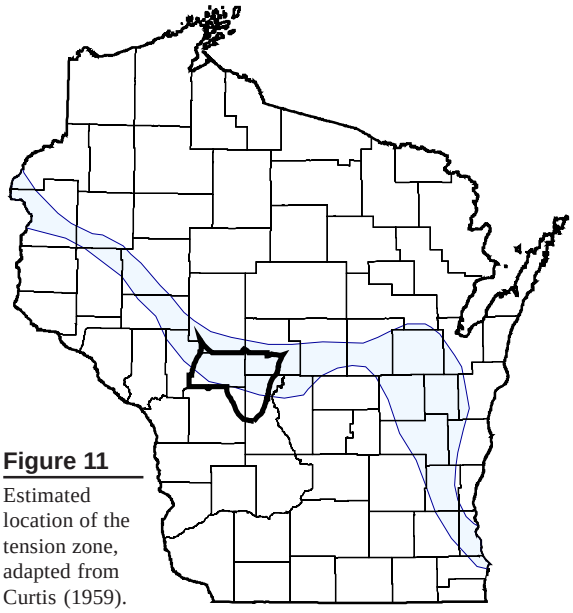
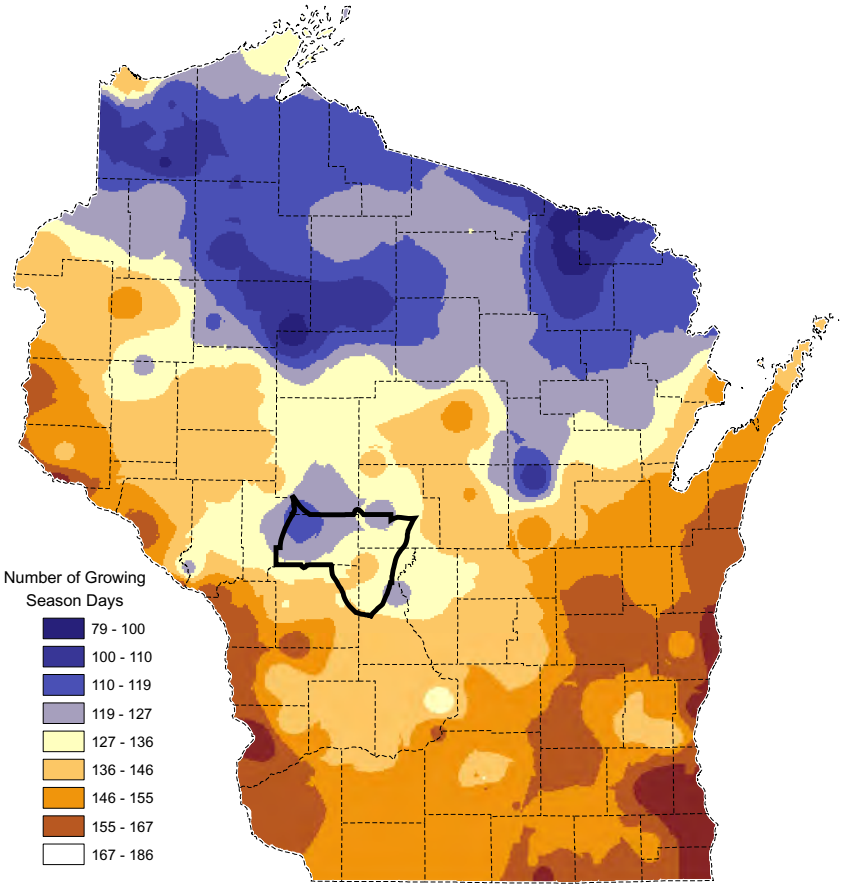


Figure 11
Estimated location of the tension zone, adapted from Curtis (1959).

Figure 12
Length of growing season (days) based on consecutive days with temps above 32 degrees.



Geology

Most of the BRSF/MV landscape lies within an area that has not been in direct contact with the ice sheets that descended from the north during the various ice ages. There are no pitted outwash or end moraine landforms, so there are very few natural lakes, other than oxbows within river floodplains. Unpitted outwash is extensive in the valleys of the Black River and several of its tributaries. There is a limited area of ground moraine in the northern part of the study area and some subsurface iron deposits southeast of Black River Falls.

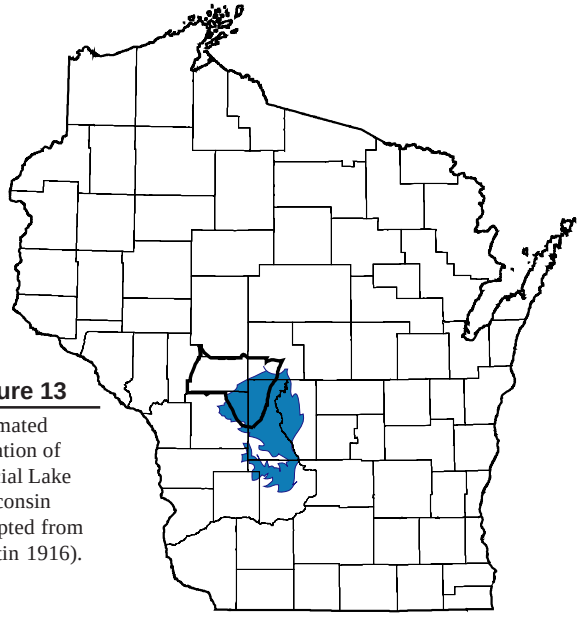


Figure 13
Estimated Location of Glacial Lake Wisconsin (adapted from Martin 1916).

Glacial processes in one form or another did affect a large part of the area. Approximately the eastern half of the study area occurs in and around what was once Glacial Lake Wisconsin (Fig. 13). This vast, pro-glacial lake was formed at the end of the last Pleistocene glacial advance that started approximately 19,000 to 18,000 years ago and covered over 1,800 square miles (Clayton and Attig, 1989). The drainage of this lake left behind an almost level landscape of infertile sands and large wetlands, punctuated or bordered by striking sandstone bedrock features. These sometimes take the form of cliff-bound pinnacles and mesas that rise abruptly to an elevation of several hundred feet above the level plain. (No other landscape in the eastern United States resembles this part of central Wisconsin). In other areas, the rock underlies eroded sandstone mounds or sinuous sandstone ridges like Saddle Mound and Wildcat Ridge. Within the BRSF/MV landscape, the Black River and it's tributaries to the east (especially the East Fork of the Black River) served as major outlets when Glacial Lake Wisconsin drained approximately 14,000 years ago.

Roughly the western half of the study area is within the Driftless Area and was not inundated by Glacial Lake Wisconsin. Upper Cambrian Sandstone is exposed in the extreme western part of study area and sandy alluvium predominates to the east and downstream of Black River Falls. An unusual feature of this part of the study area is a large flat plain, termed the Jackson plain, near the northwest outlets of Glacial Lake Wisconsin. The Jackson plain may have originated from a lake that existed long before the last stage of the Wisconsin glaciation, possibly in the Early or Middle Pleistocene (Clayton and Attig, 1989).

The Canadian Shield, a geologic formation composed of pre-Cambrian granite, can be seen at some of its southernmost Wisconsin exposures at rapids along the Black River and its tributary, the East Fork of the Black. The banks of the East Fork of the Black River are underlain by Cambrian-aged sandstones, which occasionally outcrop as low ledges or cliffs. The river bottom proper is characterized by Precambrian-age igneous and metamorphic rock, as well as sand and gravel deposits.

Soils

Upland soils are primarily sands, sandy loams, and grayish-brown unglaciated silt loams, derived from glacial lakebed and outwash deposits and erosion of sandstone bedrock. They are generally acidic, infertile, and prone to drought; the sands of this area are among the most sterile soils in the state. Extensive areas of organic soils (peats and mucks) are associated with the area's abundant wetlands. Terraces along the larger rivers include localized areas of silts and other fine-textured soils, but these make up a small part of the study area. Where the water table is close to the surface, small changes in elevation can result in a wide range of local soil moisture conditions.

Hydrology

General aspects of physical hydrology are discussed above. More detailed aspects of hydrology, as they pertain to the distribution of organisms, are given below under three main types: lakes, wetlands, and streams. The overall degree of man-made alterations through ditching and impoundments is significant, especially in the eastern half of the Study

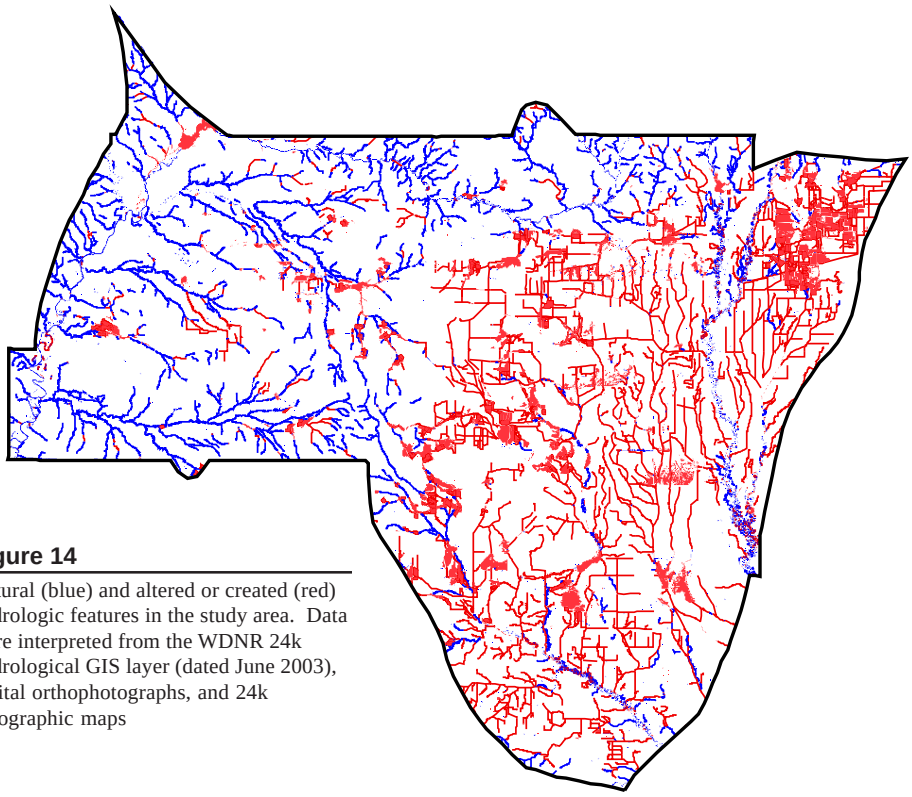


Figure 14

Natural (blue) and altered or created (red) hydrologic features in the study area. Data were interpreted from the WDNR 24k hydrological GIS layer (dated June 2003), digital orthophotographs, and 24k topographic maps

Area (see Figure 14) and is discussed in the sections below.

Lakes

There are very few natural lakes within the study area, and these are mostly of the oxbow type – abandoned channels within the floodplains of the major rivers that contain water permanently or seasonally. In a few areas small depressions hold water seasonally or during wet periods, creating ponds. The greatest areas of standing water in the study area are man-made impoundments and flowages constructed by the damming of small streams. Like the streams they impound, they are generally shallow, acidic, and infertile. The dams on the Black River at Hatfield and Black River Falls have also created areas of open water.

Wetlands

As mentioned previously, the water table is generally close to the surface and small changes in surface topography may result in a wide range of soil moisture levels. The predominance of flat topography, sterile soils, and proximity to groundwater in large portions of the study area has resulted in large areas of wetlands or wetland complexes dominated by monotypic sedge/sphagnum vegetation. The peat in most wetlands is currently shallow and is underlain by sand. It has been suggested (Rich King, WDNR, personal communication) that in the Necedah Wildlife Refuge area the peat was generally deeper before settlement, and that much of it was lost to fires. Many of these wetlands are the headwater areas of streams discussed below. Most of the large wetland basins within the study area have been at least partly ditched or drained. Ditching in the eastern part of the basin has been intensive and systematic (Fig. 14).

Streams

The major drainages in the region include the Black River on the west, the East Fork of the Black River on the north, and the Yellow and Lemonweir rivers in the east and south. The factors discussed below are thought to be most important in determining potential biota and are discussed further in Wagner, 2000.

Gradient – High gradient streams include the western tributaries to the Black River, tributaries to the East Fork of the Black River, and southern tributaries to Robinson Creek – all in the western half of the study

area. The rest of the study area is very flat with a concentration of low gradient streams. In fact, the vast majority of flowing surface waters in the eastern half of the Study Area are ditches created in earlier attempts to drain the bed of ancient Lake Wisconsin. Close to the Black River some of the tributary streams drop rapidly through narrow, soft sandstone, rock-flanked gorges to meet the parent stream. Morrison, Valentine, Hall's, Dickey, and Perry Creeks are good examples of these streams.

Size – The study area is large enough to have a range of stream sizes present ranging from 1st order headwaters to 6th order streams with average flow of 290 cfs (Black River) or 350 cfs (Yellow River).

Hydrologic Source – Surface water for most of the study area originates in extensive wetlands with significant peat and/or muck deposits. This organic material stains the water, giving many streams an amber hue. There is low groundwater input to most of these streams. The few ground water-dominated (cold water) streams originate in the uplands on the extreme western and southern edges of the study area and flow into the Black River and Robinson Creek. The few streams with sources dominated by surface water streams are in the far northern part of the study area. Most of the remaining streams in the study area are cool water streams, with mixed groundwater and surface water sources.

Many streams originating in the central and eastern portions of the study area begin in open elongate interconnected wetlands that probably receive some regular sub-surface flow. These headwater basins often contain open peatland communities (e.g. "Central Poor Fen"). Water emanating from these wetlands coalesces into surface-flowing streams, many of which are impounded for development of cranberry or wildlife flowages.

Connectivity – An important factor in the distribution of aquatic animals like fish and mussels is uninterrupted connectivity, both upstream and downstream for dispersal and completion of life cycles. Dams limit aquatic species diversity by isolating populations of aquatic organisms and preventing them from dispersing and completing important parts of their life cycles. All streams in the study area flow eventually into the Mississippi River, via either the Black River to the west or the Wisconsin River to the east. Below Black River Falls the Black River has free flow (over 60 miles) all the way to the Mississippi River. The original falls at Black River Falls was probably a natural barrier that inhibited the movements of certain species to some extent, but the dam currently in place is a complete barrier. The Wisconsin River itself has a number of dams downstream of the study area and offers little potential for the movement of aquatic animals into or out of the study area. There is also a dam on the Yellow River at Necedah, just south of the study area. The headwaters of many of the small tributaries of both the Black and Wisconsin rivers have been dammed to create flowages, which are used by cranberry growers and for wildlife interests. A large concentration of flowages exists in the Dike 17 Wildlife Area of the Black River State Forest, where waterfowl management has been the goal.

Vegetation

Historic Vegetation

The Public Land Surveys[2] (PLS) of the mid-1800s portray a landscape composed of extensive pine and oak forests on the uplands, numerous tamarack (*Larix laricina*) swamps (with some "spruce") and "marshes" in the lowlands, and open pine barrens where recent wildfires had removed or reduced the tree canopy. Figure 15 illustrates the historical importance of the barrens community within the western portion of the study area, as interpreted by pre-settlement vegetation analyses conducted by Finley (1976). Concentrations of white (*Pinus strobus*) and/or red pine (*Pinus resinosa*) dominated forests were noted south and east of Black River Falls, along the Black River and several of its tributaries (especially the East Fork, Morrison Creek, and White Creek), and in the middle portion of the

[2] These surveys were conducted by the US General Land Office to establish the current township-range-section system of property description. Surveyors recorded the species and diameter of the nearest available trees at each section and quarter section corner, and the trees distance from the survey corners; these are referred to as "witness trees."

McKenna Creek drainage in southeastern Jackson County. Hardwood forests of black (*Quercus velutina*), white (*Quercus alba*), and red oak (*Quercus rubra*) were prominent in the vicinity of the Overmeyer Hills-Wildcat Mound (in the southeastern part of what is now the BRSF), but occurred at scattered locations elsewhere. Oaks were also components of mixed forests dominated by pines. Forested lowlands were abundant, with tamarack and "spruce" [all native spruce in the study area appears to be black spruce (*Picea mariana*)] the most frequently mentioned trees. Open wetlands were generically described as "marsh."

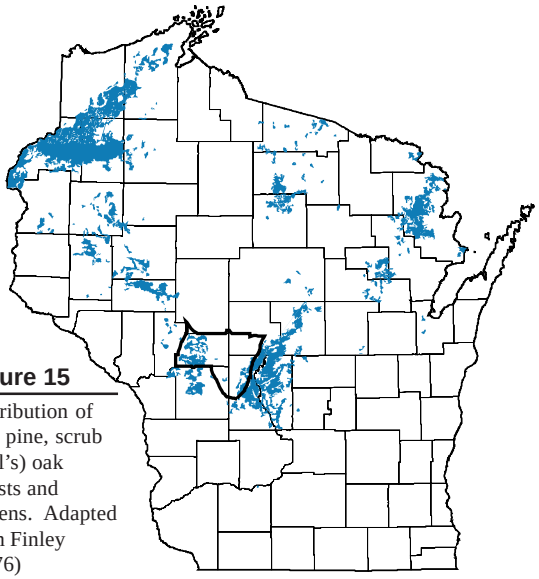
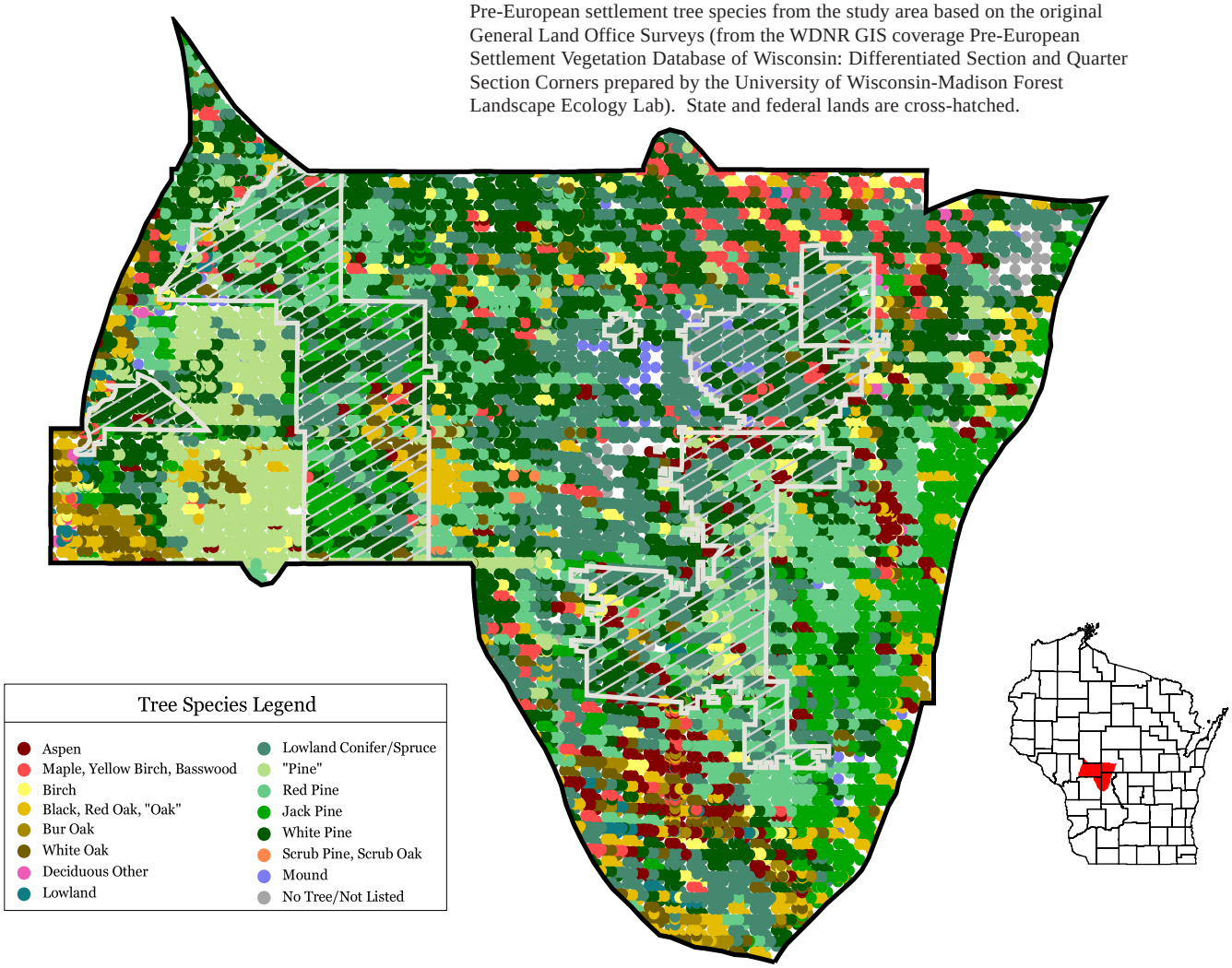


Figure 15
Distribution of jack pine, scrub (Hill's) oak forests and barrens. Adapted from Finley (1976)

The three most frequently recorded trees in the PLS records for subsection 222Ra of the NHFEU were jack pine (*Pinus banksiana*), black oak, and white pine. Bur oak (*Quercus macrocarpa*), red pine, tamarack, white oak, aspens [presumably including both trembling (*Populus tremuloides*) and bigtooth aspen (*Populus grandidentata*)], red oak, and paper birch (*Betula papyrifera*) were also very common, in roughly that order of abundance according to the surveyors (see Fig. 16) (Mladenoff, unpublished data).

Figure 16
Pre-European settlement tree species from the study area based on the original General Land Office Surveys (from the WDNR GIS coverage Pre-European Settlement Vegetation Database of Wisconsin: Differentiated Section and Quarter Section Corners prepared by the University of Wisconsin-Madison Forest Landscape Ecology Lab). State and federal lands are cross-hatched.



Widespread exploitation of the region's forests occurred during the state's "big cutover" from the mid-1800s into the early 1900s, with large white and red pines as especially sought-after commodities. The remote nature of the landscape and the prevalence of wetlands led to the construction of tramways, canals, and, ultimately, railways to facilitate the extraction and transport of timber (Eswein 1995). Logging of the highly prized white and red pines that were abundant in eastern Jackson County peaked in the late 1800s. Fires were frequently associated with logging activities.

Farming was attempted on some of the logged and burned lands in the late nineteenth and early twentieth centuries but was often unsuccessful because of infertile soils, frequent drought, and mid-summer frosts. Some of the more enterprising settlers began the commercial cultivation of cranberries quite early (before 1900), and the harvest of *Sphagnum* moss in the region dates back to the Civil War. Both of these highly regionalized endeavors have continued to the present. The failure to establish agriculture as a major land use in this part of the state ultimately led to the establishment of the current system of extensive public lands. These public lands contributed to the largely intact landscape that exists today.

Current Vegetation

Natural reforestation, augmented by tree planting and partially as the result of widespread fire suppression policies, have produced a landscape in and around the public lands of the Central Sands that is currently dominated by forest. The present forest acreage is high when compared to other areas in the southern half of the state, as illustrated by Figure 17.

WISCLAND data (Table 4) clearly demonstrate that the ecoregions of the study area (subsections 222Ra and 222 Rb) have higher acreages (in some cases, the highest acreages) for cover types such as jack pine, red pine, and mixed conifer-hardwood forests than other parts of the Eastern Broadleaf Forest Province. Several non-forested cover types are also very well represented here – for example, wet meadows and lowland shrub types. What is less apparent from the raw statistics is that the mosaic of natural vegetation is far less fragmented by intensive land uses compared with other regions in the southern part of the state (and considerably less than some parts of the north).

Common upland tree species include white pine, jack pine, and black oak, with red pine, tamarack, white oak, bur oak, aspens (trembling and bigtooth combined), and red oak and paper birch (*Betula papyrifera*) also common (based on WISCLAND data, WDNR 1999). Red maple (*Acer rubrum*) is widespread but seldom dominant, and sugar maple (*Acer saccharum*) becomes a forest dominant north of, but not within, the study area.

Silver maple (*Acer saccharinum*), river birch (*Betula nigra*), and green ash (*Fraxinus pennsylvanica*) are important trees in the forested floodplains of the larger rivers, but the area occupied by these species is comparatively small. Young and medium-aged forests are currently abundant, but stands exceeding 100 years of age are very rare.

Forests: The BRSF/MV supports extensive forest communities that vary in composition and structure depending on site-specific factors such as soil type, available soil moisture and nutrient levels, landform, disturbance regime, and historical events. While oaks and, to a lesser extent, aspens are important components of upland forests, conifers are more widespread here than in any other landscape in southern Wisconsin (Table 4), with pines being prominent upland species on sites that vary from dry to dry-mesic conditions. Plantation-grown pine is now common throughout the study area. In recent years, particularly following a severe outbreak of the jack pine budworm in the early 1990s, planted red pine has replaced some of the dry forests formerly dominated by jack pine and oaks. Current trends on some public lands are to maintain jack pine acreage by replanting harvested stands, using mechanical scarification and sometimes herbicide applications for site preparation. Natural forests dominated by red pine are now extremely rare in this region, and jack pine forest may be experiencing a similar pattern.

White pine assumes an ecologically important role in the wet-mesic forests of this region on sites that border small streams or that sometimes occur in a broad zone at the wetland-upland interface. Extensive acreages of tamarack-dominated conifer swamps are widespread in the study area's peatlands. Black spruce, close to its southernmost

Figure 17

MODIS Satellite Image of Wisconsin, acquired June 30, 2003. Imagery courtesy of the Environmental Remote Sensing Center, University of Wisconsin-Madison (http://www.ersc.wisc.edu).

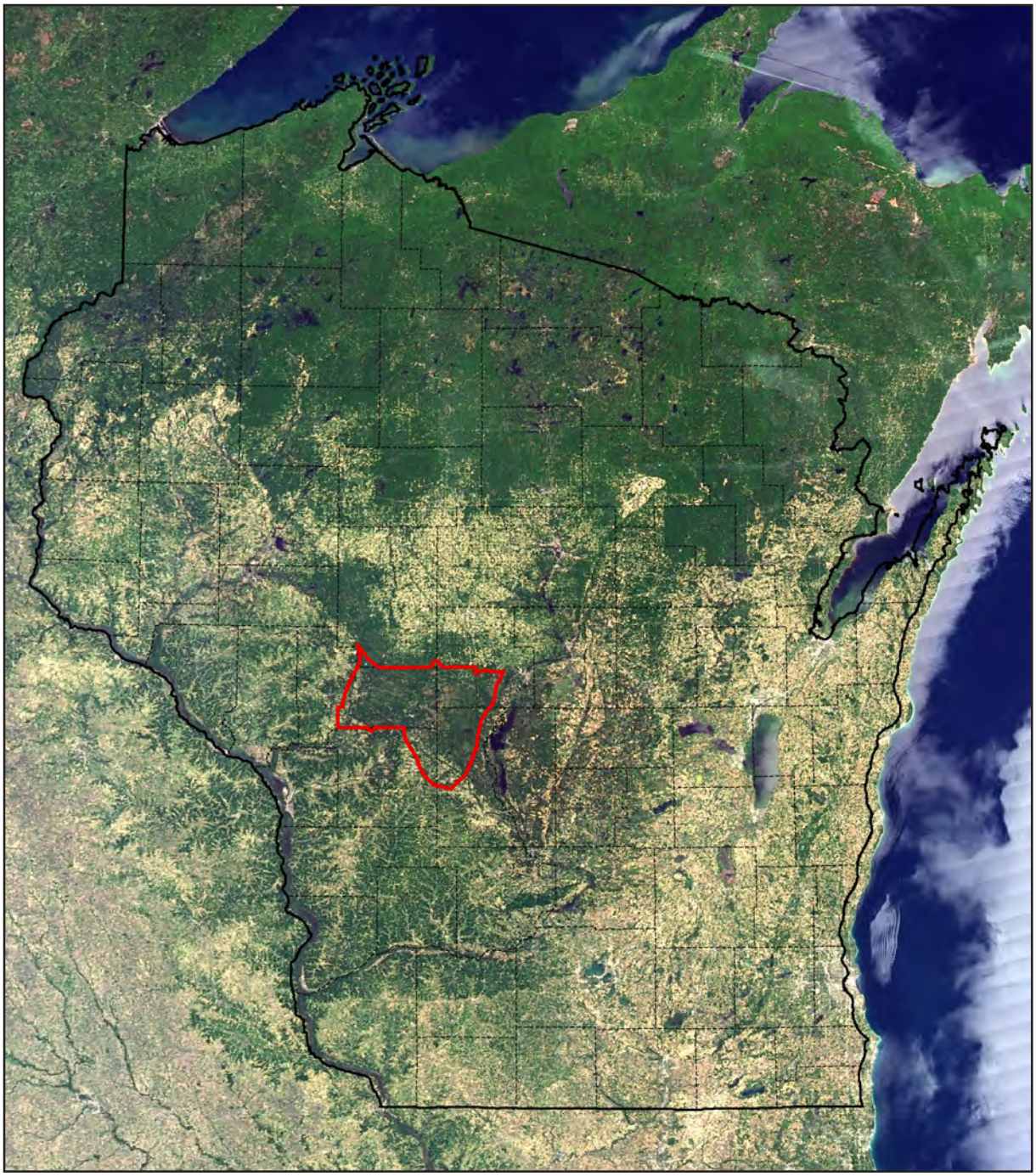


Table 4. Cover Types (in sq. miles) for each of the NHFEU subsections in Province 222 – Eastern Broadleaf Forest. Data are from the WDNR WISCLAND GIS coverage. The Central Wisconsin Sand Plain (Subsection 222Ra) comprising the majority of the study area, is shown in bold. See Appendix L for maps and descriptions of the Province, subsections, and other ecoregions of the NHFEU relevant to the BRSF/MV.

	Southern Wisconsin Subsections (222 Province) – data are in sq. miles														
Cover Type	**La**	**Md**	**Rb**	**Kb**	**Lb**	**Kc**	**Ra**	**Kd**	**Ld**	**Lc**	**Ke**	**Kg**	**Le**	**Kf**	**Kh**
Urban / Golf Course															
Urban	24	11	0	5	18	51	**37**	9	9	38	112	191	14	57	31
Golf Course	0	0	0	0	1	2	**2**	1	0	1	9	7	0	7	1
Agriculture															
Agriculture	523	516	107	386	872	484	**430**	361	522	1551	2629	322	1361	585	747
Grassland															
Grassland	261	316	81	296	418	63	**322**	121	163	478	472	139	203	203	87
Conifer Forest															
Jack Pine	0	0	31	2	28	0	**117**	1	0	0	0	0	0	0	0
Red Pine	16	9	9	66	32	0	**67**	7	1	12	0	0	0	0	1
Mixed/Other Coniferous	0	1	13	8	15	6	**54**	3	5	25	21	5	1	8	0
Deciduous Forest															
Aspen	1	1	75	0	41	0	**77**	0	0	0	0	0	0	0	0
Oak	22	2	118	214	186	2	**248**	61	139	455	37	0	121	4	10
Maple	3	1	3	1	1	0	**1**	0	0	5	0	0	0	0	0
Mixed / Other Deciduous	459	182	190	50	872	50	**156**	87	362	1232	280	80	214	135	65
Mixed Forest															
Deciduous/Coniferous	3	0	24	83	33	1	**251**	16	0	3	0	0	0	0	0
Open Water															
Open Water	22	21	7	44	11	262	**126**	32	2	171	133	17	3	42	6
Non-forested Wetland															
Emergent/Wet Meadow	27	12	39	78	44	101	**173**	40	23	103	330	31	10	79	21
Floating Aquatic	5	0	0	0	1	0	**0**	0	0	14	0	0	0	0	0
Lowland Shrub	39	4	57	50	36	48	**184**	23	6	24	100	5	2	28	6
Forested Wetland															
Broad-leaved Deciduous	21	9	70	67	34	43	**160**	21	7	119	126	13	2	44	11
Coniferous	1	0	13	18	2	6	**52**	4	0	0	13	0	0	3	0
Mixed	2	0	12	2	2	1	**26**	0	0	0	5	0	0	1	0
Barrens															
Barrens	6	4	6	4	27	15	**41**	6	7	34	72	21	20	39	2
Shrubland															
Shrubland	0	0	6	1	9	0	**31**	1	0	0	4	12	0	13	0

range limits here, is a significant canopy component of some of these conifer swamps. Locally, jack pine can also be quite common, and sometimes dominant, in acid conifer swamps of this region.

Savanna: Savanna is best represented by the pine and oak barrens communities, dynamic community types with highly variable structure. Tree cover usually consists of a scattering of jack pine, or sometimes black or northern pin oak, with tree density generally dependent on a combination of time elapsed since the last disturbance event (historically this was wildfire) and site growing limitations. The understory vegetation in the more open remnants is composed mostly of native grasses and forbs, blueberries and sweet-fern (*Comptonia peregrina*), with thickets of hazelnut (*Corylus* spp.), prairie willow (*Salix humilis*), and oak "grubs." Though tree density is variable, it is often higher today than what is desirable to provide adequate habitat for the many rare or otherwise sensitive plants and animals associated with the barrens community. Few intact stands of this globally rare natural community occur on the present landscape, primarily due to the combined effects of long-term fire suppression and the conversion of much potential barrens habitats to pine plantation monocultures. Historical acreage of this dynamic complex has been greatly reduced throughout the statewide range and is now virtually restricted to intensively managed remnants on roughly a dozen state or federal managed areas (Addis et al. 1995).

Shrub Communities: Shrub-dominated communities are widespread throughout the study area, and they are best developed in wetlands and along wetland edges. Tag alder (*Alnus incana*) is a common dominant, with winterberry holly (*Ilex verticillata*), chokeberry (*Aronia melanocarpa*), bog holly (*Ilex mucronata*), bog birch (*Betula pumila*), willows (*Salix* spp.) and dogwoods (*Cornus* spp.) among the frequent associates**.** Though it is not possible to make

direct comparisons of the extent of shrub cover today with the historical condition, it is likely that shrub-dominated wetlands are now more prevalent than they were formerly. Both fire suppression and ditching, which has affected almost all of the larger wetlands in the study area, have favored the spread of shrubs and other woody vegetation.

Upland shrub communities are generally the result of timber harvest activities, which have been intensive in many parts of the study area, although some harvests resulted from insect and disease infestations. Such stands rapidly succeed to forest in the absence of additional disturbance. Some of the managed barrens remnants feature dense growths of shrubs such as hazelnut, sweet fern, prairie willow, sand cherry (*Prunus pumila*), blueberries (*Vaccinium* spp.), and blackberries (*Rubus allegheniensis*). Prescribed fire or mechanical brushing maintains these areas in a relatively treeless condition.

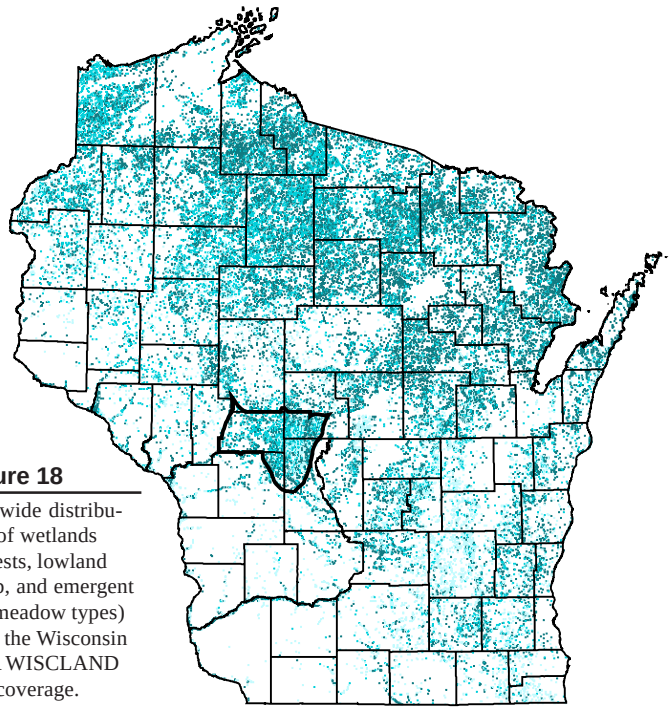


Figure 18
Statewide distribution of wetlands (Forests, lowland shrub, and emergent wet meadow types) from the Wisconsin DNR WISCLAND GIS coverage.

Open wetlands are an ecologically important and abundant resource in the study area (Fig. 18) and include broadly defined natural community types such as open bog/poor fen, sedge meadow, and emergent marsh. *Sphagnum* mosses and sedges are commonly dominant plants in the open peatlands, with varying proportions of ericaceous shrubs [leatherleaf (*Chamaedaphne calyculata*) and cranberries (*Vaccinium macrocarpon*) are the most common] and stunted bog conifers that may include tamarack, black spruce, and jack pine. True marshes, composed of species such as cattails (*Typha* spp.), bulrushes (*Schoenoplectus* spp.), pond lilies, and pondweeds are not common within the study area. When present, marshes are associated with artificial flowages where either the substrate or a nutrient enhanced water source have permitted extensive growths of marsh plants that are not generally well adapted to the acidic, infertile waters characteristic of the region.

Terrestrial Grasslands: True prairies are rare within the study area. Where maintenance activities have kept certain locales free of woody vegetation, species adapted to conditions of high light levels and sandy soils can sometimes thrive. Such sites can serve as refugia for some of the now rare organisms that need relatively permanent openings and cannot, or are unlikely to, persist on sites managed for rotations of timber that are subject to extended periods of deep shade. A few small patches of vegetation that could be interpreted as wet prairie have been noted on the margins of several open peatlands within the study area, but more typical sites now occur along roadsides or within railroad or utility corridors. Historically, most of these corridor “prairies” would have occurred within more extensive barrens complexes.

Cliffs: Cambrian sandstone cliffs flank scattered stretches of the Black River, and are also prominent in the lower gorges of several of the Black’s tributaries. Cliffs also occur on the upper slopes of the bedrock-cored mounds and ridges that are scattered throughout the landscape. The vegetation associated with such habitats is typically sparse, but may include rare habitat specialists. Most of the cliffs in the study area are dry, but at a few locations, groundwater seeping through the rock provides the constant moisture that sustains unusual biotic assemblages (madicolous community).

Regional Anomalies: While many of the plant communities occurring within the study area broadly resemble types that have been described elsewhere in either southern or northern Wisconsin, there is a strong regional flavor in the community composition that is not reflected elsewhere. It is important to recognize that the range of natural variability that is found within every vegetation type is expressed here in some ways that are unique. For example, in

contrast with the dry forests of the north, stands in this part of the state often include, and may be dominated by, species of primarily "southern" distribution such as black or white oak. Huckleberry (*Gaylussacia baccata*) is an important, sometimes dominant, shrub, and the herb layer may include species with savanna or prairie affinities.

See Appendix I for a description of each of the natural community types tracked by NHI that occur within the BRSF/MV study area.

Flora

The following are highlights of the flora of the study area, with an emphasis on rare species. More complete descriptions of the habitat requirements, numbers of populations in Wisconsin, relative importance of the study area populations in a statewide context, and conservation concerns can be found in Appendix H.

The flora of the BRSF/MV landscape is a result of many factors including the complex geological history, the position in the tension zone, plant dispersal capabilities, and disturbance regimes. These combinations have resulted in unusual habitats and a distinctive flora. Some of the most important aspects of the flora include:

- Species that are disjunct from the Atlantic coastal plain, such as Virginia meadow-beauty (*Rhexia virginica*) and cross-leaved milkwort (*Polygala cruciata*).
- Species that, in Wisconsin, are concentrated in the study area including bog fern (*Thelypteris simulata*) and long sedge (*Carex folliculata*).
- Species that specialize in barrens, savannas, or dry, sandy prairies such as sand violet (*Viola fimbriatula*) and dwarf milkweed (*Asclepias ovalifolia*).
- Species that are at the edge of their range in the state including purple bladderwort (*Utricularia purpurea*) (the study area is at the southwest part of the range in Wisconsin).
- Species that are Midwest endemics such as prairie fame-flower (*Talinum rugospermum*) and shadowy goldenrod (*Solidago sciaphila*) or Midwest/near West endemics like woolly milkweed (*Asclepias lanuginosa*).
- Species that are dependent on disturbance and that, in the study area, have been recorded from artificial settings like roadside ditches and flowages.

Fauna

The following are highlights of the fauna of the study area. More complete descriptions of the habitat requirements, numbers of populations in Wisconsin, relative importance of the study area fauna in a statewide context, and conservation concerns can be found in Appendix K. Scientific names (without common names) are used for some invertebrate animals in this report because standardized common names or English names have not yet been developed (see the species list at the back of the report for more information).

Many aspects of the study area affecting animal distribution are described in the Description of the Study Area section of this report. The physical nature of the study area allows for a wide range of habitats including some otherwise limited to northern Wisconsin, as well as habitats not otherwise found in the state. This combination of these characteristics has led to an unusual diversity of species. Some key faunal components of the study area include:

Species limited to large areas of suitable habitat including forest interior species and barrens species Examples include timber wolf (Fig. 19), Saw-whet Owl, Sharp-tailed Grouse, American Bittern, and frosted elfin butterfly (*Callophrys irus*)

- Forest species with southern affinities such as Cerulean Warbler and Louisiana Waterthrush
- Southern species at the northern limits of their ranges such as bullsnake (*Pituophis catenifer sayi*) (Fig. 20)
- Northern species disjunct from, or at the southern edge of, the main parts of their ranges such as timber wolf, fisher, porcupine, snowshoe hare, star-nosed mole, Northern Goshawk, Sharp-shinned Hawk, Red-breasted Nuthatch, Hermit Thrush, Solitary Vireo, Blackburnian Warbler, Black-throated Green Warbler, Golden-winged Warbler, Pine Warbler, Yellow-rumped Warbler, Yellow-bellied Flycatcher, Alder Flycatcher, Red Crossbill, Ring-necked Duck, Saw-whet Owl, White-throated Sparrow, Lincoln's Sparrow, and jutta Arctic (*Oeneis jutta*) (a butterfly), porcupine, and Common Raven (e.g. see Figs. 21-24)

- Stream species with relatively intact forested watersheds such as green faced clubtail dragonfly (*Gomphus viridifrons*), skillet clubtail dragonfly (*Gomphurus ventricosus*), as well as mussel beds
- "Big river" species connected to major river systems such as American eel and buckhorn mussel
- Another key group that is well represented in the central sands includes many species associated with sandy prairies and savannas (Oak and Pine Barrens in the study area). Examples include the pocket gopher (*Geomys bursarius*), Karner blue butterfly (*Lycaeides melissa samuelis*), frosted elfin, Sharp-tailed Grouse, Clay-colored Sparrow, blue racer (*Coluber constrictor*), and slender glass lizard (*Ophisaurus attenuatus).*
- Additional open sand loving species, including several tiger beetle, grasshopper, and several reptile species.
- *Sphagnum* moss - related species including those related to Central Poor Fens, wet sandstone cliffs, and Central White Pine Swamps such as warpaint emerald dragonfly (*Somatochlora incurvata*), a purse casemaker caddisfly (*Ochrotrichia riesi*), and four-toed salamander.

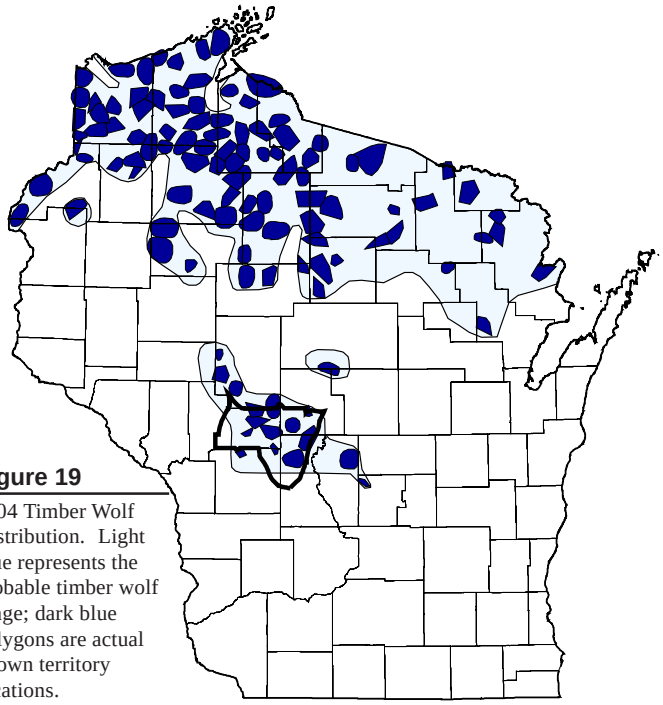


Figure 19
2004 Timber Wolf Distribution. Light blue represents the probable timber wolf range; dark blue polygons are actual known territory locations.

- Endemic populations or concentrated populations of disjunct species including a tiger beetle subspecies (*Cicindela patruela huberi*), sand snaketail dragonfly (*Ophiogomphus smithi*), ringed boghaunter dragonfly (*Williamsonia lintneri*), Kirtland's Warbler, and some predaceous diving beetle species (Coleoptera:Dytiscidae).
- Formerly persecuted species such as the timber wolf (*Canis lupus*) and eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*).
- The large open sedge- and moss-dominated wetlands as well as open marsh communities support the Sandhill Crane, Northern Harrier, American Bittern, Common Snipe, Sedge Wren, and LeConte's Sparrow), Blanding's turtle (*Emydoidea blandingii*), and the eastern Massasauga rattlesnake. The large wetlands in the eastern portion of the study area were recently chosen as sites for re-introducing/releasing rare birds species. Necedah National Wildlife Refuge was used as a release site for Trumpeter Swans (a State Threatened species) and currently is the Wisconsin training/conditioning site for the Whooping Crane reintroduction project, led by a group of non-profit organizations and government agencies. These targeted wetlands have since proven themselves suitable for both swans and Whooping Cranes, as each species has selected use of these areas following successful winter/spring migrations.

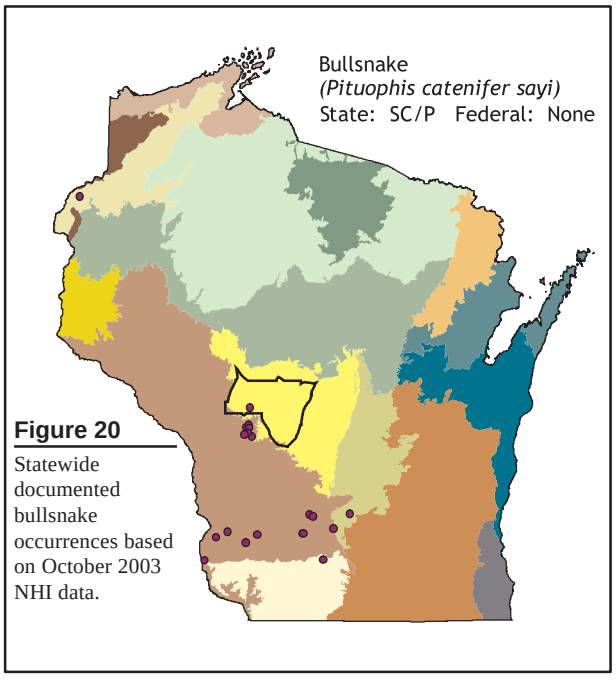


Figure 20
Statewide documented bullsnake occurrences based on October 2003 NHI data.

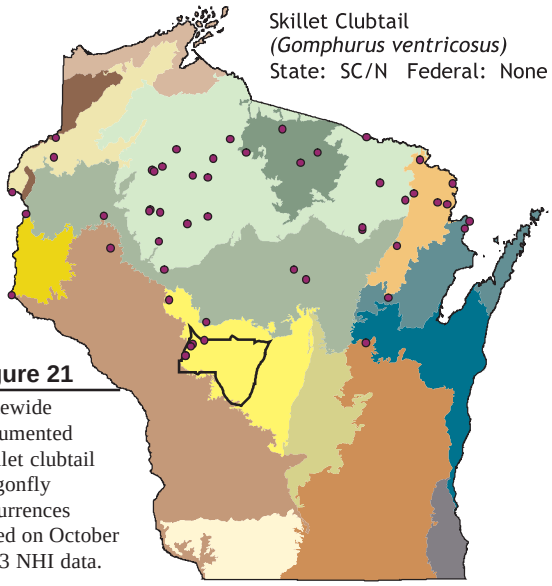


Figure 21
Statewide documented Skillet clubtail dragonfly occurrences based on October 2003 NHI data.

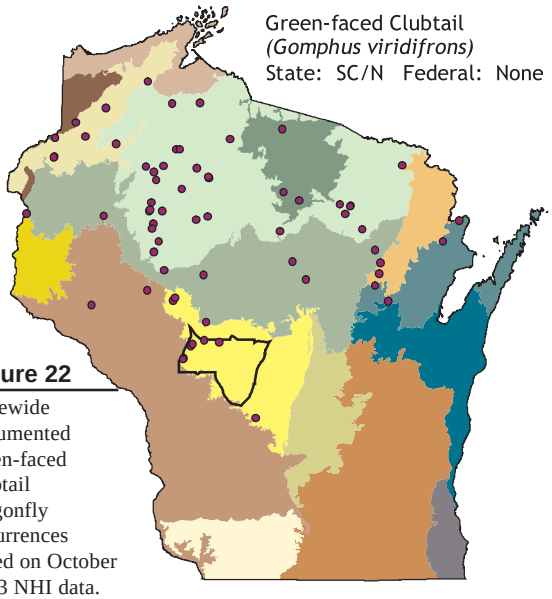


Figure 22
Statewide documented green-faced clubtail dragonfly occurrences based on October 2003 NHI data.

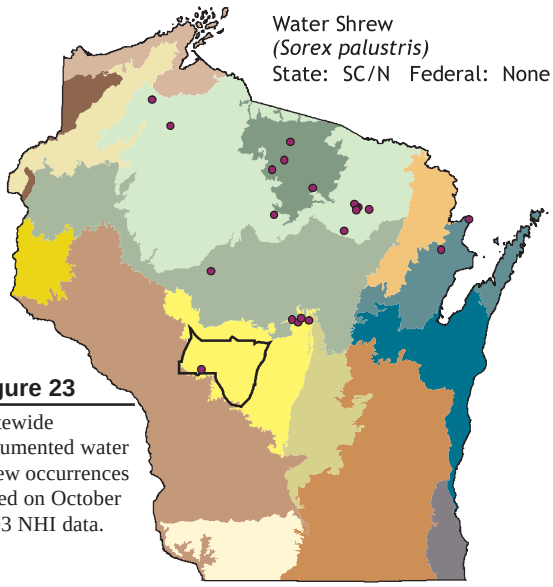


Figure 23
Statewide documented water shrew occurrences based on October 2003 NHI data.

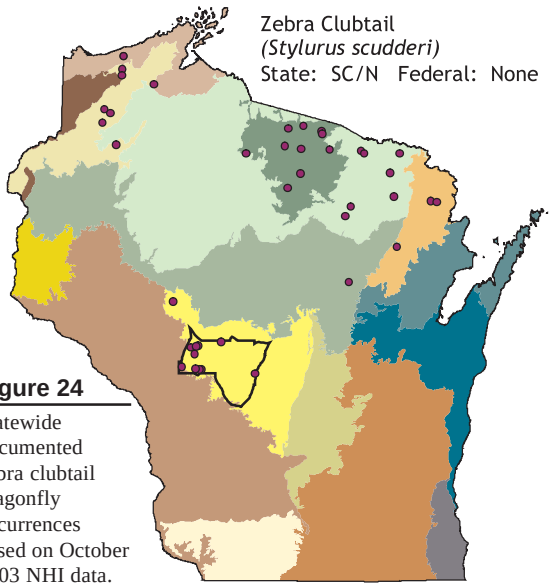


Figure 24
Statewide documented zebra clubtail dragonfly occurrences based on October 2003 NHI data.

Summary of Findings

Natural Communities of the Study Area

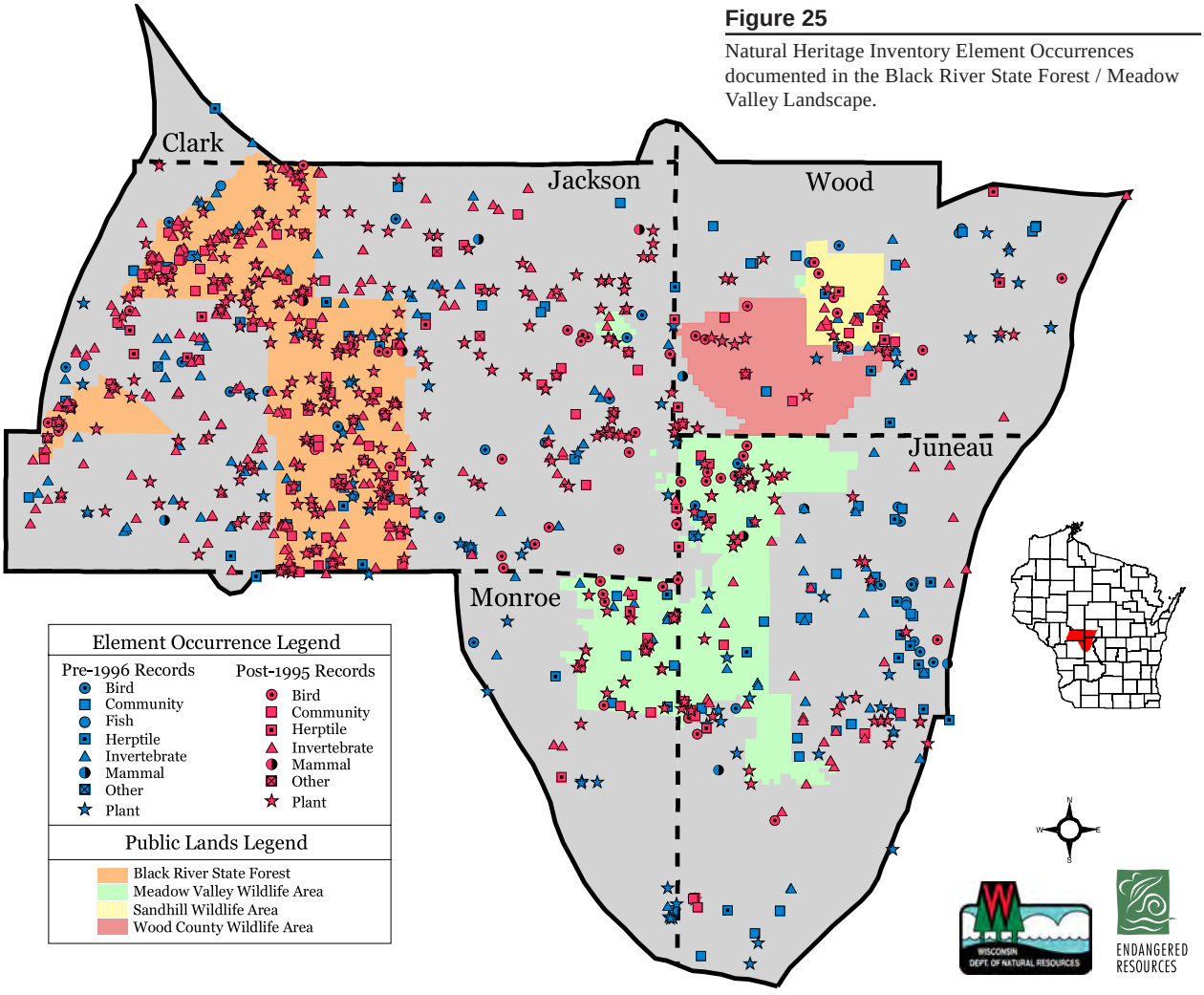
The following descriptions provide an overview of the natural communities of the study area. Examples of common or characteristic species, especially birds, are given under these community descriptions. Rare species associated with many of the natural communities are provided in the "Ecological Priorities" section. Figure 25 illustrates the general locations of plant, animal, and community element occurrences documented within the study area.

Forest Communities

Dry forests of oak, pine, or of mixed composition, are extensive throughout the study area. Most have been intensively managed, and in some areas there has been widespread conversion of this type to pine plantations (Fig. 26), which are simplified communities lacking structural, compositional, and genetic diversity. Natural stands of red pine are now extremely rare. Jack pine dominated forests have declined in acreage in recent years for a variety of reasons, with many of the remaining natural stands of jack pine being replaced or supplemented by planted stands. The greatest extent of relatively intact dry forest occurs on the sandstone ridges and mounds in the southeastern part of the Black River State Forest (the Overmeyer Hills, Wildcat Ridge, and Wildcat Mound – see Appendix B) where black and/or northern pin oak (*Quercus ellipsoidalis*) are often co-dominant with white oak and all three native

Figure 25

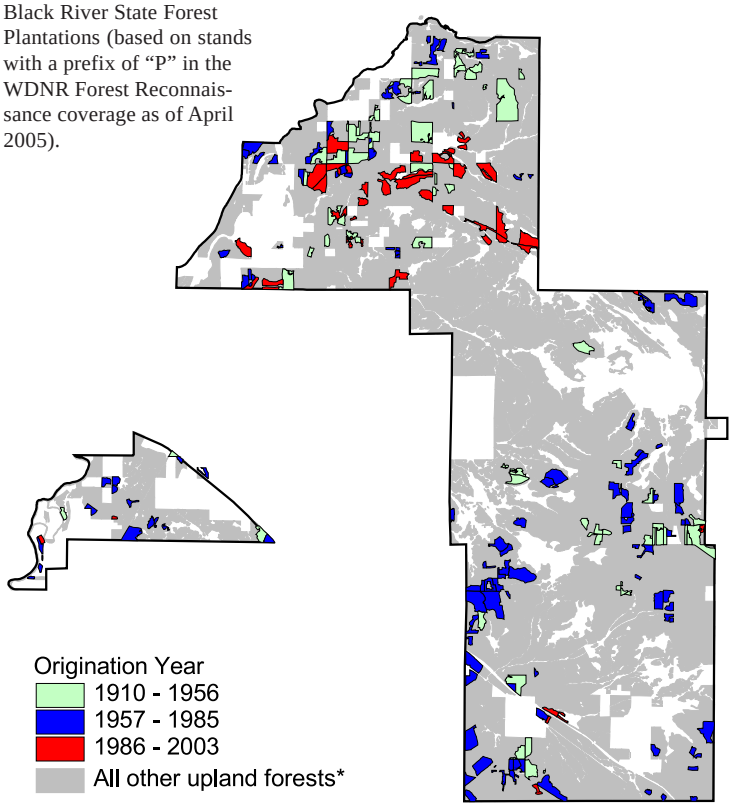
Natural Heritage Inventory Element Occurrences documented in the Black River State Forest / Meadow Valley Landscape.



pines. Aspens, black cherry (*Prunus serotina*), and red maple are typical associates. White pine is an important dry forest understory species at many locations throughout the study area.

Figure 26

Black River State Forest Plantations (based on stands with a prefix of "P" in the WDNR Forest Reconnaissance coverage as of April 2005).



* non-forested types are not shown on the map. Also not included are bottomland hardwoods, black spruce, tamarack, and swamp hardwoods.

Dry-mesic forests are sometimes associated with saddles and coves on dry sandstone ridge systems, especially where slope aspect is to the north or east or where soils are somewhat richer, deeper, and soil moisture is higher. In hardwood stands, dominants include white and red oaks, and a markedly different association of understory plants than is characteristic of the drier forests or those heavily dominated by conifers. Dry-mesic forests composed of white and red pines, often mixed with oaks, are represented by significant occurrences on the slopes and higher terraces along the Black River and several of its tributaries (including the East Fork of the Black, and Hall's, Morrison, Dickey, Valentine, Perry, and Robinson Creeks). This type is also widespread in the study area, but owing to the commercial value of large pine and oak sawtimber, opportunities to conserve older, relatively extensive stands are now limited to a few locations (see the section entitled "Priority Opportunities for Biodiversity Conservation").

Common birds of the more mature dry and dry-mesic hardwood forests include Scarlet Tanager, Great-crested Flycatcher, Ovenbird, Yellow-throated Vireo, Eastern Wood Pewee, White-breasted Nuthatch, Whip-poor-will, and many woodpeckers. In conifer-dominated forests of this group, characteristic species included Pine Warbler, Black-throated Green Warbler, Hermit Thrush, and Red-breasted Nuthatch.

Mesic forests are rare within the study area. The best developed stands of Southern Mesic Forest are on higher terraces along the Black River, where they occur within a mosaic of floodplain forest on the lower terraces and dry-mesic mixed forests of white pine, red pine, red oak, and white oak on the adjoining slopes. The rich understory flora associated with intact mesic hardwood forests is not present in any other forest community within the study area. A number of rare animal species were documented in the stands near the mouth of Morrison Creek, where mesic maple-basswood forest is embedded within extensive floodplain forests along the Black River.

Among the rare birds noted in mesic forests were Cerulean Warbler, Kentucky Warbler, Acadian Flycatcher, and Louisiana Waterthrush.

Wet-mesic forests in this landscape are best represented by mixed stands of white pine and red maple ("White Pine-Red Maple Swamp"). Understory vegetation is composed mostly of wetland species, two of which are disjunct from their eastern range limits (bog fern and long sedge). Older, more intact stands are also noteworthy for their especially rich assemblages of breeding birds, including rare species, and many that are unusual in this part of Wisconsin. This type occurs mainly in central Wisconsin, and we have documented only one stand of occurrence quality elsewhere in the state (in the Bloomer Moraine of Chippewa County, and totaling only ca 15 acres). Springs and spring runs are characteristic within-stand features. This type is subject to serious rutting, soil compaction, and hydrologic disruption, and is highly vulnerable to infestation by the aggressive exotic shrub, glossy buckthorn (*Rhamnus*

frangula). Wet-mesic white pine-red maple forests are especially high conservation priorities in the study area due to the absence of comparable opportunities elsewhere. Many of the better occurrences are on the Black River State Forest, but there are several sites containing this type on other ownerships within the study area.

The rich bird assemblage of this type typically included Canada, Black-throated Green, Blackburnian, and Pine Warblers, Blue-headed Vireo, Veery, Red-breasted Nuthatch, Red-shouldered Hawk, and Northern Raven.

Floodplain forest is best developed along the study area's major rivers, primarily the Black and the Yellow. The most mature and extensive stands provide breeding habitat for rare or otherwise noteworthy animals. There are currently no protected stands of intact floodplain forest within the study area, and these sites represent the best management and protection opportunities in central Wisconsin owing to their size, context, condition, and presence of sensitive species.

Among the noteworthy birds are Red-shouldered Hawk, Cerulean and Prothonotary Warblers, Yellow-billed Cuckoo, Blue-gray Gnatcatcher, American Redstart, and Yellow-throated Vireo.

Conifer swamps of tamarack and black spruce are uncommon and localized in southern Wisconsin. The greatest concentration of these "northern" coniferous forest types in the southern part of the state is in the Central Sands. Among the plants and animals associated with these forests are many species that occur in no other habitats, and this type should be regarded as a significant repository of a major segment of the regional biota.

Among the distinctive group of birds associated with the acid conifer swamps were Saw-whet Owl, Sharp-shinned Hawk, Yellow-rumped Warbler, Nashville Warbler, Golden-crowned Kinglet, White-throated Sparrow, and Hermit Thrush. Rare butterflies such as the bog copper and Jutta Arctic were also found in this type.

Older forests (beyond commercial rotation age): Though much of the study area is forested, intact examples of forest communities, particularly of older developmental stages, are now scarce and localized. Larger occurrences of mature and older forest are concentrated in several areas, all of them important to species that favor interior forest conditions and associated structural features. Several of the more significant examples of intact natural communities are listed below (details may be found in the "Site Descriptions" section, in **Appendices B-G**):

1. Black River corridor and the lower stretches of several of its tributaries (Floodplain Forest, Southern Mesic Forest, Northern Dry-Mesic Forest, White Pine-Red Maple Swamp, Forested Seep, Dry Cliff, Moist Cliff)
2. Yellow River corridor (Floodplain Forest)
3. Extensive sandstone ridges in the southeastern portion of the Black River State Forest (dry oak, dry mixed pine-oak, dry-mesic oak or mixed pine-oak types, Dry Cliff)
4. Starlight Wetlands, in the southern part of the Black River State Forest, just west of the ridge system mentioned above (wet-mesic White Pine-Red Maple Forest, Tamarack Swamp, Black Spruce Swamp)
5. Blueberry Swamp-Beaver Creek Complex in Juneau County (Floodplain Forest, Northern Dry-Mesic Forest, Wet-Mesic White Pine-Red Maple Swamp)
6. Kingston Pines and Peatlands (one of the few extensive areas of relatively intact dry and dry-mesic pine-dominated forest)

Other significant stands occur at scattered locations throughout the study area, but are generally smaller, younger, less well connected, or lack rare species.

Savanna Communities (Pine and Oak Barrens)

Intact examples of the globally rare Pine Barrens community occur at relatively few locations. The restoration efforts at Necedah National Wildlife Refuge and Sandhill Wildlife Area are currently the most extensive. Restoration opportunities do occur at several additional sites, including several within the Black River State Forest (e.g., Morrison Creek Barrens, Glenn Creek Barrens, and in part, Dike 17 Wildlife Area). Expansion of barrens habitats is needed if many of the associated

sensitive species are to persist in this landscape. Many populations of rare species now occur in small isolated barrens patches along roadsides, within railroad and utility corridors, on the margins of old log landings or skid trails, or in association with other partially developed sites that are kept free of dense woody plant cover. If these populations are to persist and thrive, additional accommodation to meet their needs is warranted.


Pine Barrens near Indian Grave Creek, Jackson County. Photograph by Eric Epstein.

Historically, barrens was a major community type within the study area and the Central Sands landscape. A precipitous decline in acreage has occurred in Wisconsin since European settlement, primarily due to the conversion of land to other uses and the suppression of fire. Many rare plants and animals are primarily dependent on this type, which at many locations now consists of small isolated occurrences degraded by the encroachment of woody vegetation and invasive plants. Species with large area requirements such as the Sharp-tailed Grouse are barely hanging on in much of the study area and, where present, are usually associated with large open wetland complexes. Isolated barrens patches, e.g., those occurring along roadsides or railroad tracks, or within utility rights-of-way, should not be regarded as viable with any degree of assurance. Many rare species populations are restricted to such sites, where they are vulnerable to local extirpation. Among the rare species strongly associated with this community are the Karner blue butterfly, phlox moth (*Schinia indiana*), frosted elfin, blue racer, slender glass lizard, dwarf milkweed, and prairie fame-flower.

Small to medium scale restoration efforts are underway at several locations, especially at Sandhill Wildlife Area and Necedah National Wildlife Refuge. Portions of the Black River State Forest (and some of the adjoining county forest lands) were historically occupied by extensive barrens, but these have been greatly reduced. Existing remnants are very small and of marginal viability, but based on the strong complement of barrens plants, invertebrates and herptiles that still occur here, there is high potential for the restoration of a more significant acreage (i.e. enough to support viable populations of sensitive barrens species). There may also be opportunities to conduct forest management activities in ways that will at least temporarily meet the needs of some of the area sensitive species, by creating several core barrens areas around which forest management would occur in larger blocks that would result in more extensive contiguous openings. There are limitations to relying solely on periodic tree harvest for managing barrens without prescribed fire.

Among the characteristic birds associated with barrens remnants are Eastern Bluebird, Chestnut-sided Warbler, Yellow Warbler, Eastern Towhee, Brown Thrasher, Eastern Kingbird, and Common Nighthawk. Red-headed Woodpecker and Northern Flicker are locally common where scattered large oaks have been left as nest sites.

Shrub Communities

Wetland communities composed of tall shrubs are common throughout much of the Central Sands landscape. They typically occupy the interface between forest and open meadow, fen or bog communities, and often occur in a narrow zone along the margins of many streams. In at least some locations, the acreage of shrub swamp may have increased from its historical extent because the impacts of drainage ditches and absence of periodic fire favors the growth of woody species in areas that were formerly dominated by wetland herbs. Perhaps the most characteristic dominant is speckled alder (*Alnus incana*), with bog birch, chokeberry, bog holly, winterberry holly, and various willows as common associates.

While no upland shrub natural community is recognized by the Natural Heritage Inventory at this time, shrub-dominated habitats composed of oak grubs (*Quercus spp.*), American hazelnut (*Corylus americana*), prairie willow, and others are common, though ephemeral, in parts of the study area. Many native animals make use of shrubby cutovers, but it is uncertain whether forest management activities alone can provide for the long-term needs of the sensitive plants and

animals needing full or partial sun. Many of the aforementioned species (see the plant and animals sections for details) have poor dispersal capabilities and may not persist through an entire forest rotation or series of rotations. Monitoring is needed to determine this, but in the meantime it would be prudent to maintain certain critical habitats in a relatively treeless condition. Most problematic are the area sensitive shrub-grassland specialists such as the Sharp-tailed Grouse, which require 1000s of acres of contiguous open or shrub-dominated habitat to maintain viable populations over time.

Often overlooked in management plans, the lowland shrub communities of the study area have a distinctly northern flavor and provide significant, and perhaps critical, habitat for many species. Among these are rare and/or declining species such as the wood turtle (*Clemmys insculpta*), Golden-winged Warbler and Veery, and important game animals such as the Woodcock, Ruffed Grouse, and snowshoe hare (*Lepus americanus*).

Herbaceous Communities: Prairie, Sedge Meadow, Poor Fen, and Marsh

Wetlands with a substrate of *Sphagnum* mosses are abundant throughout the study area and are referred to in this document as "peatlands." Ditching, diking, and the periodic harvest of moss have affected many peatlands. Shrubs and trees are encroaching on some of the open wetlands, probably due to a combination of lowered water tables and the suppression of wildfire. Many of the wetlands have been partially restored, mostly to benefit waterfowl. To a point this has been beneficial, but there is a need to extend protection to natural stands of open wetlands, particularly those that are now most hydrologically intact and support sensitive species. As a subset of the rarer species have geographically restricted ranges and occur at few other locations in the state, it is important to consider and manage for their requirements here.

Among the open wetlands, the most important community in this landscape is the acid peatland type referenced here as a "Central Poor Fen." Similar in composition and structure to open peatlands of northern Wisconsin, the poor fens within this landscape support a distinctive assemblage of vascular plants, invertebrates, and vertebrates, including many that are rare or otherwise sensitive.

Among the especially important larger wetland sites are the Starlight Wetlands, the Battlepoint – Dike 17 Complex, the Bear Bluff Wetlands, the Ball Road-County Line Road Complex, the Suk and Cerney Peatlands, and the Quail Point Flowage Peatlands at Sandhill Wildlife Area. Wetlands in Cranmoor Township, Wood County, though just east of the study area, are extensive and support many rare and declining species. Though most of the wetlands here are privately owned and managed as part of cranberry production areas, there may be opportunities to work with the landowners to achieve long-term protection for these valuable sites.

Prairies are not well represented in this landscape and most often occupy small, treeless, relatively shrub-free patches within barrens complexes. Several rights-of-way within the study area are managed to maintain a treeless, shrub-free condition. Such areas can serve as refugia for rare prairie or barrens plants and invertebrates but are highly vulnerable to inadvertent destruction, or subject to periodic events that can eliminate small isolated populations of sensitive species. In at least some situations within this study area, management actions that promote the maintenance or expansion of barrens could reduce the risk of losing such populations. There is a very small acreage of wet prairie vegetation, usually associated with sedge meadows or the larger peatland complexes. These can be managed as part of the wetland complexes within which they occur.

Rare Vascular Plants of the Study Area

The Wisconsin Natural Heritage Database tracks **47** rare plant species in the study area. Heritage staff documented many of these rare species during recent field inventory, while others have not been seen for decades. In the last 30 years, biologists have confirmed two Wisconsin Endangered plant species and five Wisconsin Threatened plant species in the study area. They include Wisconsin Endangered reticulated nutrush (*Scleria reticularis*) and sand violet, as well as Wisconsin Threatened dwarf milkweed, bog bluegrass (*Poa paludigena*), pale green orchid (*Platanthera flava* var. *herbiola*), prairie parsley (*Polytaenia nuttallii*), and algae-like pondweed (*Potamogeton confervoides*). Two species, both Special Concern, documented in the study area, prairie fame-flower and shadowy goldenrod, are endemic to the Midwest and are listed as G3G4 (see Appendix K) species by NatureServe, indicating that the species may be vulnerable. Wisconsin is especially important for the long-term persistence of prairie fame-

flower as a species. Shadowy goldenrod is found only in the Driftless Area of Wisconsin, Iowa, Illinois, and Minnesota.

Twenty-seven additional rare plant species found in BRSF/MV in the past 30 years are designated of "Special Concern," meaning experts suspect they are rare or declining in Wisconsin, but have not yet gathered proof of threats to their survival in Wisconsin. As of this writing, the US Fish & Wildlife Service does not track any of the plant species documented in the study area.

The BRSF/MV contains **the largest state populations** of the following species:

- sand violet (*Viola fimbriatula* – WI Endangered)*
- dwarf milkweed (*Asclepias ovalifolia* – WI Threatened)
- twining screwstem (*Bartonia paniculata* – WI Special Concern)*
- yellow screwstem (*Bartonia virginica* – WI Special Concern)*
- clustered sedge (*Carex cumulata* – WI Special Concern)
- long sedge (*Carex folliculata* – WI Special Concern)*
- straw sedge (*Carex straminea* – WI Special Concern)*
- grassleaf rush (*Juncus marginatus* –WI Special Concern)
- crossleaf milkwort (*Polygala cruciata* – WI Special Concern)
- water-thread pondweed (*Potamogeton diversifolius* – WI Special Concern)
- bog or Massachussetts fern (*Thelypteris simulata* – WI Special Concern)*

Dwarf milkweed.
Photograph by Emmet Judziewicz

The BRSF/MV has m**oderately large and/or significant state populations** of these species:

- long-leaved aster (*Aster longifolius* – WI Special Concern)
- water-purslane (*Didiplis diandra* – WI Special Concern)*
- Engelmann's spike-rush (*Eleocharis engelmannii* — WI Special Concern)
- catfoot (*Gnaphalium helleri* – WI Special Concern)
- rock or cliff clubmoss (*Lycopodium porophilum* – WI Special Concern)
- Farwell's water-milfoil (*Myriophyllum farwellii* – WI Special Concern)
- Canada mountain-ricegrass (*Oryzopsis canadensis* – WI Special Concern)
- pale green orchid (*Platanthera flava* var. *herbiola* – WI Threatened)
- bog bluegrass (*Poa paludigena* – WI Threatened)
- Virginia meadow-beauty (*Rhexia virginica* – WI Special Concern)
- reticulated nutrush (*Scleria reticularis* – WI Endangered)
- whip nutrush (*Scleria triglomerata* – WI Special Concern)
- Torrey's bulrush (*Scirpus torreyi* – WI Special Concern)
- shadowy (or cliff) goldenrod (*Solidago sciaphila* – WI Special Concern)
- small-flowered woolly bean (*Strophostyles leiosperma* – WI Special Concern)
- prairie fameflower (*Talinum rugospermum* – WI Special Concern)
- hidden-fruited bladderwort (*Utricularia geminiscap*a – WI Special Concern)

Virginia meadow beauty.
Photograph by Emmet Judziewicz

*Species that, in Wisconsin, are concentrated in the study area.

The BRSF/MV is especially important for many species that require barrens, savannas, and dry sandy prairies for their habitat. For example, ten rare plant species are found in predominantly dry, sandy habitats. Plants in this group include woolly and dwarf milkweeds (*Asclepias lanuginosa* and *A. ovalifolia*), clustered sedge *(Carex cumulata*), catfoot (*Gnaphalium helleri*), brittle prickly-pear (*Opuntia fragilis*), Canada mountain-ricegrass (*Oryzopsis canadensis*), whip nutrush (*Scleria triglomerata*), small-flowered woolly bean (*Strophostyles leiosperma*), prairie fame-flower, and sand violet. In particular, the BRSF/MV provides excellent opportunities for assuring the long-term viability of the Threatened dwarf milkweed because a significant proportion, roughly half, of all Wisconsin sites for

that species occur in the area. Periodic management with fire for natural barrens vegetation would benefit this species as well as many other rare plants, animals, and natural communities.

One particularly interesting aspect of the flora of the study area is presence of rare plants that are disjuncts of the Atlantic coastal plain. Some of these disjuncts may occur in other parts of the state but their largest populations lie within the study area. By Atlantic coastal plain disjuncts, we mean those species whose occurrences in the Great Lakes region are disjunct (typically by at least 100 km) and whose main ranges are largely confined to the coastal plain (Reznicek 1994). Some of the disjuncts in the study area include yellow screwstem (*Bartonia virginica*), twining screwstem (*Bartonia paniculata*), cross-leaved milkwort, Virginia meadow-beauty, reticulated nutrush, algae-like pondweed, and hidden-fruited bladderwort (*Utricularia geminiscapa*).

Prior to widespread European settlement, many of these species probably grew in areas that were fairly frequently disturbed such as along game trails that crossed poor fens or other wetlands or in large mammal wallows. Some of the rare plants may have grown in the few coastal plain marshes that are in the study area. Periodic catastrophic fires probably also served a role in creating suitable habitat. It is likely that these species functioned as metapopulations, shifting across the landscape as disturbance occurred.

Scattered small populations of some of these species have been documented in more natural settings, but many of the more recent occurrences are in artificial settings such as ditches, moss drying areas, commercial cranberry operation dikes, and other rights-of-way such as power line corridors. In fact, yellow screwstem, twining screwstem, crossleaf milkwort, and Virginia meadow-beauty, have their largest populations in artificial settings such as sandy-peaty roadside ditches. The two screwstem species and crossleaf milkwort are annuals and tend to shift locations based on habitat suitability. Virginia meadow-beauty is a perennial species but may not compete well with shrubs. All of these species are apparently dependent on periodic disturbances that expose mineral soil and therefore create suitable habitat for plant establishment. Disturbance also can reduce competition within established populations.

Ten rare submersed aquatic plant species are found in the study area. These species are represented by a total of **64** populations. Prior to European settlement and subsequent widespread manipulation of the region's hydrology, many of these species may have grown in creeks, sloughs along the larger streams, or in wallows or small pools along game trails. Some of the natural habitat may no longer be present or exists in such a degraded condition that is no longer suitable for species that are sensitive to water quality, certain water levels, or annual, seasonal water fluctuations. Among the aquatic species, only the Special Concern species hidden-fruited bladderwort has been found in natural habitats – namely, pools in game trails through poor fens.

Rare plants that have been found in impoundments in the study area include large water-starwort, prickly hornwort (*Ceratophyllum echinatum*), Farwell's water-milfoil (*Myriophyllum farwellii*), several species of pondweed, and two species of bladderwort. Several of these species, namely large water-starwort, algae-like pondweed, spotted pondweed, and Vasey's pondweed, are known only from historical records in the study area and were not relocated during this inventory. However, the BRSF/MV landscape has the largest population of water-thread pondweed and significant populations of water-purslane (*Didiplis diandra*) and Farwell's water-milfoil in Wisconsin. The impoundments appear to effectively, at least at present, mimic natural conditions such as quiet or slowly moving, shallow, and often slightly acidic water required by many of these species.

Populations of rare plants in impoundments might be particularly vulnerable due to a number of conditions. As dikes and dams age, they can become unstable and may need to be replaced or removed. Either of those activities would greatly alter the habitat conditions within the impoundment, usually to the detriment of the organisms within that impoundment. Because impoundments trap sediments, as impoundments age, they gradually become shallower and temperatures can increase and alter habitat conditions that some organisms might rely on. Management of water levels for specific purposes might not be compatible with the requirements of some of the rare aquatic plants. Upstream inputs, such as chemicals used in commercial cranberry operations, might accumulate within impoundments and change water quality.

Some species of rare plants in the state have occurrences that lie almost entirely within central Wisconsin; these include straw sedge (*Carex straminea*), long sedge (although this species might be under collected, especially in the counties bordering the Upper Peninsula of Michigan), clustered sedge, grassleaf rush (*Juncus marginatus*), and bog (=Massachusetts) fern.

One result of this inventory that needs further elucidation is the absence of several plant species that had been found prior to 1971. These include four Threatened or Endangered plant species: woolly milkweed (Threatened), large water-starwort (Threatened), brittle prickly-pear (Threatened), and spotted pondweed (*Potamogeton pulcher*, Endangered). The seven Special Concern species that were documented in the study area before 1971 but were not relocated this study are prairie sagebrush (*Artemisia frigida*), showy lady's-slipper (*Cypripedium reginae*), marsh willow-herb (*Epilobium palustre*), Hooker's orchid (*Platanthera hookeri*), Vasey's pondweed (*Potamogeton vaseyi*), silky willow (*Salix sericea*), and Georgia bulrush (*Scirpus georgianus*). Additionally, algae-like pondweed (Threatened) was last documented in 1975 and Engelmann's spike-rush (*Eleocharis engelmannii*, Special Concern) in 1972. Habitat for showy lady's slipper is very limited within the study area.

Rare Animals of the Study Area

The Wisconsin NHI database tracks 118 species of rare animals and two miscellaneous elements that have been recorded in the study area. The large number of rare animal species found here reflects on the diversity and general condition of habitat. These rare animals include five mammals, 25 birds, 12 reptiles and amphibians, seven fish, 31 terrestrial invertebrates, 38 aquatic invertebrates and two Miscellaneous Elements (bird rookery and bat hibernacula). Seventy-four species were found in the study area prior to the inventories conducted beginning in 1997. During this inventory, NHI staff found 42 of these species extant plus an additional 44 species not previously known. So, a total of 86 species were located or relocated as part of this project.

Some of the rarest animals found in the study area are summarized below in several different categories. The lists in each group are not necessarily unique; for example, the American burying beetle can be found in the Thought to be Extirpated category and is Federally Endangered so it is also in the Federally Listed category.

Animals Believed to be Extirpated

Several animal species recorded from the study area have not been documented in over 20 years and are believed to be extirpated (listed below). However, only limited surveys were conducted for the tiger beetle *Cicindela macra* in the right habitat (big river sandbars) and season. Also, no recent fish surveys have been conducted in the study area. Only old dead shells of the purple wartyback (*Cyclonaias tuberculata*) mussel were found in surveys conducted in 1997. The American burying beetle (*Nicrophorus americanus*) has not been documented anywhere in Wisconsin since the mid – 1950's. Blanchard's cricket frog (*Acris crepitans blanchardi*) has experienced a general retraction in its Wisconsin range over the past several years to the southern tier of counties.

Scientific Name	Common Name
Acris crepitans blanchardi	Blanchard's cricket frog
Cicindela macra	a tiger beetle
Cyclonaias tuberculata	purple wartyback mussel
Lythrurus umbratilis	redfin shiner
Nicrophorus americanus	American burying beetle

Animals Whose Numbers Have Been Greatly Reduced

Another group of animal species (listed below) has been greatly reduced in numbers or sites since the late 1950's. Wood turtle population declines have been noted in the past 10 years in the Black River below Black River Falls, possibly due to illegal harvest (Bob Hay, pers. comm.) The Eastern massasauga rattlesnake has experienced serious declines and contraction of range since the 1970's and is now very rare in the study area, throughout Wisconsin and

its entire range. Sharp-tailed grouse have undergone a long-term decline in Wisconsin that began shortly after the cessation of the catastrophic logging that occurred statewide during the last half of the nineteenth century and early decades of the twentieth century. Implementation of widespread fire suppression began in the 1930s, accelerating the succession of prairie, barrens and shrub habitat to forest. In recent decades there has been an emphasis on converting lands ecologically suited for managing as barrens to pine plantation monocultures (Fig. 26), resulting in a further loss of habitat and increased fragmentation of most of the remaining large patches.

Eastern massasauga rattlesnake.
Photograph by Dan Nedrelo.

Scientific Name	Common Name
Clemmys insculpta	wood turtle
Pituophis catenifer sayi	Bullsnake
Sistrurus catenatus catenatus	eastern massasauga rattlesnake
Tympanuchus phasianellus	Sharp-tailed Grouse

State Endangered or Threatened Animals

Many of the rare animals found in the study area are listed as State Endangered or Threatened. Occurrences of these **28** species are given various levels of protection via a variety of mechanisms depending on land ownership.

Scientific Name	Common Name	State Status
Acris crepitans blanchardi	Blanchard's cricket frog	END
Cyclonaias tuberculata	purple wartyback	END
Cygnus buccinator	Trumpeter Swan	END
Lanius ludovicianus	Loggerhead Shrike	END
Nicrophorus americanus	American burying beetle	END
Ophisaurus attenuatus	western slender glass lizard	END
Podiceps grisegena	Red-necked Grebe	END
Schinia Indiana	phlox moth	END
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	END
Somatochlora incurvata	warpaint emerald	END
Thamnophis proximus	western ribbon snake	END
Tyto alba	Barn Owl	END
Ammodramus henslowii	Henslow's Sparrow	THR
Buteo lineatus	Red-shouldered Hawk	THR
Callophrys irus	frosted elfin	THR
Canis lupus	timber wolf	THR
Clemmys insculpta	wood turtle	THR
Dendroica cerulea	Cerulean Warbler	THR
Empidonax virescens	Acadian Flycatcher	THR
Emydoidea blandingii	blanding's turtle	THR
Lythrurus umbratilis	redfin shiner	THR
Moxostoma carinatum	river redhorse	THR
Nyctanassa violacea	Yellow-crowned Night-Heron	THR
Oporornis formosus	Kentucky Warbler	THR
Pandion haliaetus	Osprey	THR
Percina evides	gilt darter	THR
Polyamia dilata	net-veined leafhopper	THR
Tritogonia verrucosa	buckhorn	THR

Globally Rare Animals

Many animal species found in the study area are considered globally rare or imperiled throughout their range. Globally rare species (includes G1, G2, G3+ spp as recognized by NatureServe, see Appendix K) are defined as those species or subspecies that are critically imperiled, imperiled, or rare or locally distributed throughout their range because of extreme rarity and/or because some factor makes them vulnerable to extinction. There are generally 21 to 100 viable populations thought to remain for G3 species, between 6 and 20 viable populations for G2 species and 1 to 5 populations for G1 species. The frosted elfin is a barrens species that, like the Federally Endangered Karner blue butterfly, requires wild lupine (*Lupinus perennis*) to complete its life cycle but is actually much rarer in Wisconsin than the Karner. The tiger beetle listed below is a relatively newly described subspecies and is endemic to pine/oak barrens in central Wisconsin. Kirtland's Warbler is one of the rarest birds in North America and has been reported a number of times in the study area. Despite extensive searches, breeding Kirtland's Warblers have yet to be found in Wisconsin. While discussions of introduction of Kirtland's Warbler to Wisconsin have taken place, there are currently no official plans to do so.

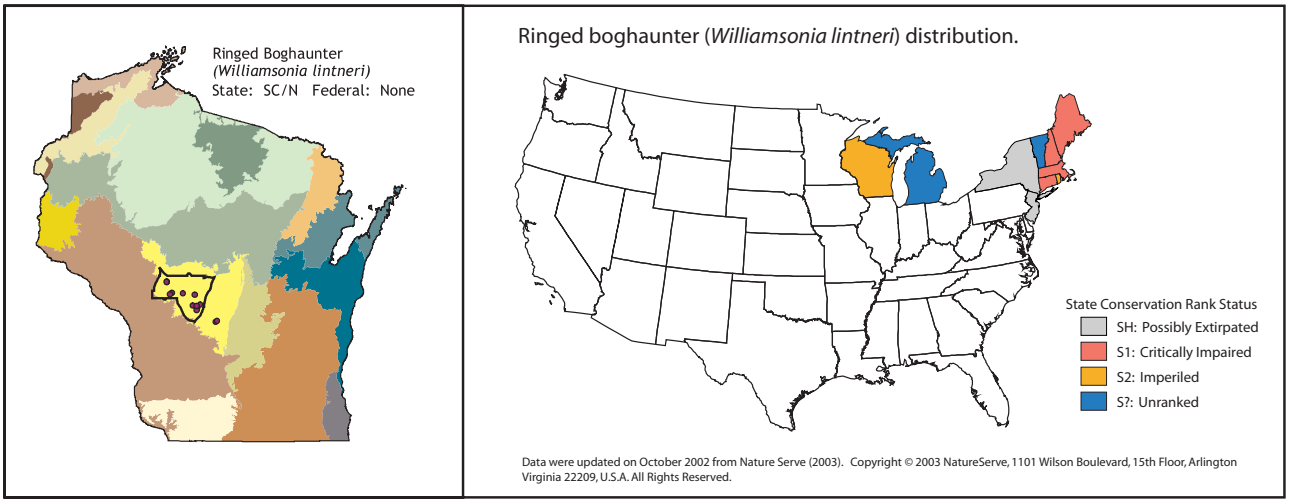
Western sand darters (*Etheostoma clarum*) and the elusive clubtail (*Stylurus notatus*) dragonfly are big river species

Scientific Name	Common Name	G Rank*
Callophrys irus	frosted elfin	G3
Cicindela patruela huberi	a tiger beetle	G3T2
Dendroica kirtlandii	Kirtland's Warbler	G1
Erynnis martialis	mottled dusky wing	G3G4
Etheostoma clarum	western sand darter	G3
Gomphurus ventricosus	skillet clubtail	G3
Gomphus viridifrons	green-faced clubtail	G3
Hemileuca sp *3*	Midwestern fen buckmoth	G3G4Q
Meropleon ambifuscum	Newman's brocade	G3G4
Nicrophorus americanus	American burying beetle	G2G3
Ophiogomphus smithi	sand snaketail	G2
Papaipema beeriana	Liatris borer moth	G3
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	G3G4T3T4
Stylurus notatus	elusive clubtail	G3
Williamsonia fletcheri	ebony bog haunter	G3G4
Williamsonia lintneri	ringed boghaunter	G3

* See Appendix K for an explanation of ranks.

Figure 27

Documented occurrences for the ringed boghaunter dragonfly from the Wisconsin NHI database and the status for this species for the rest of the United States from NatureServe (see www.natureserve.org/explorer for more information).



that are now doing best in the northern part of their central U.S. range. Skillet and green-faced clubtail dragonflies are species of fast clean medium sized streams in forested watersheds and in the study area are disjunct from populations in northern Wisconsin. Another dragonfly, the sand snaketail, is a species newly discovered and was just published as *Ophiogomphus smithi*. This dragonfly is restricted in range to western Wisconsin and northeastern Iowa. Two other dragonflies, the boghaunters, are rare throughout their range. Discovery of the ringed boghaunter (Fig. 27) in the study area extended the range for this species all the way from coastal bogs in New England.

Federally Endangered or Threatened Animals

Federally Endangered and Threatened species known from the study area are listed below. As mentioned above, Kirtland's Warblers are known here as accidentals, although singing males have been found during the breeding season. Bald eagles are proposed for delisting because of population recovery. Karner blue butterflies have their globally largest populations in the study area, and are managed under the auspices of a formal Habitat Conservation Plan (WDNR 2000). This plan, overseen by WDNR, calls for inventory, management, and monitoring of Karner populations on a number of public and private lands. The American burying beetle is mentioned above under species extirpated from the study area. The eastern massasauga rattlesnake, also mentioned above, is a formal Candidate for Federal listing and attempts are being made to protect existing sites to preclude the need for federal listing. The timber wolf is relatively new to the study area. The BRSF/MV falls in Wisconsin Wolf Management Zone 2, which is thought to be capable of sustaining 20-40 wolves (Wisconsin Department of Natural Resources 1999). There were between 35 and 38 wolves reported from this Management Zone in 2002 (Wisconsin Department of Natural Resources 2002). The study area is significant in that it provides the only opportunity for a viable wolf population in central Wisconsin and is disjunct from suitable habitat in northern Wisconsin. Recent wolf population levels in Wisconsin meet recovery goals and efforts are underway to delist as Threatened and instead provide protection as a Protected Species. Timber wolves are also under review fr delisting by the US Fish and Wildlife Service in Wisconsin and Michigan.

Scientific Name	Common Name	Federal Status in Wisconsin
Canis lupus	timber wolf	Listed Endangered, Under Review for Delisting
Dendroica kirtlandii	Kirtland's Warbler	Listed Endangered, Accidental
Haliaeetus leucocephalus	bald eagle	Listed Threatened, Under Review for Delisting
Lycaeides melissa samuelis	Karner blue butterfly	Listed Endangered
Nicrophorus americanus	American burying beetle	Listed Endangered, Extirpated
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	Candidate for Future Listing

Animals Whose Populations are Largely Restricted to the Study Area or are Best Represented Within the Study Area

The study area contributes a significant portion of the state's current populations of many of the 120 rare animal species known here. The 21 species listed below represent those with the highest proportions of their statewide occurrences in the study area (see Figs. 28-30). **Overall, 47 rare animal species have at least 25% of their**

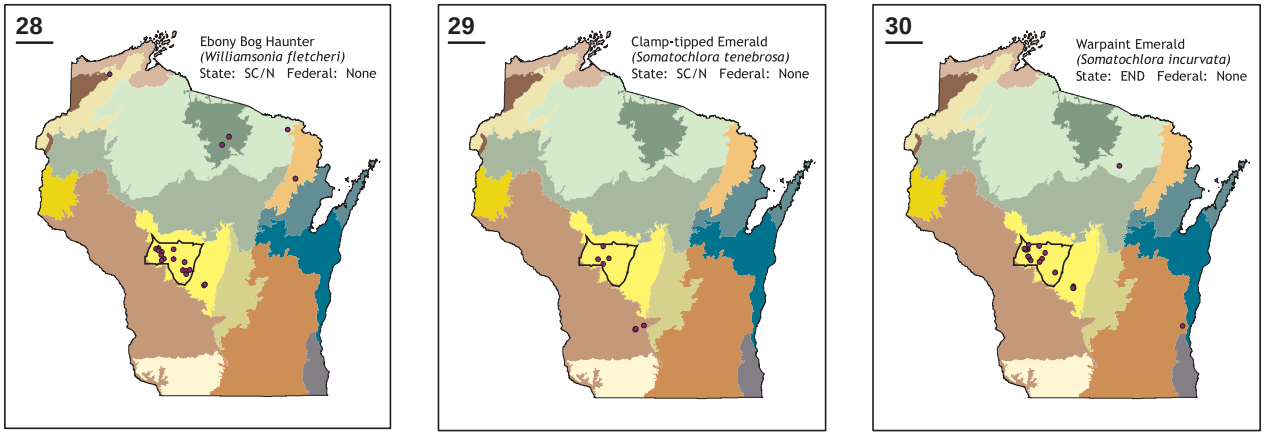
Scientific Name	Common Name	Importance Rank*
Lycaeides melissa samuelis	Karner blue butterfly	1
Callophrys irus	frosted elfin	2
Cicindela patruela huberi	a tiger beetle	3
Williamsonia fletcheri	ebony bog haunter	4
Somatochlora incurvata	warpaint emerald	5
Williamsonia lintneri	ringed boghaunter	6
Erynnis persius	Persius dusky wing	7

Scientific Name	Common Name	Importance Rank*
Atrytonopsis hianna	dusted skipper	8
Aeshna verticalis	green-striped darner	9
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	10
Schinia indiana	phlox moth	11
Paradamoetas fontana	a jumping spider	12
Dendroica kirtlandii	Kirtland's Warbler	13
Chlosyne gorgone	gorgone checker spot	14
Cygnus buccinator	Trumpeter Swan	15
Stylurus scudderi	zebra clubtail	16
Somatochlora tenebrosa	clamp-tipped emerald	17
Spharagemon marmorata	northern marbled locust	18
Trachyrhachys kiowa	ash-brown grasshopper	19
Psinidia fenestralis	sand locust	20
Orphulella pelidna	spotted-winged grasshopper	21

***** Importance Rank = rank order of the number of study area occurrences squared and divided by the number of total statewide occurrences (i.e. the proportion of statewide occurrences found in the study area with consideration given to magnitude). These adjusted proportion values were then arranged with largest assigned a rank of one and so on.

Figures 28-30

Statewide documented occurrences for ebony boghaunter, clamp-tipped emerald, and warpaint emerald dragonflies based on October 2003 NHI data.



statewide occurrences in the study area.

Savanna and Prairie Species

Another key group that is well represented in the central sands includes many species associated with sandy prairies and savannas (Oak and Pine Barrens in the study area). Examples include the pocket gopher, Karner blue butterfly, frosted elfin, Sharp-tailed Grouse, Clay-colored Sparrow, blue racer, slender glass lizard, Blanding's turtle, and the Massasauga rattlesnake.

Aquatic or Wetland Species

The study area is especially notable for the number and nature of aquatic and wetland animal species. Both common and rare species characteristic of a number of major and minor habitat types are found here. The aquatic fauna includes elements of large warm southern rivers, fast flowing - medium sized streams of northern Wisconsin, warm backwaters and oxbows associated with larger streams, small, cool or cold headwater streams, slow marshy streams, large open sedge- and moss-dominated wetlands, and microhabitats such as springs, spring runs, wet cliffs, and seeps.

Threats to Natural Communities, Aquatic Systems, and Rare Species

As discussed throughout this report, the BRSF/MV landscape is relatively intact, has low human population densities, and has a high proportion of publicly owned land. The potential exists across this landscape for large-scale, cross-ownership restoration and management projects. The study area is extremely important for many animals, plants, and communities, including some that are globally rare and for which the study area significantly contributes to their continued existence across their range. However, there are several broad threats to the many species and important habitats of the study area. Although these threats have been itemized for convenience below, they are interrelated and may interact to amplify potentially negative effects. Avoiding, eliminating, or, in some cases, reversing these threats will play a key role in conserving the biological diversity of the landscape.

Active sand and gravel mine along the Black River north of Morrison Creek. Black River State Forest, Jackson County. Photograph by Eric Epstein.

Fragmentation

Fragmentation occurs when large continuous patches of relatively homogeneous habitat are broken up, resulting in smaller, isolated patches of habitat and increased proportions of edge. These smaller habitat patches exhibit altered microclimate, species composition, and species behavior. The structural changes caused by fragmentation (the horizontal configuration and distribution of patches on the landscape) can limit seed dispersal, pollination and movement; increase predation and competition; and decrease size of plant and animal populations. Animals and plants with poor dispersal abilities or large area needs can become isolated and may reach viability thresholds with respect to insufficient population size or genetic diversity, leading to local extirpation.

Site management that does not consider the long-lasting effects of fragmentation on a landscape scale can result in loss of ecosystem functions and processes. For example, planting trees within areas that support barrens remnants can effectively fragment the open landscapes needed by many species in the same way that creating permanent openings within an extensive forest contributes to fragmentation of that habitat. The construction and placement of roads, trails, and dams can increase fragmentation, and create problems such as dispersal barriers; provide increased access for edge-adapted predators, competitors, and brood parasites; and provide pathways that facilitate the spread of invasive species. Management decisions made for an individual stand without reference to the context of that stand within its larger landscape setting can potentially contribute to habitat fragmentation. The remnant habitat patches may no longer be able to support the full complement of species that they once did.

The BRSF/MV landscape is much less fragmented than many other parts of Wisconsin, especially in the southern half of the state, providing unique opportunities for management that are not available in most other areas. As many other parts of the state continue to become fragmented, the study area represents an invaluable opportunity to maintain a relatively intact landscape, serving a critical function on a statewide level. It is critical that activities conducted by public agencies consider the entire landscape in order to maintain the integrity of this important area.

Habitat Loss

The loss of habitat has direct and obvious effects at the stand level, and cumulatively, can have wide impacts on a landscape scale. Not only does direct destruction of habitat result in the displacement or outright replacement of

plants and animals, but it also leads to many indirect effects, similar to fragmentation. Within the study area, significant loss of both open barrens and older forest successional stages has occurred. Large habitat patches are needed to ensure that area-sensitive species find adequate living space within this landscape.

Habitat loss is often a byproduct of management choices, both decisions made in the past and others that are made today. For example, when the implementation of fire suppression policies became widespread in the study area, many areas that were formerly open barrens succeeded into dense forests. This resulted in the loss of habitat for many specialized plants and animals. At some locations it is still possible to walk through barrens habitats overgrown with woody vegetation and find isolated pockets of diverse barrens vegetation. These pockets might serve as refugia for certain species, especially long-lived perennial plants and some invertebrates, but these patches are often too small and isolated to support area sensitive species or allow for adequate dispersal and gene flow between patches. In addition, organisms in isolated patches can be more vulnerable to predation or destruction, and in extreme situations (small patches, small population sizes) of isolation such populations might actually become sinks instead of functioning as sources of additional individuals for a more widespread population.

Habitat loss can also result from the conversion of a native, mixed species stand to a planted stand of a single species. For example, when a stand of jack pine becomes more open as a result of budworm damage, it is common to note a resurgence of barrens-associated forbs, grasses, and sedges. If a decision is made to harvest jack pine from an insect-damaged stand, prepare the site by mechanical or chemical means, and replant to jack pine, the resulting stand will look and function very differently than the original stand. Ecosystem function may be impaired because the resulting stand supports lower species richness and structural diversity. Restoration of missing or diminished species, structures, or processes is often far more problematic, and will almost certainly be more expensive, than maintaining relatively intact ecosystems that could be managed to accommodate the full suite of species, communities, and environmental conditions that characterize a given region.

Ecological Simplification

Ecological simplification (Addis et al. 1995) is a threat to biodiversity and is of particular concern in biologically rich landscapes such as the study area. As with the other threats outlined in this section, ecological simplification can take place across the landscape as well as within or between individual stands.

In many stands found within the study area, natural dry forest (and barrens) communities have been replaced by planted stands (see Fig. 26) that emphasize a single desired species (usually jack pine or sometimes red pine). These modifications greatly simplify the communities structurally and can result in the loss of habitat for various species, both directly and indirectly. The configuration and spacing of trees in traditional plantations are very different from anything found in a natural community. The shrub layer is often absent or diminished, and the ground flora typically sparse and depauperate. Chemical treatments used to control competing vegetation, often for site preparation, may have significant consequences for rare plants or the host plants used by rare animals. One result is that few species find acceptable habitat in such simplified communities. This is in stark contrast to the rich mosaic of habitat patches of varying scales that are created by natural disturbance events.

Mossing near Sharptail Flowage north of Millston.
Photograph by Eric Epstein

Consideration of landscape vegetation patterns, the distribution of plants and animals that are significant local and regional components of biodiversity, and application of the principles of ecosystem management can assist in the development of decisions that identify those areas that may be best suited to plantation development. This process can also identify situations when and where ecological simplification should be avoided.

Simplification can also result from other processes, such as fire suppression, the colonization and spread of invasive species, or the loss of characteristic forest successional stages and the associated structural elements that some species depend on. Excessive herbivory by high populations of deer can lead to ecological simplification by suppressing reproduction of certain trees, especially by those species that are preferred forage for herbivores. Heavy herbivory can also subject some herbs and shrubs to pressures they cannot withstand, resulting in loss of vigor or population size.

The harvest of "wild" *Sphagnum* moss has been a local industry for over a century, and has affected open peatlands across the study area. When the living moss is harvested, all other plants are also removed from the affected areas. In some peatlands the practice has been confined to limited areas, but in others, the entire wetland basin has been subject to harvest. The impacts of *Sphagnum* harvest are not well understood, and it is for this reason that a research project is needed to clarify the effects at both the stand and the landscape level, and identify the conservation issues associated with this practice (see section entitled "Research and Monitoring").

Glossy buckthorn (*Rhamnus frangula*). Photograph by Stephen L. Solheim courtesy Wisconsin State Herbarium.

Invasive Species

Invasive species, whether terrestrial or aquatic, exotic or native, have the potential to out-compete and displace other species. Infestations of invasive species can result in ecological simplification and habitat loss. Human activities often, if inadvertently, exacerbate the problem by establishing means and pathways that aid in the transport and dispersal of seeds, plant fragments, or larvae.

Several problematic invasive species now occur within or immediately adjacent to the study area. Among the most troublesome at this time are glossy buckthorn, leafy spurge (*Euphorbia esula*), cypress spurge (*Euphorbia cyparrissias*), black locust (*Robinia pseudoacacia*), and reed canary grass (*Phalaris arundinacea*). All of these plants are notoriously difficult to control once established, and though they can invade intact natural communities, they frequently spread and rapidly increase in abundance following certain types of disturbance. Leafy spurge and spotted knapweed (*Centaurea biebersteinii*) have become serious problems in the sandy uplands south of the study area at Ft. McCoy Military Reservation. They are easily spread when human activities disturb the soil and inadvertently create an ideal substrate for establishment and growth. Both leafy spurge and spotted knapweed have the potential to become serious resource management problems within the study area, and activities that result in soil disturbance should be monitored to quickly identify new infestations. Glossy buckthorn is a localized, but already serious, problem in both wet-mesic and dry-mesic forests within the study area. It can spread rapidly along trails, ditches, spoil banks and haul roads.

Management capacity to control invasive species is limited at this time and will need to be increased if problems associated with their future spread are to be met effectively. It will be important for resource personnel, especially those who spend a high proportion of their time in the field, to identify the invasive species that they are most likely to encounter, map and report the locations, and develop and implement control measures in a timely manner for species that are still controllable. If resources are limited, priority for control measures should be given to ecologically significant areas. The efforts that have been expended to control black locust at Dike 17, a species that had been deliberately planted prior to the establishment of the State Forest for erosion control, can serve as an illustration of the difficulties that invasive species can cause once they become established.

Hydrologic Disruption

Virtually all of the rivers in the study area have been affected by the construction of dams, resulting in the isolation of populations of many aquatic organisms that can now no longer move freely throughout their respective drainageways. Secondary impacts of dams influence streamside vegetation, by altering the disturbance regimes to

which floodplain systems are adapted. The larger rivers, notably the Black, were used to drive logs during the nineteenth century, resulting in altered channel structure and flow characteristics and disruption of stream bottom materials. Many small streams have been channelized, obliterating their natural courses and rendering them unsuitable for some of the animals associated with them. Early attempts to drain much of the eastern part of the study area in the bed of extinct Glacial Lake Wisconsin have resulted in hundreds of miles of ditches. The spoilbanks associated with the construction of ditches and canals are frequent points of entry for invasive plants. Many of these drainages have subsequently been impounded for wildlife (usually waterfowl) management or cranberry production. Hydrologic modifications have directly impacted thousands of acres of wetlands within the study area, by inundating them or drying them out, or by breaking up formerly contiguous habitats into smaller patches, which may differ greatly from what they had been. Finally, water has been diverted from sections of the Black River's original channel for hydroelectric power.

Cranberry beds north of Tomah, Monroe County.
Photograph by Eric Epstein

Cranberry beds north of Tomah, Monroe County.
Photograph by Eric Epstein

Priority Opportunities for Biodiversity Conservation

The priority opportunities for biodiversity conservation for the study area emerged primarily from our analysis of the data collected during the recent field inventory. We also included relevant information from past studies and utilized tools that permit an effective analysis of large landscapes. These included: satellite imagery and associated interpretations such as WISCLAND; Geographic Information Systems (GIS); the NHFEU (see Appendix L); various analyses of pre-European settlement vegetation data; and Forest Inventory and Analysis (FIA) data summaries (WDNR 1996). The priority opportunities reflect inventory and assessment of the natural features both within and around the BRSF/MV. Conservation opportunities are not equivalent throughout the study area, and we have emphasized those sites (locations) that contain the best examples of rare and representative native ecosystems, aquatic features, and sensitive species populations, based on our inventory findings. Best examples include the largest and potentially most viable populations of plants and animals on the NHI Working List. For communities, priority opportunities are determined by identifying community occurrences that are 1) least modified from a natural condition 2) that occur in a context which is compatible with maintaining that community over time, and 3) which are represented by relatively large stands. To conserve and manage for diversity efficiently, both rare and representative community types are evaluated.

The priority opportunities are organized around several topics: management and protection, restoration, land use, and monitoring. This information was collected and analyzed in part for use by the Department's master planning team, which will consider it in developing overall recommendations for the future management of the Black River State Forest. However, it is our hope that this report will be useful for many groups and individuals including local, county, and federal governments; conservation and environmental organizations; private landowners and others with an interest in decisions affecting the significant ecological resources of this area.

Research needs and future inventory priorities are also described in the following section; these items may be most useful in identifying actions that will follow property master planning. Information and management considerations specific to individual sites are provided in the site description sections (Appendices B-G).

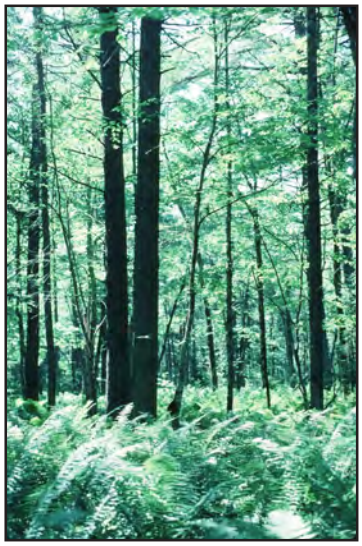
Landscape Level Priorities

The study area constitutes a large part of one of Wisconsin's most intact and distinctive landscapes due to a combination of climatic and geologic conditions not found elsewhere in the Lake States and a legacy of public ownership and stewardship following degradation in the early 1900s. Vast forests, abundant wetlands, and numerous streams support a highly diverse assemblage of plants and animals that includes large predators, area sensitive species, habitat specialists, and a number of disjuncts that occur in few southern Wisconsin landscapes outside of the Central Sands. Some of the most sensitive species are doing well, others are barely hanging on as their habitat dwindles and population size shrinks, and populations become increasingly isolated from one another. The opportunity exists to extend protection to key natural communities, restore seriously diminished habitats on which many rare species are dependent, influence trends that are leading to accelerated habitat fragmentation, and maintain connections with other landscapes via the major river corridors.

Ecological Connections

At the landscape level, there are important opportunities to maintain or expand ecological connections with other key areas on the margins of the study area. Among the most critical are the Clark County Forest, Fort McCoy Military Reservation, the Bear Bluff Wetlands, Wood County's Cranmoor Wetlands, and, especially, the corridors of the Black, East Fork of the Black, and Yellow Rivers.

Community Priorities



White Pine - Red Maple Swamp, with understory dominated by cinnamon fern. Starlight Complex, Black River State Forest. Photograph by Eric Epstein.

In this report we have focused wherever possible on occurrences of native plant communities that are relatively large, embedded within a mosaic of other intact communities, and show relatively little evidence of disturbances such as hydrologic alteration, presence of invasive species, or timber harvest. We have also highlighted those communities that are especially representative of the central sands landscape and support not only the characteristic suite of native plants and animals associated with each type, but those that are now rare and may be in need of increased management attention if their habitat needs are not provided for.

Our emphasis on mature stands of forest communities is because older successional stages of many forest communities are under-represented in the present landscape. Older forests, composed of large trees with relatively high canopy closure, best meet the habitat preferences or needs of a group of rare species. Those species associated primarily with younger and smaller stands will likely persist under current management regimes. For forest communities that are dominated by short-lived tree species adapted to relatively frequent disturbance, the management issue focus is on regeneration methods. It is uncertain whether or not replanting, scarification, and herbicide use will enable the full complement of species associated with these forest types to persist. We would suggest that the use of prescribed fire could be an important management tool, especially for communities dominated by shade intolerant species such as jack pine, red pine, and some of the oaks.

We have also emphasized relatively large community patches for some of the same reasons, though in this case, larger stands of open wetlands and barrens need to be considered along with forests. For all community types, benchmarks are needed to enable us to compare the results of management using a variety of methods. This could be part of a monitoring protocol for the forest.

Ecological context is a key factor to consider when planning management and protection actions; thus the ecological values and management/protection options for a given site are not generally considered in isolation or in terms of a single community occurrence.

The information below describes priorities in terms of a subset of the natural communities that are most important ecologically in this landscape, as well as a subset of species for which each of these communities provides important habitat.

Communities that are priorities because they are absent or rare elsewhere in Wisconsin include:

White Pine-Red Maple Swamp. By far the greatest numbers of occurrences statewide are within the study area (Fig. 31). Mature stands support distinctive assemblages of plants and animals that include many rare species including bog fern, long sedge (Fig. 32), and those listed below.

Scientific Name	Common Name	State Status
Accipiter gentilis	Northern Goshawk	SC/M
Buteo lineatus	Red-shouldered Hawk	THR
Carex folliculata	long sedge	SC
Hemidactylium scutatum	four-toed salamander	SC/H
Thelypteris simulata	bog fern	SC

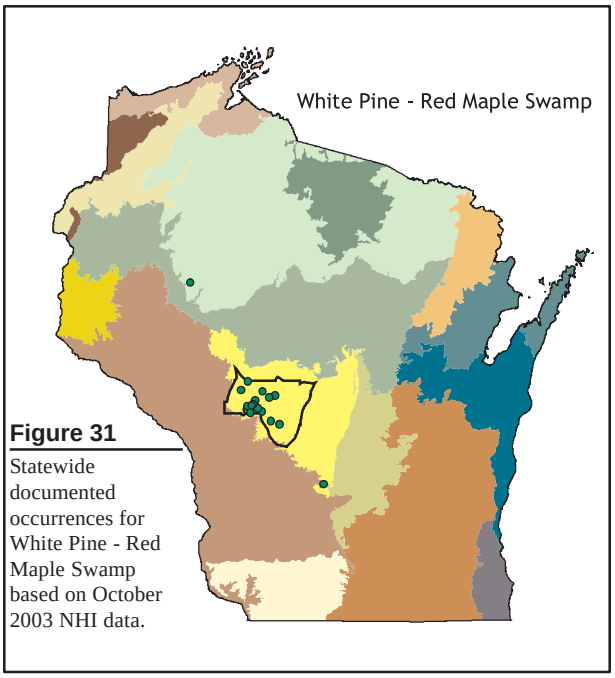


Figure 31
Statewide documented occurrences for White Pine - Red Maple Swamp based on October 2003 NHI data.

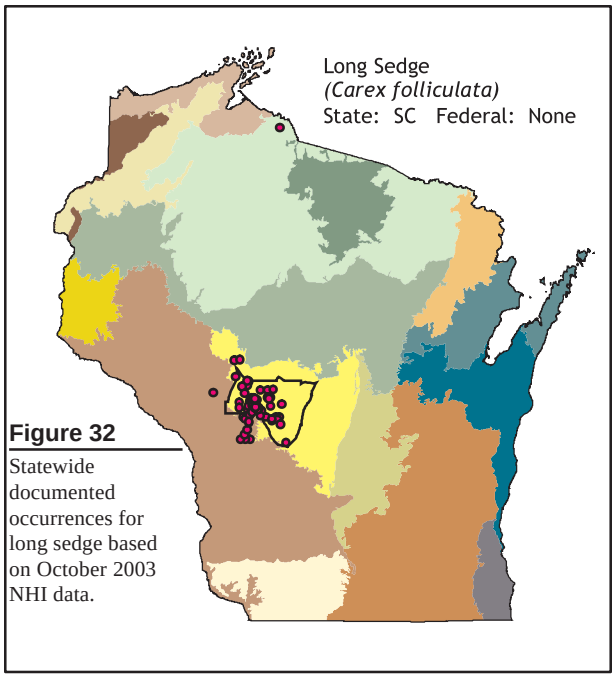


Figure 32
Statewide documented occurrences for long sedge based on October 2003 NHI data.

Coastal Plain Marsh. This unusual open wetland community harbors many rare species, including disjuncts, and is known from only two of Wisconsin's Ecological Landscapes. Examples of rare species associated with this type include:

Scientific Name	Common Name	State Status
Aeshna verticalis	green-striped darner	SC/N
Bartonia paniculata	twining screwstem	SC
Bartonia virginica	yellow screwstem	SC
Botaurus lentiginosus	American Bittern	SC/M
Carex cumulata	clustered sedge	SC
Carex livida var radicaulis	livid sedge	SC
Didiplis diandra	water-purslane	SC
Eleocharis engelmannii	Engelmann spike-rush	SC
Juncus marginatus	grassleaf rush	SC
Polygala cruciata	crossleaf milkwort	SC
Rhexia virginica	Virginia meadow-beauty	SC
Scirpus torreyi	Torrey's bulrush	SC
Scleria reticularis	reticulated nutrush	END

Crossleaf milkwort.
Photograph by Emmet Judziewicz

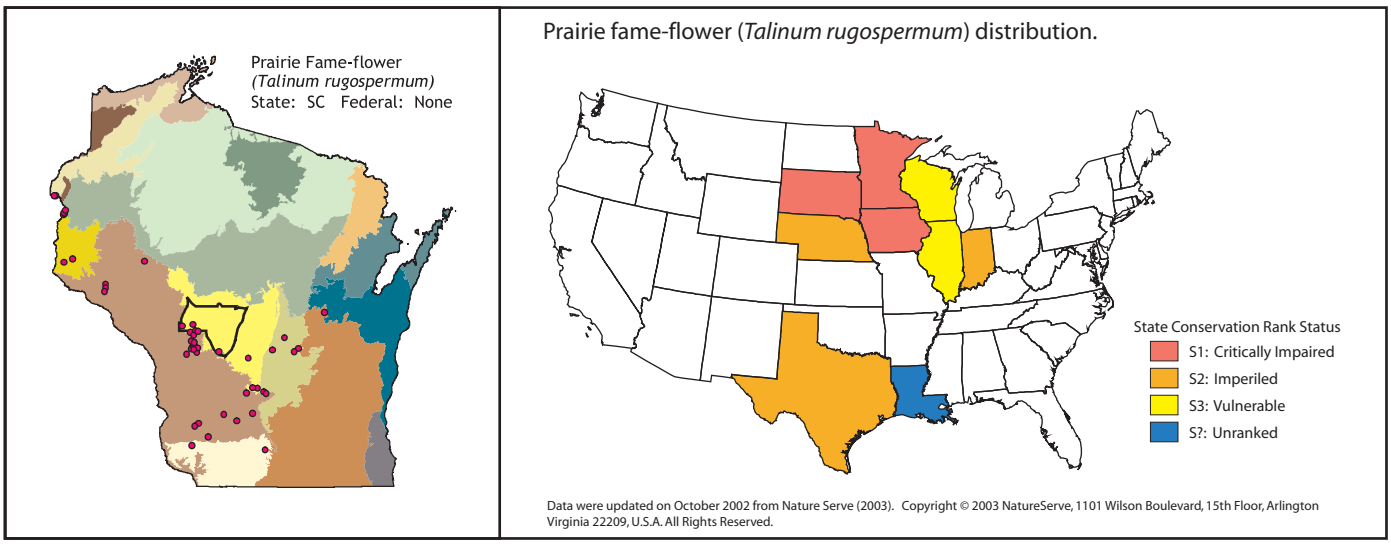
Communities that were formerly more widespread but have been greatly diminished and are now rare throughout their range:

Pine Barrens. The Pine Barrens community is globally rare, and there are opportunities for barrens management in this landscape that are not available in many other areas. Several sites contain representative barrens flora and would be good candidates for barrens management. Historically, the central sands supported one of the largest concentrations of barrens habitats in the state. Numerous rare species are associated with this type in the study area including prairie fame-flower (Fig. 33) and others listed below.

Scientific Name	Common Name	State Status	Federal Status
Artemisia frigida	prairie sagebrush	SC	
Asclepias lanuginosa	woolly milkweed	THR	
Asclepias ovalifolia	dwarf milkweed	THR	
Atrytonopsis hianna	dusted skipper	SC/N	
Callophrys irus	frosted elfin	THR	
Carex cumulata	clustered sedge	SC	
Cicindela patruela huberi	a tiger beetle	SC/N	
Coluber constrictor	yellow-bellied racer	SC/P	
Dichromorpha viridis	short-winged grasshopper	SC/N	
Erynnis persius	Persius dusky wing	SC/N	
Gnaphalium helleri	catfoot	SC	
Juncus marginatus	grassleaf rush	SC	
Lycaeides melissa samuelis	Karner blue butterfly	SC/FL	LE
Ophisaurus attenuatus	western slender glass lizard	END	
Opuntia fragilis	brittle prickly-pear	THR	
Orobanche fasciculata	clustered broomrape	THR	
Oryzopsis canadensis	Canada mountain-ricegrass	SC	
Pituophis catenifer sayi	bullsnake	SC/P	
Schinia indiana	phlox moth	END	
Scleria triglomerata	whip nutrush	SC	
Strophostyles leiosperma	small-flowered woolly bean	SC	
Talinum rugospermum	prairie fame-flower	SC	
Viola fimbriatula	sand violet	END	

Figure 33

Documented occurrences for prairie fame-flower from the Wisconsin NHI database and the status for this species for the rest of the United States from NatureServe (see www.natureserve.org/explorer for more information).



Communities that represent variants of more widespread types but are represented in the study area by occurrences that are large and relatively intact:

Central Poor Fen. These open boggy peatlands are extensive within the study area (Fig. 34), differ floristically from open peatlands north of the Tension Zone, and host many rare plants and animals, including those listed below.

Scientific Name	Common Name	State Status	Federal Status
Aeshna verticalis	green-striped darner	SC/N	
Ammodramus henslowii	Henslow's Sparrow	THR	
Ammodramus leconteii	Le Conte's Sparrow	SC/M	
Bartonia virginica	yellow screwstem	SC	
Carex straminea	straw sedge	SC	
Coturnicops noveboracensis	Yellow Rail	THR	
Cymbiodyta acuminata	a water scavenger beetle	SC/N	
Hydroporus badiellus	a predaceous diving beetle	SC/N	
Ilybius discedens	a predaceous diving beetle	SC/N	
Juncus marginatus	grassleaf rush	SC	
Oeneis jutta	Jutta Arctic	SC/N	
Polygala cruciata	crossleaf milkwort	SC	
Scleria triglomerata	whip nutrush	SC	
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	END	C
Somatochlora franklini	delicate emerald	SC/N	
Somatochlora incurvata	warpaint emerald	END	
Somatochlora kennedyi	Kennedy's emerald	SC/N	
Williamsonia fletcheri	ebony bog haunter	SC/N	
Williamsonia lintneri	ringed boghaunter	SC/N	

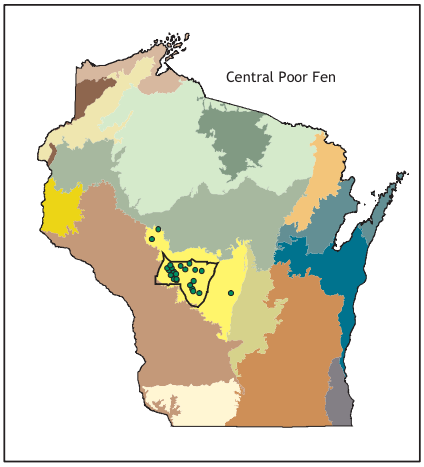


Figure 34

Statewide documented Central Poor Fen occurrences based on October 2003 NHI data.

Large, open central poor fen basin in the Black River State Forest, *Carex urticulata* is the dominant species. Wildcat Peatlands, Jackson County. Photograph by Eric Epstein.

Central Sands Pine-Oak Forest. The most extensive forest type within the study area shares features with the dry and dry-mesic forests of northern Wisconsin but also exhibits attributes of composition that are not shared with northern forests and differ markedly from other forests in southern Wisconsin (Fig. 35). Rare species associated with this type include:

Scientific Name	Common Name	State Status
Asclepias lanuginosa	woolly milkweed	THR
Carex cumulata	clustered sedge	SC
Oryzopsis canadensis	Canada mountain-ricegrass	SC
Viola fimbriatula	sand violet	END

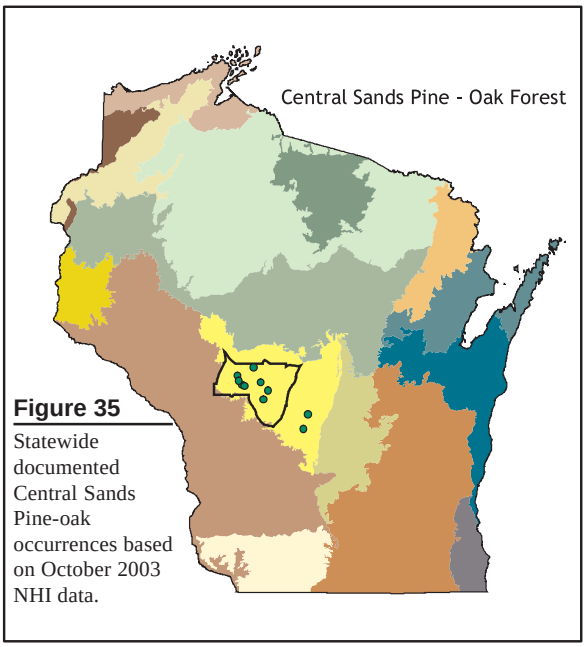


Figure 35
Statewide documented Central Sands Pine-oak occurrences based on October 2003 NHI data.

Communities of wider state distribution that are represented in the study area by occurrences that are important to conserve because of their size, condition, context, or the number of rare species they support:

Floodplain Forest. This type is best developed within the floodplains of the study area's two largest rivers, the Black and the Yellow. Several rare species are associated primarily with this type (see below), and disturbances such as widespread logging would need to be minimized to maintain the structural and microclimatic conditions needed by these habitat specialists. Infrequently flooded terraces are discussed further in the southern mesic forest section below.

Scientific Name	Common Name	State Status
Buteo lineatus	Red-shouldered Hawk	THR
Carex assiniboinensis	Assiniboine sedge	SC
Clemmys insculpta	wood turtle	THR
Dendroica cerulea	Cerulean Warbler	THR
Didiplis diandra	water-purslane	SC
Nyctanassa violacea	Yellow-crowned Night-Heron	THR
Protonotaria citrea	Prothonotary Warbler	SC/M

Southern Mesic Forest. Very limited acreage occurs within the study area, but the best occurrences are important components of the floodplain community mosaic, containing an assemblage of groundlayer plants found in no other major community, and supporting a distinctive set of rare species (including those listed below). Included within this community are rarely inundated terraces of floodplains forests. Within the study area, these terraces occasionally may have microhabitats created by seeps that are suitable for rare species like bog bluegrass and showy lady's-slipper.

Scientific Name	Common Name	State Status
Buteo lineatus	Red-shouldered Hawk	THR
Dendroica cerulea	cerulean warbler	THR
Empidonax virescens	Acadian flycatcher	THR
Oporornis formosus	Kentucky Warbler	THR
Orobanche uniflora	one-flowered broomrape	SC

Northern Dry-mesic Forest. Widespread within the study area, the best occurrences are associated with important examples of other communities and contribute directly or contextually the ability of several sites, e.g., the corridor of the Black River, to support area sensitive species.

Scientific Name	Common Name	State Status
Platanthera hookeri	Hooker orchis	SC

Tamarack-Black Spruce Swamp. The greatest acreage and concentration of "northern" conifer swamps in southern Wisconsin occurs within the study area. This type supports a highly distinctive group of plants and animals, many of them at their extreme southern range limits and some of them rare or important for other reasons.

Scientific Name	Common Name	State Status
Sorex hoyi	pigmy shrew	SC/N

Alder Thicket. Common and widespread in northern Wisconsin, shrub swamps are more common in the study area than at any other location in southern Wisconsin. At the site level, we have treated shrub swamps as integral components of wetland complexes.

Scientific Name	Common Name	State Status
Sorex arcticus	Arctic shrew	SC/N
Thamnophis proximus	western ribbon snake	END

Dry Cliff. Widespread in the Driftless Area and at several other locations in Wisconsin, dry cliff communities in the study area provide critical habitat for highly specialized plants, including several that are rare. Rock clubmoss (*Lycopodium porophilum*) has several disjunct populations the central Atlantic states and the Midwest. The most notable populations are in the Driftless Area, including part of the study area. Shadowy goldenrod is another Driftless Area endemic, and the study area provides important habitat for this species as well. The rare species on dry and moist cliffs were probably never abundant due to limited habitat for these specialists. However, the habitat available is important, range-wide, for these specialists. Protection of these features should provide adequate habitat for these species in the study area.

Scientific Name	Common Name	State Status
Lycopodium porophilum	rock clubmoss	SC
Solidago sciaphila	shadowy goldenrod	SC
Viola fimbriatula	sand violet	END

Moist Cliff. Several important occurrences were documented, mostly along the Black River or in the lower stretches of the Black's tributaries. Several highly specialized rare species are associated with this type.

Scientific Name	Common Name	State Status
Lycopodium porophilum	rock clubmoss	SC
Ochrotrichia riesi	a purse casemaker caddisfly	SC/N

Rare Plants and Artificial Habitats in the Study Area

The BRSF/MV provides important habitat for many rare plant species. In fact, the greatest concentrations of some of Wisconsin's rare plant species have been found in the study area. For a number of species, such as dwarf milkweed, sand violet, and grassleaf rush, the populations in the study area might be critical for their perpetuation in the state. The juxtaposition and amount of public land in the study area provides unusual opportunities for management of rare plants, especially as natural community management often benefits rare plants. For example, the use of prescribed fire in barrens will benefit a host of rare plants including prairie fameflower, sand violet, dwarf milkweed, Canada mountain-ricegrass, and catfoot.

As mentioned earlier, rare wetland or upland plant species frequently found in disturbed artificial habitats ("ditch plants") include many of the Atlantic coastal plain disjuncts such as the two species of screwstem, crossleaf milkwort, and Virginia meadow-beauty. Additional species that are not coastal plain disjuncts include long-leaved aster (*Aster longifolius*), straw sedge, and clustered sedge. While many of these populations may occur in artificial habitats they still represent the largest populations in the state and are important for the continued survival of these species in Wisconsin. The study area takes on greater significance because many of these species, particularly the disjunct species, are either concentrated here or have not been found elsewhere in the state.

Regardless of their natural habitat, these "ditch plants" seem dependent on periodic disturbance that exposes bare soil and reduces competition from other plants. The current maintenance used for roadside ditches and similar areas appears to approximate natural disturbance regimes. Additionally, mowing operations or periodic flooding due to heavy rains or snow melt could also play a role in helping disperse seeds of "ditch plants" to microhabitats with suitable conditions. However, maintenance techniques in vogue today can quickly be changed to a new regime and consequent loss of these rare plant species. For example, a simple shift from mowing to widespread herbicide application could dramatically affect existing populations. In the interim, it may be important to encourage maintenance managers to continue the current maintenance practices.

Rare Aquatic Species and Impoundments

A number of rare plant species were found in impoundments during the inventory; many of these are sensitive to water rate of flow, quality, and chemistry, and any changes can be detrimental. Impoundments present a complicated set of management considerations and opportunities. On one hand, impoundments provide valuable habitat that is limited in the study area for several rare aquatic plant species. However, the habitat provided by the impoundments may be ephemeral due to water level management regimes, the accumulation of sediments and chemicals, and the periodic need to renovate dikes and dams. Some aquatic animals could benefit from dike and dam removal in many cases. As mentioned under several Stream Segment site descriptions (Appendix F), impoundments are sometimes a source of water quality degradation negatively affecting aquatic animals in downstream sections. However, some aquatic systems like Madison Creek with its beaver dams may not be negatively affected. The preferred alternative for conserving overall biological diversity may be to evaluate each impoundment that affects rare plants and animals on an individual basis.

Other Important Features

Several species or species assemblages do not fit well into the current NHI Natural Community Classification used, or they occur on a local or site scale. Important features identified in the study area include unusual assemblages such as Mussel Beds, Bird Rookeries and a Bat Hibernaculum. Specialty features such as Wet Cliffs, moats around Central Poor Fens, open sand, *Sphagnum* moss and peat, river sand bars, sand banks and gravel or rock substrates, headwater streams with undercut banks, and Bald Eagle and Osprey nest trees all support some of the study area's most unusual or distinctive animal species.

Primary Sites: Significance and Summaries

Inventory sites were identified within and around the BRSF/MV Study Area and surveyed by NHI field biologists during 1997-1999. Site files are maintained in the NHI offices in Madison, WI and include details on flora and fauna, data sheets, maps, aerial photographs, and other information.

The significance of each site was evaluated during the Ranking Workshop according to the condition, quality, and extent of the natural communities present; the number and size of the rare species populations; and the ecological context of these features. Significance was evaluated at three scales: the Black River State Forest, The Central Sand Plains Ecological Landscape, and the state as a whole. Note that some sites may have high ranks even though they are disturbed if they represent the best extant examples relative to other even more disturbed sites. Many of the sites inventoried were found to be of relatively low significance by these criteria, as they had either been greatly disturbed, supported only widespread or generalist species, or contained features for which better examples occur elsewhere in northern Wisconsin. Such lands included pine plantation monocultures, even-aged aspen stands, and certain natural communities.

These lands of lower significance do possess economic, recreational, and ecological values and may also deserve consideration for long-term restoration or other special management designation depending on site potential, condition, and context. Their management can significantly impact surrounding lands. Therefore, management decisions for forest production or other intensive uses should be considered as carefully as for the more ecologically sensitive areas.

Eighty-one sites, several of which have been grouped into 3 larger macrosites, contained some feature of significance that raised their importance over other parts of the study area as determined through the Ranking Workshop. Termed Primary Sites, they generally include the best examples of both rare and representative natural communities, aquatic features, and rare species populations that we have documented within the BRSF/MV. **All or significant portions of these sites warrant high protection and/or restoration consideration**. The location of each Primary Site is shown on Figure 38. Additional sites of importance have been organized within three other categories: Aquatic Sites, Isolated Occurrences of Rare Species and Ecologically Significant Sites outside the BRSF/MV. These categories are defined below and illustrated on Figures 36 and 37.

1. **Primary Sites** are selected inventory sites within the four state properties that contain the best-documented examples of rare and representative natural features. Descriptions are provided for each of these sites in Appendices B, C, D, and E.

	# of Sites
· Black River State Forest	37
· Meadow Valley Wildlife Area	12
· Wood County Wildlife Area	5
· Sandhill Wildlife Area	6

2. **Aquatic Sites** are sites chosen because of they represent functional examples of important types found in the study area and or contain significant biological diversity. All 12 sites are stream corridors. Many of these sites include a significant portion of stream located outside of the BRSF/MV or outside of publicly managed lands and are included because of the importance of watershed scale management to stream integrity.
3. **External Sites** are within the study area but lie outside of the WDNR properties. These 22 sites also contain good examples of natural communities, rare species populations, aquatic features, or a combination of these elements. Sites in this category have similar significance to the primary sites but are located outside of the boundaries of the 4 properties listed above (Fig. 36). Descriptions are provided for each of these sites in Appendix G.

4. **Scattered Occurrences of Rare Species** – Inventory locations within the Black River/Meadow Valley Landscape boundary that contain a rare species occurrence not associated with other features. These are generally small, isolated areas. Protection priority will depend on the significance of each population at local and regional scales, and the feasibility of maintaining or enhancing that population.

Site descriptions for each of the above groupings are contained in separate appendices (B-G). The appendices include the following information for each site:

- location information,
- a site map showing occurrences of significant communities, species and aquatic features, and public ownership according to the most recent GIS public ownership coverages available at the time of this writing,
- a brief summary of the natural features present,
- the site's ecological significance (including a table of element occurrences), and
- management considerations (Management considerations are made in the context of protecting and/or maintaining biological diversity at multiple spatial and temporal scales).

Each site map[3] shows the site location against a background of a scanned USGS topographic quadrangle. The scale of the maps varies from 1:18,000 to 1:49,000 depending upon the size of each site and information presented (original USGS resolution is 1:24,000). Occurrences of rare or endangered species or natural communities are portrayed as dot symbols. Only those species or communities within the site or within 200 meters of the site boundary are portrayed in order to emphasize their location(s) relative to the boundary. Please note that: 1) there may be more than one occurrence of one or more species or communities represented by any single symbol, 2) these symbols may overlap, and 3) the significance of the site is not based only on the presence of rare species occurrences. In addition, the area of land a species or community occupies may be much larger than the dot representation. Non-DNR owned lands were obtained from a 1998 DNR GIS public lands coverage. The coverage does not represent legal ownership boundaries and may encompass errors in presentation.

Site List and Characteristics

Tables 5 and 6 list each of the primary sites contained within the four state properties and summarize the local, regional, and statewide significance of the sites, prioritizing them at the local, regional and statewide levels. General comments are provided on management and other issues, and are based on the ranking workshop. Full descriptions and management considerations for each site are provided in Appendices B-F. The primary sites for each grouping are arranged geographically, from north to south, and numbered to correspond with Figure 36.

1

3. The maps should not be reproduced except by permission from the Bureau of Endangered Resources and are for illustrative purposes only. Contact the Bureau of Endangered Resources for more information.

Table 5. Significance of Sites Based on Workshop Rank – Black River State Forest.

Site ID	Site Name:	Significance BRSF	Significance Central Sand Plains	Statewide
BR01	East Fork of the Black River	H	H	H
BR02	Upper Black River	H	H	H
BR03	Morrison Creek	H	H	H
BR04	Valentine Creek Pines	L/M	L/M	L
BR05	Dickey Creek Gorge	--	--	--
BR06	Dickey Creek Pines and Peatlands	M/H	M/H	M/H
BR07	Lichtner Road Peatlands	--	--	--
BR08	Komensky Peatlands	H	H	H
BR09	Staffon Road Barrens and Peatlands	M/H	M/H	M/H
BR10	Brockway Ponds	M	H	M/H
BR11	Battle Point – Dike 17 Complex	H	H	H
BR12	Martin Marsh	L	M	L/M
BR13	Spider Peatlands	M/H	M/H	M
BR14	Ring Marsh	L	L	L
BR15	Circle Hill Marsh	M	L	L
BR16	Settlement Road Pine Swamp	H	H	M/H
BR17	Wildcat Peatlands-Trowe Marsh	H	H	M/H
BR18	Wildcat Ridge	H	H	H
BR19	Smrekar Ridge	M/H	M/H	M/H
BR20	Ketchum Creek Headwaters	H	H	H
BR21	Hidden Fen	M	M	
BR22	Pigeon Creek Headwaters	H	M/H	M/H
BR23	Sharptail Peatlands	M/H	M/H	M/H
BR24	Washburn Marsh	H	H	H
BR25	Stanton Pines	M	M	L/M
BR26	Lower Pigeon Creek Barrens	--	--	--
BR27	Starlight Wetlands	H	H	H
BR28	Rudd Hills	M	M	M
BR29	Millston Railroad Prairie	M	L	L
BR30	Robinson Creek Pines	M/H	M*	M*
BR31	Millston Pines	M	M	M
BR32	Paradise Valley Pines	M	M	M
BR33	Millston Ridge	M/H	M/H	H
BR34	Castle Mound Pine Forest	M-H	M	M
BR35	Catfish Eddy Bottoms/ Perry Creek Gorge	--	--	--
BR36	Hawk Island Complex	--	--	--
BR37	Manchester Bottoms	H	M/L	L
	Lower Black River Macrosite	H	M/H	M

*Has important adjacent sites; if managed as an ecosystem, this site would be rated higher.

Table 6. Significance of Sites Based on Workshop Rank – Meadow Valley Wildlife Area, Sandhill Wildlife Area, and Wood County Wildlife Area Properties

Site ID	Site Name:	Significance		
		BRSF	Central Sand Plains	Statewide
MV01	Meadow Valley Flowage	M/H	M/H	M
MV02	Kingston Pines and Peatlands	M/H	M/H	M
MV03	Scott Flowage Peatlands	M/H	M	M
MV04	Mather Tamaracks	M	M	M/L
MV05	Norway Ridge Road Pines and Peatlands	M	M/L	M/L
MV06	Norway Ridge Road Powerline ROW	H	H	H
MV07	Atwood Avenue Peatlands	M	L	L
MV08	Monroe County Flowage	M/H	M	M/L
MV09	Dandy Creek Swamp	M	L	L
MV10	Blueberry Trail Complex	H	H	H
MV11	County Trunk Hwy H Barrens	H	M	M
MV12	Suk and Cerney Peatlands	H	H	
SH01	Gallagher Flowages	M/H	M	M
SH02	North Bluff	M	L	L
SH03	Quail Point Flowage Peatlands	H	M/H	M
SH04	Sandhill Rifle Range	M/H	M	M
SH05	Bison Prairie	H	M/H	M
SH06	Yellow River Bottoms-Babcock	H	H	H
WC01	Ball Road Flowages	H	H	H
WC02	South Bluff Tamaracks	M	M	L
WC03	South Bluff	M/H	M	M/L
WC04	County Trunk Hwy X Sand Prairie	--	--	--

Future Inventory, Monitoring and Research Needs

Future Inventory

Inventory is an ongoing endeavor, with new efforts adding information to the baseline established for this report. For example, stand specific inventories resulting from BRSF annual planning meetings have resulted in the documentation of several new natural communities and rare species. However, there are still inventory needs for the study area.

1. A basic inventory of bryophytes of the central Wisconsin peatlands is needed. This task could be part of the proposed research project to examine the effects of *Sphagnum* harvest in central Wisconsin.
2. A status survey of species that may be restricted to habitats where mosses are harvested is needed to better understand the effects of *Sphagnum* harvest and its effects on these rare plant and animal species. A study initiated by BER in 2004 should help our understanding of the status of these species.
3. Additional inventory work for this landscape is needed in Clark County. Extensive forests and wetlands are present, but this area received limited attention because of the lack of state ownership in that area and because the landscape is quite different from that of the sand plains to the south.
4. Plot sampling of vegetation conducted in conjunction with the community inventory work should be continued and expanded, focusing on those types that are rare, geographically restricted, represent "variants" at the range limits of more widespread community types, or where classification issues are unresolved.
5. Conduct additional inventories for disturbance dependent rare plants ("ditch plants") in native habitats.
6. Conduct invasive species inventories focusing on those species known to be ecologically disruptive and to occur in the study area.

Monitoring

The following comprise an initial list of monitoring needs. These suggestions should be factored into master planning to help develop an overall monitoring plan for the forest. The preferred alternative selected through master planning will be an important factor in determining the monitoring plan.

For the long-term, we suggest that it would be valuable to assemble an interdisciplinary working group of scientists and land managers to address monitoring needs for this landscape in a more comprehensive way. At a minimum, the expertise represented should include forest ecology, wetlands, disturbance ecology, hydrology, soils, rare species, invertebrates, and "lower" plants.

1. Identify a selected subset of rare, sensitive, highly specialized, or otherwise appropriate plant and animal species which are important in the BRSF/MV and design a monitoring project to measure changes in populations over time.
2. Develop monitoring protocols to measure the responses of both target and non-target species to various management activities. The same should be done for all restoration projects and at least a subset of natural communities. Include mossing, conversion of natural communities to plantations, herbicide use.
3. Develop a coarse scale monitoring protocol to measure changes over time in patch size distribution, cover type representation, successional stage representation, and development in and around the BRSF/MV.
4. Reference the Habitat Conservation Plan for the Federally Endangered Karner Blue Butterfly for recommendations regarding monitoring of that species and its primary habitat, Pine Barrens.

5. Monitor rare disturbance-dependent plants that, in the study area, occur primarily in artificial habitats such as ditches and flowages.
6. Establish standardized breeding bird surveys in important sites and community types throughout the BRSF/MV.
7. Conduct periodic systematic inventories for forest raptor species on NHI Working List.
8. Establish benchmarks for certain communities and inventory them to measure the effects of management on vegetation. Benchmarks are clearly needed to objectively assess impacts of management and changes over time; they are also a way to provide benefits and opportunities that may not be available on actively managed land. The DNR Forestry, Endangered Resources, Wildlife Management, and Fish and Habitat Management Programs have discussed the desirability for and need to establish benchmarks. This is not currently a DNR land use designation. How, when, and where benchmarks would be established has not yet been determined.

Research

In addition to the inventory and monitoring needs identified above, the following basic research questions have been identified in the study area. Research typically requires a commitment of resources, both time and money for the duration of the project, and cooperation across a variety of disciplines.

1. The impacts of *Sphagnum* harvest are not well understood and it is for this reason that we encourage the implementation of a research project to clarify community effects and conservation issues.
2. Many of the wetlands in this landscape are likely to have burned at times in the past, but few details on burn frequency, severity, or impacts to flora and fauna are available. Research on the central Wisconsin peatlands should include a component on fire disturbance history.
3. Develop effective and practical control measures to address present and future problems associated with the spread of invasive species, including but not limited to, glossy buckthorn and leafy spurge.
4. Conduct research on the long-term impacts of fire suppression on dry and dry-mesic forest communities, pine barrens, sand prairies, and open peatlands.
5. Complete the descriptions of the Land Type Associations (LTAs). More detailed ecoregional information is needed to sufficiently describe and analyze the lands of the Black River/Meadow Valley Landscape and apply this information to other data sets including rare species, community types, aquatic features, and others.
6. Further research is needed to better elucidate the relationship of disturbance to rare plant species that occur mostly in highly disturbed habitats (“ditch plants”) and more fully characterize their natural habitats. Because many of these species probably function at a metapopulation level, additional research may provide management recommendations at a larger scale than a single ditch or right-of- way.
7. Additional research could incorporate long term monitoring of water chemistry and other physical parameters with plant population fluctuations. Basic biological research is also needed, including on seed dispersal and plant establishment requirements.
8. Integrate items above with the WDNR’s new Status of Wisconsin Peatlands Study

Glossary

adaptive management – a formal, structured approach to dealing with uncertainty in natural resource management, using the experience of management as an ongoing and continually improving process.

aquatic macrophyte – vascular plants such as cattails, bulrushes, pond lilies, and pondweeds that have special adaptations that enable them to live in aquatic habitat

bog – wetlands characterized by the accumulation of peat derived from *Sphagnum* moss, high acidity, low oxygen and nutrient availability, and a group of highly specialized vascular plants that includes ericaceous shrubs (e.g., leatherleaf, bog laurel, cranberries), sedges, and insectivorous species. By the strictest definition, a bog receives nutrients only from precipitation, and is isolated from mineral enriched groundwater by thick beds of living *Sphagnum* mosses and partially decomposed moss peat. "Open" bogs are those lacking a dense overstory of coniferous trees. Forested, or treed, bogs support a relatively dense growth and correspondingly closed canopy of black spruce, sometimes mixed with tamarack. See "*muskeg*."

coastal plain disjuncts (Atlantic coastal plain disjuncts) – those species whose occurrences in the Great Lakes region are disjunct (typically by at least 100 km) and whose main ranges are largely confined to the coastal plain (Reznicek 1994).

Cambrian – the earliest geologic period of the Paleozoic Era, from 500 to 600 million years before the present. Most of the exposed or otherwise prominent bedrock in the study area is sandstone of Cambrian age.

complex – used here to reference an integrated mosaic of natural communities and/or aquatic features.

context- used in this report to aid in the assessment of the ecological effects that surrounding biological and physical features, land uses, ownership or other significant attributes of the environment may have on the potential to maintain an occurrence of a natural community or rare species population at a given location.

coulee – used in reference to the narrow, steep-sided valleys that are especially characteristic of southwestern Wisconsin's Driftless Area.

cover type – a generalized method of broadly classifying vegetation based on the single species or species group comprising a majority of the living plants (when used in a forestry context, these are usually commercially important trees). Cover types may also be applied to cultural features such as cornfields or pastures. In cases where a clear plurality of a single species is not apparent, terms have been invented to reference groups of commonly co-occurring species, such as "northern hardwoods" (see definition below), "swamp conifers", and bottomland hardwoods."

degree growing days – the days when the average temperature exceeds a specified amount. The accumulated number of degree growing days are often used to estimate the progress of the growing season at a given point in time.

diversity – used in this report as a shortened form for biological diversity, or biodiversity. A general definition (Matthiae et al., 1993) is "the spectrum of life forms and the ecological processes that support and sustain them. Biological diversity is a complex of four interacting levels: genetic, species, community, and ecosystem."

Driftless Area – the portion of southwestern Wisconsin and adjoining states that were not covered by ice sheets during the last glaciation. Topography and drainage patterns are markedly different from regions that have a glacially modified landscape. Most of the study area was not covered by glacial ice but was affected by the presence of a huge proglacial lake and glacial outwash deposits.

drumlin – streamlined, teardrop shaped hills created by glacial action. The long axis parallels the direction of past glacial movement.

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

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

ecoregion – geographic units that are differentiated by climate, geology, geomorphology, physiography, hydrology, soils, and vegetation. These units have been defined and organized in different ways by various institutions but in this document we use the National Hierarchical Framework of Ecological Units (NHFEU). As described by Avers et al (1994), the NHFEU can provide a basis for assessing resource conditions at multiple scales. In this report we have most frequently referred to ecoregions of the "subsection" level, which are intermediate in scale within the NHFEU and typically cover areas of hundreds to thousands of square miles. In recent years the NHI has found the ecoregions of the NHFEU to be useful tools for work planning, interpreting the collected data, and communicating across political and administrative boundaries.

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

element occurrence – an individual example of an element (a natural community, a rare plant population, a rare animal population, or other feature tracked by the Natural Heritage Inventory program) at a specific geographic location.

ericaceous – pertaining to a family of plants, the Ericaceae, especially characteristic of highly acidic habitats such as bogs and muskeg. Members include familiar plants such as blueberries, cranberries, leatherleaf, Labrador tea, and bog rosemary.

fen – wetlands that receive nutrients via direct contact with mineral enriched groundwater and in which peat accumulates. A "poor" fen has relatively low concentrations of plant nutrients and a carpet of *Sphagnum* mosses, but is capable of supporting more nutrient demanding plants that are not characteristic of or abundant in the more acidic, true "bogs." "Rich" fens have relatively high concentrations of nutrients, lack the continuous carpet of *Sphagnum* mosses, and support an assemblage of plants that often includes calcium-loving species absent from poor fens and bogs.

flowage – a body of standing water (an impoundment) created by constructing a dam or other water control structure across a stream or flowing ditch.

forb – a general term that usually refers to those native herbaceous plants of prairies and savannas that are not grasses, or grasslike. In broad terms, "wildflowers."

fragmentation – the breaking up of large and continuous ecosystems, communities, and habitats into smaller discontinuous areas that are surrounded by altered or disturbed lands or aquatic features.

Glacial Lake Wisconsin – a huge lake covering 1,800 sq. miles that was created when the Wisconsin River was dammed by ice during the last glacial advance (19,000 to 18,000 years ago). The lake drained catastrophically approximately 14,000 years ago, leaving behind a landscape characterized by an extensive sand plain, vast peatlands, wave-carved sandstone bedrock features and ancient dune fields. The lakebed and associated features provided the environmental conditions that are responsible for much of what is still found here today.

habitat – references those environmental attributes necessary to provide a niche that supports the needs of a species or group of species.

habitat type – as used in the Forest Habitat Classification System, all sites capable of producing similar climax plant communities (Kotar 1996). This system of vegetation classification uses the floristic composition of a plant community as an integrated indicator of those environmental factors that affect reproduction, growth, competition, and community development. These include soils, moisture, nutrient levels, and topography. Some professional foresters in the upper Great Lakes region have begun using this system as a forest management tool, primarily for upland forest communities.

inventory site – also "site" in text. The geographic location at which a biological survey has been conducted. These may be large or small, depending on the nature of the species or community surveyed. Boundaries may be finite and discrete (a property boundary, a single stand of a forest community), or rather arbitrary. When sites become very large (exceeding several thousand acres) and encompass complex landscapes, they are sometimes referred to as "macrosites" (see below).

Landtype Association (LTA) – a level in the National Hierarchical Framework of Ecological Units representing an area of thousands to hundreds of thousands of acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

lentic – pertaining to standing waters; lakes, ponds, and flowages.

lotic – pertaining to flowing waters; rivers and streams.

macroinvertebrate – a term used in this report to refer to aquatic insects, crustaceans, and mollusks.

macrosite – two or more standard survey sites in close proximity, where consideration of their collective attributes is in some way related to the viability of the ecological values of the larger site.

madicolous – organisms characterized as living in very shallow water where there is a continuous coat of diatoms, other algae, and a cushion of moss or liverworts through which the water trickles

matrix – used in this document to refer to the dominant land cover within which other features of the landscape are embedded.

mesic – used by ecologists to describe site conditions that are well-drained but almost never excessively dry or inundated.

moraine – landforms composed of unsorted materials deposited by glaciers. They can cover broad geographic areas of millions of acres. Topography can vary from nearly level "till" plains to rough end moraine landscapes composed of steep dry ridges interspersed with deep kettle holes. These glacial "kettles" are frequent locations for lakes and wetlands.

mossing – the commercial harvest of living *Sphagnum* moss from open peatlands such as bogs and poor fens. This practice was begun in central Wisconsin in the late 1800s.

muskeg – similar to "open bog." Used to describe highly acidic peatlands characterized by a sparse growth of scattered, stunted black spruce and tamarack over ericaceous shrubs, sedges, and a deep carpet of *Sphagnum* mosses.

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

natural community – an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.
natural community occurrence – a place on the landscape that supports an example of a natural community that has been surveyed and evaluated by ecologists using standard NHI methodology and meets minimum criteria for condition, context, and size.

natural division – six major natural divisions have been delineated for the state of Wisconsin based on gross differences in vegetation, soils, and geomorphology. Recent collaborative work by the USDA Forest Service, The Nature Conservancy, the WDNR, and others has resulted in a somewhat similar but hierarchical classification system of "ecoregions."

Natural Heritage Inventory – A system developed by the Science Division of The Nature Conservancy and currently coordinated by NatureServe for the collection, management, and use of biological, ecological, and related information. In Wisconsin, the Natural Heritage Inventory was established by an act of the state legislature in 1985, after which the program was installed within the WDNR's Bureau of Endangered Resources.
northern hardwoods –generally applied to those forests of northern Wisconsin composed primarily of hardwoods such as sugar maple, basswood, ash, and yellow birch. It is also sometimes used to refer to forests with a significant component of red maple or red oak, or sometimes even aspen, but which lack strong representation by coniferous species. The term is widely used in the Great Lakes states in areas that have vegetation similar to that of northern Wisconsin.

oak grubs – the short, young living stems of oaks that have been repeatedly top-killed by various disturbances such as fire, frost, or mechanical stem removal ("brushing"). The underground parts of the oak may survive for many decades or even centuries and continue to produce "grubs". In this region they are typically black, Hill's (northern pin), or bur oak.

old-growth – various definitions exist, but most include mature forests with attributes such as large living trees, standing snags, coarse woody debris, pit and mound microtopography, and complex multi-layered canopies. Old-growth stages of many forest types were formerly common and/or widespread in Wisconsin but are now very rare (Frelich, 1995).

outwash – composed of materials sorted and deposited by glacial meltwaters. The resulting topography can range from a level plain ("uncollapsed") to very hilly ("collapsed" or "pitted"). Pitted outwash may contain numerous lakes, which originated when blocks of ice stranded by a receding glacier were buried within outwash deposits, but pitted outwash is absent from the Central Sands.

peat – organic deposits consisting of the partially decomposed remains of plants, which accumulate over time more rapidly than decomposition processes can break them down. Peat may be derived from the remains of mosses, sedges, or woody plants.

peatland –wetlands characterized by the gradual accumulation of peat, the partially decomposed remains of plants. Open bog, muskeg, black spruce swamp, tamarack swamp and poor fen are among the common peatland communities in the Central Sands study area.

pinery – because pine played such an important role in the European settlement of Wisconsin, those areas that supported extensive forests of white and red pine were called "pineries" by nineteenth century European settlers and loggers. While the most extensive and best known Wisconsin pineries were in the northern part of the state, a significant volume of pine was taken from the central sands in the late 1800s.

Pleistocene – in the geologists parlance, "the first epoch of the Quaternary Period." In more common usage, the Ice Age.

potential pack habitat – areas that have greater than a 50 percent probability of being settled by wolf packs (Mladenoff et al., 1995). Such habitat would be heavily forested, have few people, and have a density of improved roads of <0.7 mi/mi^2. Winter pack wolf territories on the average cover 50 mi^2, but can range from 20 – 120 mi^2.

Precambrian – the oldest major division in the geologic time scale, equivalent to ca. 90% of geologic time, covering the period up to approximately 600 million years ago.

rare– used in this report to refer to native species and natural communities known or suspected to be rare and/or declining in the state (included on NHI's "Working List"). Included are species legally designated as "Endangered" or "Threatened" by either the State of Wisconsin or the federal government, as well as species in the Department's advisory "Special Concern" category and on the U.S. Fish & Wildlife Service's "Candidate" and "Species of Concern" lists.
"rare" natural community – in this context the modifier can refer either to the relative scarcity of the community type itself, to the scarcity of a particular developmental stage, or to a specific attribute of the community occurrence
"relatively intact" (or "closed canopy") – crown closure that approximates that achieved in the absence of artificial or major natural disturbance. This will vary somewhat by forest type.

refugium– a place where plant or animal species have survived despite widespread disturbance such as glaciation.

restoration – used in this report to refer to the re-establishment of a natural community, habitat, species population, or other ecological attribute, that has been eliminated or greatly reduced on a given property or landscape. Many factors, sociological as well as ecological, must be weighed when making a decision to engage in a restoration project.

sawtimber – a forestry term referring to living trees of at least 9" d.b.h. for softwoods such as pine or of at least 11" d.b.h. for hardwoods such as sugar maple, yellow birch, or ash.

Section – a level in the National Hierarchical Framework of Ecological Units characterized by combinations of climate, geomorphic processes, topography, and stratigraphy. The study area is located primarily within Section 222R, the "Wisconsin Central Sands."
significant – has either documented or high potential for biodiversity conservation based on present condition, stand size, presence of rare species, or other factors

sink – A site that is attractive to breeding plants or animals but that acts as a drain on overall populations of such organisms.

site – see "inventory site."

source – A site where sufficient offspring are produced that can disperse into the surrounding landscape.

State Natural Area – sites that are formally designated by the state of Wisconsin to protect outstanding examples of both representative and rare native plant communities, aquatic and geologic features, or archaeological sites. State Natural Areas are often among the last refuges in the state for rare and endangered species of plants and animals. State Natural Areas are devoted to scientific research, the teaching of conservation biology and, especially, to the preservation of natural values and genetic diversity for future generations. Management may be active or passive, depending on the natural features present. (For more information regarding Wisconsin's State Natural Areas, visit the State Natural Areas Web pages, http://www.dnr.state.wi.us/org/land/er/sna/).

Subsection – This is a level in the NHFEU that is intermediate in scale (e.g. see Appendix L). Subsections are characterized by distinctive glacial landforms (e.g., outwash or moraine), soils, and broadly, by vegetation. The Ecological Landscapes developed by the WDNR are largely based on Subsections (see ***Ecological Landscape***).

survey site – see "inventory site."
tension zone – a climatic transition area that crosses Wisconsin from northwest to southeast, and separates the conifer-hardwood forests of northern Wisconsin from the mosaic of prairie, savanna, and mainly deciduous forests of the south.

TNC – The Nature Conservancy, a private conservation organization responsible for developing the standardized methodology used by Natural Heritage programs.

xeric – characterized by excessive dryness. Plants and animals dwelling in xeric habitats must have adaptations that allow them to cope with periodic moisture deficits if they are to persist at such sites.

wire-leaved sedges – grass-like plants in the sedge genus *Carex*, characterized by very narrow leaves and stems, that can be dominant in certain herbaceous wetland communities. Also referred to by the misnomer "wiregrass." The most common wire-leaved sedges in the study area are *Carex oligosperma* and *C. lasiocarpa*.

Species List

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

Common	Scientific	State Status	Federal Status
algae-like pondweed	*Potamogeton confervoides*	THR	
American burying beetle	*Nicrophorus americanus*	END	LE
American elm	*Ulmus americana*		
American hazelnut	*Corylus americana*		
American lopseed	*Phryma leptostachya*		
arrowhead	*Sagittaria latifolia var. latifolia*		
Assiniboine sedge	*Carex assiniboinensis*	SC	
azure aster	*Aster oolentangiensis*		
balsam willow	*Salix pyrifolia*		
basswood	*Tilia americana*		
bearberry	*Arctostaphylos uva-ursi*		
beggars-tick	*Bidens sp.*		
big bluestem	*Andropogon gerardii*		
big-leaved aster	*Aster macrophyllus*		
bigtooth aspen	*Populus grandidentata*		
birdfoot violet	*Viola pedata*		
black cherry	*Prunus serotina*		
black locust	*Robinia pseudoacacia*		
black oak	*Quercus velutina*		
black spruce	*Picea mariana*		
blackberry	*Rubus allegheniensis*		
Blanchard's cricket frog	*Acris crepitans blanchardi*	END	
Blanding's turtle	*Emydoidea blandingii*	THR	
bluebead lily	*Clintonia borealis*		
blueberry	*Vaccinium angustifolium*		
bluejoint grass	*Calamagrostis canadensis*		
bog birch	*Betula pumila*		
bog bluegrass	*Poa paludigena*	THR	
bog fern	*Thelypteris simulata*	SC	
bog goldenrod	*Solidago uliginosa*		
bog holly	*Ilex mucronata*		
bracken fern	*Pteridium aquilinum*		
brambles	*Rubus spp.*		
brittle prickly-pear	*Opuntia fragilis*	THR	
bullsnake	*Pituophis catenifer sayi*	SC/P	
bulrush	*Scirpus spp. & Schoenoplectus spp.*		
bur oak	*Quercus macrocarpa*		
Canada mayflower	*Maianthemum canadense*		
Canada mountain-ricegrass	*Oryzopsis canadensis*	SC	
cardinal flower	*Lobelia cardinalis*		
catfoot	*Gnaphalium helleri*	SC	
cherries	*Prunus spp.*		
chokeberry	*Aronia melanocarpa*		
cinnamon fern	*Osmunda cinnamomea*		
cliff clubmoss	*Huperzia porophila*		
clubmoss	*Lycopodium spp.*		
clustered sedge	*Carex cumulata*	SC	
cotton-grasses	*Eriophorum spp.*		
cranberry	*Vaccinium macrocarpon*		
crossleaf milkwort	*Polygala cruciata*	SC	
cutleaf coneflower	*Rudbeckia laciniata*		
cypress spurge	*Euphorbia cyparrissias*		
dogwoods	*Cornus spp.*		
dwarf milkweed	*Asclepias ovalifolia*	THR	

eastern hemlock	*Tsuga canadensis*		
eastern massasauga rattlesnake	*Sistrurus catenatus catenatus*	END	C
elusive clubtail	*Stylurus notatus*	SC/N	
Engelmann spike-rush	*Eleocharis engelmannii*	SC	
false dragonhead	*Physostegia virginiana*		
Farwell's water-milfoil	*Myriophyllum farwellii*	SC	
flowering spurge	*Euphorbia corollata*		
frosted elfin	*Callophrys irus*	THR	
garlic mustard	*Alliaria petiolata*		
Georgia bulrush	*Scirpus georgianus*	SC	
glossy buckthorn	*Rhamnus frangula*		
goat's rue	*Tephrosia virginiana*		
goldthread	*Coptis trifolia*		
grassleaf rush	*Juncus marginatus*	SC	
grass-leaved goldenrod	*Euthamia graminifolia*		
green ash	*Fraxinus pennsylvanica*		
green dragon	*Arisaema dracontium*		
green-faced clubtail	*Gomphus viridifrons*	SC/N	
hackberry	*Celtis occidentalis*		
hardhack	*Spiraea tomentosa*		
hazlenut	*Corylus spp.*		
hidden-fruited bladderwort	*Utricularia geminiscapa*	SC	
Hill's oak	*Quercus ellipsoidalis*		
Hooker orchis	*Platanthera hookeri*	SC	
Hooker's orchid	*Platanthera hookeri*	SC	
huckleberry	*Gaylussacia baccata*		
Indian grass	*Sorghastrum nutans*		
Interrupted fern	*Osmunda claytoniana*		
jack pine	*Pinus banksiana*		
June grass	*Koeleria macrantha*		
Jutta arctic	*Oeneis jutta*	SC/N	
Karner blue butterfly	*Lycaeides melissa samuelis*	SC/FL	LE
Labrador tea	*Ledum groenlandicum*		
lady fern	*Athyrium filix-femina*		
large water-starwort	*Callitriche heterophylla*	THR	
large-fruited cranberry	*Vaccinium macrocarpon*		
large-toothed aspen	*Populus grandidentata*		
leafy spurge	*Euphorbia esula*		
leather-leaf	*Chamaedaphne calyculata*		
little bluestem	*Schizachyrium scoparium*		
long sedge	*Carex folliculata*	SC	
long-leaved aster	*Aster longifolius*	SC	
manna grass	*Glyceria spp.*		
maple-leaved arrow-wood	*Viburnum acerifolium*		
marsh willow-herb	*Epilobium palustre*	SC	
Missouri gooseberry	*Ribes missouriense*		
moccasin flower	*Cypripedium acaule*		
mountain holly	*Ilex mucronata*		
northern bush-honeysuckle	*Diervilla lonicera*		
northern pin oak	*Quercus ellipsoidalis*		
ostrich fern	*Matteuccia struthiopteris*		
pale green orchid	*Platanthera flava var herbiola*	THR	
paper birch	*Betula papyrifera*		
partridgeberry	*Mitchella repens*		
Penn sedge	*Carex pensylvanica*		
phlox moth	*Schinia indiana*	END	
pink lady's slipper	*Cypripedium acaule*		
pipsissewa	*Chimaphila umbellata*		
pitcher plant	*Sarracenia purpurea*		
Pocket gopher	*Geomys bursarius*		
poison ivy	*Toxicodendron radicans*		
poverty oatgrass	*Danthonia spicata*		
prairie alumroot	*Heuchera richardsonii*		

prairie buttercup	*Ranunculus rhomboideus*		
prairie fame-flower	*Talinum rugospermum*	SC	
prairie parsley	*Polytaenia nuttallii*	THR	
prairie phlox	*Phlox pilosa*		
prairie sagebrush	*Artemisia frigida*	SC	
prairie willow	*Salix humilis*		
prickly hornwort	*Ceratophyllum echinatum*	SC	
purple bladderwort	*Utricularia purpurea*	SC	
purple milkwort	*Polygala sanguinea*		
purple wartyback	*Cyclonaias tuberculata*	END	
red elm	*Ulmus rubra*		
red maple	*Acer rubrum*		
red oak	*Quercus rubra*		
red pine	*Pinus resinosa*		
reed canary grass	*Phalaris arundinacea*		
reticulated nutrush	*Scleria reticularis*	END	
ringed boghaunter	*Williamsonia lintneri*	SC/N	
river birch	*Betula nigra*		
rock clubmoss	*Lycopodium porophilum*	SC	
rock-cress	*Arabis spp.*		
rough blazing star	*Liatris aspera*		
rush	*Juncus spp.*		
sand cherry	*Prunus pumila*		
sand snaketail	*Ophiogomphus smithi*	SC/N	
sand violet	*Viola fimbriatula*	END	
sessile-flowered bellwort	*Uvularia sessilifolia*		
shadowy goldenrod	*Solidago sciaphila*	SC	
sheep sorrel	*Rumex acetosella*		
Short's rockcress	*Arabis shortii*	SC	
showy lady's-slipper	*Cypripedium reginae*	SC	
silky willow	*Salix sericea*	SC	
silver maple	*Acer saccharinum*		
skillet clubtail	*Gomphurus ventricosus*	SC/N	
skunk cabbage	*Symplocarpus foetidus*		
slender willow	*Salix petiolaris*		
small-flowered woolly bean	*Strophostyles leiosperma*	SC	
snowshoe hare	*Lepus americanus*		
southern bog lemming	*Synaptomys cooperi*		
speckled alder	*Alnus incana*		
spikerush	*Eleocharis sp.*		
spotted knapweed	*Centaurea biebersteinii*		
spotted pondweed	*Potamogeton pulcher*	END	
starflower	*Trientalis borealis*		
stiff coreopsis	*Coreopsis palmata*		
straw sedge	*Carex straminea*	SC	
sugar maple	*Acer saccharum*		
swamp dewberry	*Rubus hispidus*		
swamp raspberry	*Rubus hispidus*		
swamp white oak	*Quercus bicolor*		
sweet fern	*Comptonia peregrina*		
sweet-fern	*Comptonia peregrina*		
tag alder	*Alnus incana*		
tamarack	*Larix laricina*		
three-seeded sedge	*Carex trisperma*		
three-way sedge	*Dulichium arundinaceum*		
tick-trefoil	*Desmodium spp.*		
timber wolf	*Canis lupus*	THR	LE
trailing arbutus	*Epigaea repens*		
trembling aspen	*Populus tremuloides*		
trout-lily	*Erythronium sp.*		
twining screwstem	*Bartonia paniculata*	SC	
Vasey's pondweed	*Potamogeton vaseyi*	SC	
Virginia meadow-beauty	*Rhexia virginica*	SC	

warpaint emerald	*Somatochlora incurvata*	END
water horehound	*Lycopus americanus*	
water-purslane	*Didiplis diandra*	SC
watershield	*Brasenia schreberi*	
western sand darter	*Etheostoma clarum*	SC/N
western slender glass lizard	*Ophisaurus attenuatus*	END
western sunflower	*Helianthus occidentalis*	
whip nutrush	*Scleria triglomerata*	SC
white beakrush	*Rhynchospora alba*	
white oak	*Quercus alba*	
white pine	*Pinus strobus*	
whorled loosestrife	*Decodon verticillatus*	
wild geranium	*Geranium maculatum*	
wild lupine	*Lupinus perennis*	
wild sarsaparilla	*Aralia nudicaulis*	
willows	*Salix spp.*	
winterberry holly	*Ilex verticillata*	
wintergreen	*Gaultheria procumbens*	
witch hazel	*Hamamelis virginiana*	
wood anemone	*Anemone quinquefolia*	
wood turtle	*Clemmys insculpta*	THR
woodland phlox	*Phlox divaricata*	
woolgrass	*Scirpus cyperinus*	
woolly milkweed	*Asclepias lanuginosa*	THR
yellow birch	*Betula alleghaniensis*	
yellow screwstem	*Bartonia virginica*	SC
yellow-bellied racer	*Coluber constrictor*	SC/P

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APPENDIX A

Natural Heritage Inventory Overview and General Methodology

The Black River State Forest / Meadow Valley Landscape inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program, which is part of an international network of NHI programs. The defining characteristic of this network, and the feature that unites the programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers was established by The Nature Conservancy and is currently coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on rare species, natural communities, and other rare elements of nature. When NHI programs are established, one of the first tasks facing the staff is to consolidate existing information on the status and location of rare elements. Before proceeding, the NHI program must determine what elements warrant "tracking" and which are more common. Similar to most states, Wisconsin biologists had a general idea of which species in the better-studied taxonomic groups (e.g., mammals, birds, and vascular plants) were rare or declining. For less-studied groups such as macroinvertebrates, the process of assembling the list of species to track and gathering the data were quite dynamic. Initially, NHI staff cast a wide net, collecting data on many species from existing sources (e.g., scientific literature, field guides, books, maps, and museum collections) as well as from direct contact with experts throughout the state. As more data were gathered, it was clear that some species were more common than originally thought and the NHI program stopped collecting data on them. Thus, the list of which elements are tracked, the NHI Working List, changes over time as species' populations change (both up and down) and as our knowledge about their status and distribution increases. This evolution continues today, with the NHI Working List typically going through several revisions a year. The most current Wisconsin Natural Heritage Working List for the State of Wisconsin is available through the NHI office and on the Endangered Resources Program Web pages (http://webtest.dnr.state.wi.us/org/land/er/).

In general, there are two approaches to surveying biodiversity: (1) those focused on locating occurrences of particular elements, and (2) those focused on assessing the components of a particular area. The latter approach employs a "top down" analysis that begins with an assessment of the natural communities and aquatic features present, their relative quality and condition, the surrounding landscape pattern, and current land use and results in the identification of future species-oriented surveys. This approach, commonly referred to as "coarse filter-fine filter," concentrates inventory efforts on those sites most likely to contain target species. It also allows sites to be placed in a larger, landscape context for more broad applications of ecosystem management principles.

The Black River State Forest / Meadow Valley Landscape inventory used the top-down, coarse filter-fine filter approach. The initial analysis assessed the entire region and determined the important ecological attributes and the biological processes supporting them. Criteria to evaluate sites were established and then vegetative communities were identified and characterized. Based upon existing habitat characteristics and known habitat preferences of various rare species, sites where species-specific surveys were most appropriate were identified***. No doubt, occurrences of***

rare species exist that were not located through these inventories. However, by concentrating inventory efforts on the highest quality or otherwise suitable sites, it is most likely that the populations with the highest conservation value were located.

The NHI methodology for organizing and storing data is actually a system of three inter-related data storage techniques: structured manual information files, topographic map files, and a computer database that integrates the various information. The computer component, known as the Biological & Conservation Data System (BCD), was developed by The Nature Conservancy for use by the Heritage Network. It is a sophisticated relational database management application built upon the Advanced Revelation application environment. Owing to the diversity and complexity of the information managed--from species taxonomy and ecosystem classification to real estate transactions--the system contains 36 database files and more than 2,000 information fields. The data in the Biological & Conservation Data System populate the NHI Geographic Information System.

Methods of Inventory

The following is a description of standard NHI methods for conducting NHI inventories. Any step may be modified, dropped, or repeated as appropriate to the project.

File Compilation: Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the Biological & Conservation Data system, housed within DNR's Natural Heritage Inventory. Other databases with potentially useful information may also be queried, such as: forest stand/compartment reconnaissance, which is available for many public agency owned lands; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; museum/herbarium collections for various target taxa; soil surveys; and the fish distribution database (by watershed, WDNR-Research).

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources contain information on a variety of subjects relevant to the inventory of natural features and are frequently useful.

Literature Review: Field biologists involved with a given project consult basic references on the natural history and ecology of the region within which the study area is situated. This can both broaden and sharpen the focus of the investigator.

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

Map Compilation: USGS 7.5 minute topographic quadrangles serve as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth.

Ecoregion maps are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. As these maps evolve, they should become increasingly useful, even for relatively small, localized projects.

Geographic Information Systems (GIS) are increasing our ability to integrate spatial information on lands and waters of the state and are becoming a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

Aerial photographs: These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time.

Original Land Survey Records: The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. These notes also record general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns.

Interviews: Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield information not available in other formats.

Analysis of Compiled Information: The compiled information is analyzed to identify inventory priorities, determine needed expertise, and develop budgets.

Meetings: Planning and coordination meetings are held with all participants to provide an overview of the project, share information, identify special equipment needs, coordinate schedules, and assign landowner contact responsibilities. Team development may be a part of this step.

Aerial Reconnaissance: Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most easily identified and differentiated. They are also useful for observing the general lay of the land, vegetation patterns and patch sizes, aquatic features, infrastructure, and disturbances within and around the site.

APPENDIX B

Primary Inventory Sites within the Black River State Forest

The ecologically significant sites identified through the WDNR-BER inventory are depicted on Figure 37 and described in the following narratives. Each site contains documented, significant occurrences of rare and/or representative natural features of the Central Sands landscape. Most sites are within the *Central Wisconsin Sand Plain* ecoregion (subsection 222Ra[1]). Sites that are outside of this subsection include East Fork Pines (BR01) and Lichtner Road Peatlands (BR07), that are within the *Neillsville Sandstone Plateau* (222Rb), and Millston Ridge (BR33) that is within the *Melrose Oak Forest and Savanna* (222Lb) subsection. The communities, aquatic features and rare species populations identified herein will give agency planners, managers, and the public the opportunity to make informed decisions on appropriate protection and management (land use classification and designation) in the new property master plan and other planning efforts. Restoration potential for features that are now absent, substantially diminished, or isolated are discussed along with additional opportunities for management and protection of significant resources on lands adjoining the property.

Table of Sites

[1] Appendix L describes the ecoregions of the study area

BR01. EAST FORK OF THE BLACK RIVER

Location

USGS 7.5' Quadrangle:	Hatfield
Town-Range-Section:	T22N-R2W, parts of sections 4, 5, and 6
	T23N-R2W, parts of sections 31 and 32
Approximate Size:	384 ac.

Description of Site

The site borders the lower stretches of the East Fork of the Black River just before it reaches its confluence with the Black River at Lake Arbutus, an impoundment created by the Hatfield Dam. The primary features include the East Fork proper, and a series of ridges and swales that parallel the river on its south side. The ridges support mature dry-mesic forest of pine and oak. The swales contain a variety of wetland communities, including white pine-red maple swamp, tamarack swamp, northern sedge meadow, and alder thicket. Rare plants and animals are resident here, and the diversity of northern animals is significant. Among the latter are Pine, Black-throated Green, Blackburnian, Nashville, Golden-winged, and Canada Warblers, Hermit Thrush, Veery, and Northern Raven.

The East Fork is at the southern extremity of the Canadian Shield. Bottom materials include boulders, cobbles, and gravel. Outcroppings of pre-Cambrian granitic bedrock occur along the shores. Aquatic life is diverse and includes several rare invertebrates. For additional information on the East Fork of the Black River see Appendix F.

Significance of Site

This is one of the longest stretches of undammed, essentially undeveloped river corridors in the southern 2/3 of Wisconsin. It contains a biologically significant mosaic of terrestrial, palustrine, and aquatic communities. A number of rare plants (bog fern, long sedge, yellow screwstem), birds (Cerulean Warbler, Red-shouldered Hawk), and invertebrates occur here. Several river stretches to the east of the State Forest boundary, each several miles long, lack any permanent or seasonal dwellings, or other developments.

Management Considerations

Primary considerations include maintaining water quality and quantity, extending protection of the river corridor above the eastern boundary of the State Forest. East fork upstream, allowing for the development of old-growth features and high canopy closure throughout the forests, and ensuring that the management of adjoining lands is compatible with retaining the features present. The site should be periodically monitored for the presence of invasive species, especially glossy buckthorn and garlic mustard.

BR01 - East Fork of the Black River Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Buteo lineatus	red-shouldered hawk	2001	S1N,S3S4B	G5	THR
Cymbiodyta acuminata	a water scavenger beetle	1997	S3	G?	SC/N
Dendroica cerulea	cerulean warbler	2001	S2S3B,SZN	G4	THR
Gomphurus lineatifrons	splendid clubtail	1997	S3	G4	SC/N
Gomphus viridifrons	green-faced clubtail	1997	S3	G3	SC/N
Hemidactylium scutatum	four-toed salamander	1998	S3	G5	SC/H

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Neurocordulia yamaskanensis	stygian shadowfly	1997	S3	G5	SC/N
Paradamoetas fontana	a jumping spider	1997	S?	G?	SC/N
Somatochlora incurvata	warpaint emerald	1997	S2	G4	END
Sorex arcticus	arctic shrew	1997	S2	G5	SC/N
Sorex hoyi	pigmy shrew	1997	S3	G5	SC/N
Plants					
Carex folliculata	long sedge	1997	S3	G4G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
central sands pine-oak forest	central sands pine-oak forest	1997	S3	G3	NA
white pine-red maple swamp	white pine-red maple swamp	1981	S2	G3G4	NA

UPPER BLACK RIVER MACROSITE

Sites Included

- Upper Black River
- Morrison Creek Gorge
- Valentine Creek Pines
- Dickey Creek Gorge

Description of Macrosite

Site Description: This stretch of the Black River runs from the Hatfield Dam at Lake Arbutus south to the city of Black River Falls. Major streamside features include low terraces vegetated with floodplain forest or black ash swamp, slightly higher terraces supporting rich mesic hardwood forest, steep bluffs clad in dry-mesic forest of pine and oak, and numerous microsites containing sandstone cliffs, coves, and numerous spring seeps and spring runs. This site includes the sole documented occurrence of eastern hemlock within the study area.

Other notable features included here are the lower portions of the Morrison, Hall's, Dickey, and Valentine Creek gorges. Each of these gorges contains older dry-mesic forests of white and red pine, sandstone cliffs, and small streams that provide habitat for diverse aquatic communities. The Morrison Creek system (including its tributaries) is especially noteworthy for its aquatic biota (see Appendix F for additional information on Morrison Creek).

An area of perched ridge and swale topography in the southwestern portion of the site supports sedge meadow, tamarack swamp, and white pine-red maple swamp, grading to dry-mesic oak or mixed white pine-oak forest on the higher ridges. A perched swale west of the Black River and north of the mouth of Hall's Creek contains a stand of mature tamarack.

Significance of Macrosite

This site is relatively large (ca. 2600 acres), contains an extensive area of mature forest, encompasses a diverse community mosaic, supports significant aquatic biota, and is home to many rare species. Some of the latter are area-sensitive, and a subset of these are restricted to "southern" habitats (such as mesic maple-basswood forest, or silver maple-green ash-river birch floodplain forest), which are rare and very localized elsewhere within the study area. Another subset of the rare species present consists of habitat specialists. These occur primarily on cliffs, in seepages, or in association with the high gradient drainages running through sandstone coves. The third group is made up of aquatic species, and the fourth consists of species found primarily in northern Wisconsin.

Management Considerations

Key considerations include the maintenance and protection of a substantial area of forest with high canopy closure, allowing for the development of old-growth forest characteristics, protection of hydrology, and protection of water quality and water quantity. Management of surrounding lands should avoid isolating forested areas and diminish high contrast edge. Opportunities to increase protection along this stretch of forested river corridor and its tributaries should be taken advantage of wherever possible, including expansion of the state forest boundary. Construction of roads or other rights-of-way through the terraced floodplain or across steep sandy slopes should be minimized.

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BR02. UPPER BLACK RIVER

(Upper Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Black River Falls, Hatfield, Merrillan
Town-Range-Section:	T21N-R4W, part of sections 1
	T22N-R3W, parts of sections 9, 10, 16, 17, 19, 20, 21, and 28-32
	T22N-R4W, parts of sections 36
Approximate Size:	1846 ac.

Description of Site

This portion of the macrosite borders the Black River and includes areas within the river's floodplain as well as the adjoining bluffs. Among the more extensive natural communities that comprise the diverse vegetation mosaic of this site are Floodplain Forest, Southern Mesic Forest, Northern Dry-mesic Forest and Southern Dry-mesic Forest. Small patch community types that are important here include Dry Cliff, Moist Cliff, Forested Seep, Hemlock Relict, and Alder Thicket. There are also very small patches of fen-like vegetation. Seepages are frequent and outcroppings of Cambrian sandstone are prominent in some areas.

Significant natural features are also associated with several of the valleys created by tributary streams that enter this stretch of the Black. See site descriptions for "Morrison Creek Gorge," "Valentine Creek Pines," and Hall's Creek Gorge" that follow this narrative.

The Black River is affected by operations of the dam that created Lake Arbutus just above the upstream end of the site. There is also a dam at Black River Falls, several miles below the site. A large sand and gravel quarry is located on the west side of the Black River, just above the confluence with Hall's Creek. The nearly level sandy uplands away from the river bluffs are mostly forested and are actively managed for forest products. Important commercial species include jack pine, white pine, red pine, and oaks.

Significance of Site

Intact and important examples of several natural communities occur here, including types that are rare or restricted elsewhere in the study area. Among the latter are Floodplain Forest and Southern Mesic Forest, communities that do not occur away from large rivers. These communities in turn support a large number of rare species, including habitat specialists that are not present in other community types and exist at few other locations within the landscape.

Management Considerations

This site could serve as a core area of lands that would feature a relatively extensive acreage of older, intact, connected forest. Numerous sensitive species would benefit from this management emphasis. Timber sales on lands bordering this site could be designed to maintain large blocks of forest that would retain core areas of older forest, protect sensitive drainages, and focus on types that are native to the landscape.

Additional protection is desirable for lands along the river above and below this site. The sand and gravel quarry should be protected as soon as mining ceases. Impacts of operations of the dams on this stretch of the Black should be reviewed, and if improvements are feasible, they should be implemented.

BR02 - Upper Black River Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna tuberculifera	black-tipped darner	1997	S3	G4	SC/N	
Alasmidonta marginata	elktoe	1997	S4	G4	SC/H	
Atrytonopsis hianna	dusted skipper	1997	S2?	G4G5	SC/N	
Buteo lineatus	Red-shouldered Hawk	1997	S1N,S3S4B	G5	THR	
Chromagrion conditum	aurora damselfly	1993	S3	G5	SC/N	
Cicindela patruela huberi	a tiger beetle	1997	S3	G3T2	SC/N	
Clemmys insculpta	wood turtle	1979	S3	G4	THR	
Cyclonaias tuberculata	purple wartyback	1997	S1	G5	END	
Dendroica cerulea	Cerulean Warbler	2001	S2S3B,SZN	G4	THR	
Empidonax virescens	Acadian Flycatcher	1997	S2S3B,SZN	G5	THR	
Gomphurus lineatifrons	splendid clubtail	1997	S3	G4	SC/N	
Gomphurus ventricosus	skillet clubtail	1997	S3	G3	SC/N	
Gomphus viridifrons	green-faced clubtail	1997	S3	G3	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Neurocordulia yamaskanensis	stygian shadowfly	1997	S3	G5	SC/N	
Ophiogomphus sp 1 nr *aspersus*	barrens snaketail	1997	S2	G2	SC/N	
Oporornis formosus	Kentucky Warbler	1997	S2B,SZN	G5	THR	
Percina evides	gilt darter	1979	S2	G4	THR	
Protonotaria citrea	Prothonotary Warbler	2001	S3B,SZN	G5	SC/M	
Sperchopsis tessellatus	a water scavenging beetle	1997	S2S3	G?	SC/N	
Stylurus notatus	elusive clubtail	1993	S2S3	G3	SC/N	
Stylurus scudderi	zebra clubtail	1997	S3	G4	SC/N	
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Bartonia virginica	yellow screwstem	1997	S3	G5	SC	
Carex assiniboinensis	assiniboine sedge	1997	S3	G4G5	SC	
Carex straminea	straw sedge	1947	S1	G5	SC	
Lycopodium porophilum	rock clubmoss	1997	S3	G4	SC	
Poa paludigena	bog bluegrass	1997	S2S3	G3	THR	
Salix sericea	silky willow	1933	S1	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
Calcareous fen	calcareous fen	1997	S3	G3	NA	
dry cliff	dry cliff	1982	S4		NA	
Floodplain forest	floodplain forest	1997	S3	G3?	NA	
forested seep	forested seep	1997	S2		NA	
hemlock relict	hemlock relict	1997	S2	G2Q	NA	
moist cliff	moist cliff	1997	S4		NA	
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA	
pine barrens	pine barrens	1982	S2	G2	NA	
southern dry-mesic forest	southern dry-mesic forest	1997	S3	G4	NA	
southern mesic forest	southern mesic forest	1997	S3	G3?	NA	
tamarack (poor) swamp	tamarack (poor) swamp	1997	S3	G4	NA	

BR03. MORRISON CREEK

(Upper Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Black River Falls, Hatfield, Hatfield SW
Town-Range-Section:	T22N-R3W, parts of sections 15, 21, 22, and 28
Approximate Size:	522 ac.

Description of Site

This site consists of two communities. Morrison Creek itself is classified as a "Stream – Fast, Soft, Warm" from a short distance west of Oxbow Pond, west to the outlet of its gorge a short distance east of the Black River. It is a second order stream that flows through a 2-3 mile long, steep-walled gorge of Cambrian sandstone. The stream gradient is steep, and the bottom has cobbles, boulders, gravel, and sand. Seepages occur beneath or between some of the sandstone cliffs flanking the river. The valley of the gorge is occupied by a mature Northern Dry-Mesic Forest composed of white pine, red pine, white oak, and red oak, with some basswood, red maple, and yellow birch in more mesic sites (such as below moist shaded cliffs). The forest understory is dominated by bracken fern, blueberry species, Canada mayflower, and whorled loosestrife. There are also small patch communities (seeps) dominated by skunk cabbage, and local areas of wet-mesic White Pine - Red Maple Swamps. The major use of the surrounding uplands is for commercial forestry. The vast former barrens to the north of the gorge were recently clearcut and partially planted to red pine. Northern bird species such as Red-breasted Nuthatch, Pine Warbler, Hermit Thrush Blackburnian Warbler, Black-throated Green Warbler, and Northern Raven are present in the older, conifer-dominated forest.

Significance of Site

This is a high quality example of an uncommon stream type. There are significant species records and community microsites. There has been no recent cutting in the forest, and some patches may never have been cut. Cliff clubmoss and Hooker's orchid are known from historical records at this site, but were not relocated.

Management Considerations

Both the stream and the associated cliffs and forests are notable and should be considered for strong protection in the new property management plan. Protection of water quality and quantity are of paramount importance. Timber sales on the uplands above the gorge should be designed to maintain as much of the site within a forested context as is feasible and ecologically appropriate. This site is contiguous with the "Upper Black River" site described in the preceding text and should be managed compatibly with it.

BR03 - Morrison Creek Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Atrytonopsis hianna	dusted skipper	1997	S2?	G4G5	SC/N	
Cicindela patruela huberi	a tiger beetle	1999	S3	G3T2	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Neurocordulia yamaskanensis	stygian shadowfly	1997	S3	G5	SC/N	
Ophiogomphus sp 1 nr aspersus	barrens snaketail	1997	S2	G2	SC/N	
Soyedina vallicularia	a stonefly	1997	S1	G5	SC/N	
Stylurus scudderi	zebra clubtail	1997	S3	G4	SC/N	
Plants						

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Lycopodium Porophilum	rock clubmoss	1947	S3	G4	SC	
Platanthera hookeri	hooker orchis	1947	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
dry cliff	dry cliff	1982	S4		NA	
moist cliff	moist cliff	1982	S4		NA	
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA	
pine barrens	pine barrens	1982	S2	G2	NA	
stream—fast, soft, warm	stream--fast, soft, warm	1997	SU		NA	

BR04. VALENTINE CREEK PINES

(Upper Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Hatfield SW, Black River Falls
Town-Range-Section:	T22N-R3W, sections 27 and 28
Approximate Size:	115 ac.

Description of Site

The steep slopes of this narrow sandy gorge feature a mature dry-mesic forest composed of large white pine and red maple. Other characteristic species include are red oak, paper birch, bracken fern, Canada mayflower, wintergreen, and early blueberry. Upper slopes support a dense layer of shrubs and saplings, especially hazelnut, cherries, white pine, and red maple. The slopes down to the bottom of the gorge vary from nearly vertical, with slumping banks, to gentle. Small, nearly level terraces occur on the inside bends of meanders and oxbows. Resident birdlife includes species more commonly found in the northern forests, such as Pine Warbler, Black-throated Green Warbler, Red-breasted Nuthatch, and Hermit Thrush. Louisiana Waterthrush, a bird that nests along high gradient streams bordered by forest, has been found along Valentine Creek in the past.

The gorge opens to the floodplain of the Black River. Numerous additional high quality natural communities and many rare species have been documented here. See "Upper Black River" and "Morrison Creek Gorge" for details.

The level uplands above the gorge are managed for forest products, with jack pine, oaks, and plantation-grown red pine among the important cover types. Sandy roadsides in the area support some native prairie species (including wild lupine and prairie phlox). The Ho Chunk tribe owns adjoining land just to the west, which includes a small settlement.

Significance of Site

The deep gorge contains a somewhat linear stand of mature dry-mesic forest composed of large white pine, red pine, red maple, and black/Hill's oak. Canopy closure is high and regionally uncommon birds more typical of northern Wisconsin's conifer forests are among the summer residents. The gorge opens into the floodplain of Morrison Creek, less than ½ mile east of that stream's junction with the Black River.

Management Considerations

The gorge and its pine forest warrant strong protection owing to the maturity of the forest, the uncommon species it supports, and its connection to the Morrison Creek Gorge and Upper Black River sites. The steep slopes are highly erodible and need protection from damage to ensure maintenance of water quality. There is potential for expansion and improvement of the pine forest community by allowing for the development of mature forest characteristics on the adjoining lands, and minimizing the creation of high contrast edge in the managed forest around the gorge. Presently the upland flats are managed intensively for forest products. Illegal garbage dumping is a problem that needs to be addressed.

BR04 - Valentine Creek Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Communities					
dry cliff	dry cliff	1982	S4		NA
moist cliff	moist cliff	1982	S4		NA
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA
pine barrens	pine barrens	1982	S2	G2	NA
stream—fast, soft, warm	stream--fast, soft, warm	1997	SU		NA

BR05. DICKEY CREEK GORGE

(Upper Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Hatfield SW, Black River Falls
Town-Range-Section:	T22N-R3W, sections 28, 29, and 33
Approximate Size:	134 ac.

Description of Site

The steep sandy slopes along the corridor of Dickey Creek support a mature second-growth Northern Dry-Mesic Forest. White pine is the dominant tree, with some large individuals exceeding 20" d.b.h. present. Associates include red pine, red maple, black/Hill's oak, and paper birch. Slopes above Dickey Creek vary from nearly vertical, with slumping sandy or clay-shale slopes, to almost level terraces on the inside bends of meanders and oxbows. The understory is generally sparse, with scattered patches of American hazelnut and huckleberry, and occasional thickets of white pine seedlings/saplings in canopy gaps. The groundlayer is dominated by Penn sedge, bracken fern, and Canada mayflower, with northern plants such as clubmosses, Canada honeysuckle, goldthread, and pink lady's-slipper also present.

Dickey Creek is a very soft, brown colored, cold water stream that is tributary to Morrison Creek. Headwater segments between flowages are often intermittant in flow. Bottom substrate is mostly sand with gravel, bedrock, and rubble.

The surrounding sandy, level upland flats above the valley of Dickey Creek are managed on commercial rotations for (natural) jack pine and (plantation-grown) red pine. Dickey Creek flows into Morrison Creek less than ¼ mile east of the Black River.

Significance of Site

This small linear site has a representative native flora and contains an intact stand of mature forest that is developing old-growth attributes and supports regionally uncommon northern birds. This site is directly connected to the "Morrison Creek Gorge" and "Upper Black River" sites.

Management Considerations

There is potential for expansion and improvement of the stand by allowing the community to expand along the creek corridor and onto adjoining upland flats in a continuum. Presently these upland flats are managed as jack pine and red pine plantations. The presence of an old roadbed and borrow pit may be contributing to slumping and eroding clay slopes along the creek. Illegal garbage dumping is a problem that should be addressed. A portion of the stream corridor is on lands owned by the Ho-Chunk tribe, and their interest in site protection should be explored.

BR05 - Dickey Creek Gorge Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Communities					
dry cliff	dry cliff	1982	S4		NA
moist cliff	moist cliff	1982	S4		NA
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA
pine barrens	pine barrens	1982	S2	G2	NA

BR06. DICKEY CREEK PINES AND PEATLANDS

Location

USGS 7.5' Quadrangle: Hatfield SW

Town-Range-Section: T22N-R3W, sections 26 and 33-35

Approximate Size: 327 ac.

Description of Site

The uplands support a managed dry-mesic forest composed mostly of large to medium-size white and red pines. Canopy associates include Hill's (or black) oak, red maple, and bigtooth aspen. The understory composition is primarily of bracken fern, early blueberry, partridgeberry, and sedges. Sprouts of hardwoods, especially red maple are common, and there are scattered patches of white pine saplings. The canopy is very open, with large gaps almost throughout the stand.

The wetter areas are dominated by white pine and red maple, with supercanopy pines to 30" d.b.h. present. The tall shrub and tree sapling layer is generally sparse, but there are occasional thickets of white pine saplings, mountain holly, and winterberry holly. The low shrub layer and tall herb layers are composed of sphagnum mosses, cinnamon fern, and huckleberry.

To the east of the pine forest communities is an open peatland dominated by sphagnum mosses, sedges, and hardhack.

The dry sandy uplands surrounding the site are managed commercially for forest products. Common cover types include jack pine-Hill's/black oak and red pine plantations.

Significance of Site

The site is significant only for the size and maturity of its residual pines and the relatively undisturbed open peatland. The site occupies a sensitive location, as the wetlands constitute the headwaters of Valentine Creek and also feed Dickey Creek. At this time, the forest canopy is too open to support the more sensitive species that occur in older central Wisconsin pine forests. It might be considered for old-growth status, but it will be many decades (and probably several property management plans) before conditions would make this a worthwhile action.

Management Considerations

Protection of site hydrology and allowing the development of forests with old-growth characteristics over a viable acreage are the primary considerations. Very few pine stands in this part of the forest exhibit mature attributes.

BR06 - Dickey Creek Pines and Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Oeneis jutta	jutta arctic	1999	S3	G5	SC/N	
Somatochlora franklini	delicate emerald	1999	S2S3	G5	SC/N	
Somatochlora incurvata	warpaint emerald	1997	S2	G4	END	
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N	
Plants						
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Scleria triglomerata	whip nutrush	1997	S2S3	G5	SC	
Communities						

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
central poor fen	central poor fen	1997	S3		NA	
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA	
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA	

BR07. LICHTNER ROAD PEATLANDS

Location

USGS 7.5' Quadrangle:	Hatfield, Hatfield SW
Town-Range-Section:	T22N-R2W, sections 18-20
	T22N-R3W, sections 13
Approximate Size:	64 ac.

Description of Site

The site contains an elongated, linear peatland trending northwest-southeast that is bisected by Lichtner Road. The substrate is sedge and moss peat, over sand. The dominant plant species include sphagnum mosses, wire-leaved sedges, and hardhack. Floristic diversity is low, which is characteristic of the open peatlands of central Wisconsin. Scattered tiny "islands" of slightly higher ground support jack pine, over an understory of swamp dewberry, chokeberry, huckleberry, and bog birch. There is an old ditch present through a portion of the peatland, but the hydrologic impacts do not appear significant. Mossing history is uncertain.

The surrounding landscape is a commercially managed dry forest of jack pine, Hill's or black oak, aspen, and white pine, with scattered pine plantations.

Significance of Site

The significance of this site is primarily in the occurrence of a relatively undisturbed, albeit small and linear, peatland, and the rare species it supports.

Management Considerations

The potential harvest of jack pine stands on the wet soils at the margin of the peatland is a potential threat to the peatland. Hydrologic impacts related to the town road should be monitored.

BR07 - Lichtner Road Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Communities						
central poor fen	central poor fen	1997	S3		NA	

BR08. KOMENSKY PEATLANDS

Location

USGS 7.5' Quadrangle:	Hatfield SW
Town-Range-Section:	T22N-R2W, sections 30 and 31
	T22N-R3W, sections 25 and 36
Approximate Size:	478 ac.

Description of Site

This extensive, branching open peatland, is dominated by sphagnum mosses and wire-leaved sedges. Broad-leaved sedges, hardhack, and bluejoint grass are also frequent, and are locally dominant in some areas. Moss harvest has occurred in the western portion of the basin, but the overall site hydrology is intact. Small stands of swamp conifers, mostly tamarack, more rarely, black spruce, occur as islands within the otherwise open peatland, and also form a fringe around the wetland margin on the south. A wet forest, composed of small jack pine and red maple, occurs in small stands on the southern edge of the wetland basin.

The peatland is surrounded by a managed dry forest of jack pine, Hill's/black oak, aspen, and white pine. Recent cutovers to the east and south of the wetland support many plants characteristic of both barrens and heath communities.

Significance of Site

The site is significant for its unaltered hydrology and relatively intact peatland communities. Numerous rare species have been documented here; several of these are rare region-wide. The dry sandy uplands provide a mosaic of natural communities that could be managed to enhance the ecosystem's natural values.

Management Considerations

The impacts of ditching on Central Wisconsin peatlands vary from minor to highly significant. This site is one of the few on the State Forest that might serve as a benchmark for the original condition of this wetland type. Rare species protection needs will be reviewed by BER staff. Affording strong protection to the natural communities present will provide a foundation for protecting both sensitive species and community processes.

Management of the uplands needs to provide both patches of dry conifer forest and open barrens habitat. The uplands south and east of the wetland basin could be managed, in part, by the use of prescribed fire, brushing, and other methods to retain parts of the site in an open or semi-open condition. Restoration of barrens to the east and north of the site would complement efforts there to maintain rare or otherwise sensitive members of the barrens community.

BR08 - Komensky Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Aeshna verticalis	green-striped darner	1998	S3	G5	SC/N
Ammodramus leconteii	Le Conte's sparrow	2000	S2B,SZN	G4	SC/M
Oeneis jutta	jutta arctic	2000	S3	G5	SC/N
Paradamoetas fontana	a jumping spider	1997	S?	G?	SC/N
Somatochlora franklini	delicate emerald	1999	S2S3	G5	SC/N
Somatochlora incurvata	warpaint emerald	1999	S2	G4	END

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N
Williamsonia lintneri	ringed boghaunter	1999	S2S3	G3	SC/N
Plants					
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Salix sericea	silky willow	1933	S1	G5	SC
Communities					
central poor fen	central poor fen	2000	S3		NA

BR09. STAFFON ROAD BARRENS AND PEATLANDS

Location

USGS 7.5' Quadrangle:	Hatfield SW
Town-Range-Section:	T22N-R2W, sections 20, 21, 28, 29, 31, and 32
Approximate Size:	1079 ac.

Description of Site

This nearly level, sandy site is drained by tributaries of the Morrison Creek system. Extensive salvage of budworm-damaged jack pine occurred here in the mid-1990s, leaving much of the landscape in a brushy, open condition. In its present state, many plants characteristic of sand prairies and pine barrens communities are favored. Among the native grasses and forbs now prominent are little bluestem, June grass, big bluestem, wild lupine, rough blazing star, goat's rue, birdfoot violet, western sunflower, and azure aster. Blueberries, sweet fern, and bearberry are also thriving. Grubs of Hill's/black and bur oak, and sapling jack pine are also common. Widely scattered mature oaks and a few large pines are also present.

The fauna includes many species that prefer or depend on open, somewhat brushy conditions. These include several rare invertebrates, and birds such as Common Nighthawk, Rufous-sided Towhee, Brown Thrasher, Vesper Sparrow, Eastern Bluebird, Eastern Kingbird, and Chestnut-sided Warbler.

Several small streams cross the site, generally from east, or southeast, to west. The streams are bordered by narrow terraces, which are typically a few meters below the level of the uplands. These terraces support a variety of small patch wetland communities, primarily alder thicket and sedge meadow. Small seepages are common.

South of Staffon Road, open peatlands are common. These are dominated by sphagnum mosses, sedges, and hardhack, with small patches or "islands" of jack pine, chokeberry, and bog birch. Low ridges between the wetlands were also cutover recently in the jack pine salvage operations, and these also support a number of barrens species.

The site occurs within a vast area of commercialized logged forests, and smaller embedded open peatlands. A drained, diked, abandoned cranberry marsh adjoins the northeast end of the site and has doubtlessly impacted its hydrology. No mossing activity was apparent. A state prison is located about one mile to the northwest of the site; otherwise the region is uninhabited.

Significance of Site

The site affords a good opportunity to manage for both open barrens and savanna conditions on the uplands, thereby maintaining habitat for a large number of rare and declining species. The hydrology has been locally disturbed, but a variety of rare species are present, including several specialized plants in an apparently "natural" habitat (see rare plant table, and discussion of "ditch" plants), and the Karner blue butterfly.

The streams drain an extensive area, and drain into Morrison Creek, which supports a highly significant aquatic biota.

Management Considerations

Maintaining at least a portion of this site in a permanently open or semi-open savanna condition is highly desirable here, given the presence of rare or otherwise sensitive species and the opportunities to link these populations to others in the local landscape. Several areas have been planted to red pine

in the past few years, diminishing short-term opportunities locally. Good opportunities for barrens restoration and maintenance remain, especially south of Staffon road and to the north, between White Creek, Morrison Creek, and the unnamed creek corridors to the south of Morrison Creek. Prescribed fire should be considered as a management option in at least some of these areas, as both natural and unnatural firebreaks occur here.

A portion of the peatland just south of Staffon Road had been converted to a cranberry operation, via ditch and dike construction. Restoration of site hydrology is a potentially important management consideration.

Protection of water quality and quantity is critical to ensure the protection of the aquatic community of Morrison Creek.

BR09 - Staffon Road Barrens and Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Sorex arcticus	arctic shrew	1998	S2	G5	SC/N	
Plants						
Bartonia virginica	yellow screwstem	1997	S3	G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC	
Communities						
central poor fen	central poor fen	1997	S3		NA	
pine barrens	pine barrens	1999	S2	G2	NA	

BR10. BROCKWAY PONDS

Location

USGS 7.5' Quadrangle: Hatfield SW

Town-Range-Section: T21N-R3W, sections 1

Approximate Size: 144 ac.

Description of Site

Most of this site is on Jackson County Forest lands just to the west (see site EX02, “Brockway Ponds and Peatlands” in Appendix G) The portion that occurs on the Black River State Forest consists mostly of boggy open meadow (Central Poor Fen) and shrub swamp (Alder Thicket and Shrub-Carr).

Significance of Site

The wetlands are intact and site hydrology appears unmodified. Several rare species have been documented on the limited area of the site within the boundary of the Black River State Forest.

Management Considerations

The most important management consideration is to maintain the integrity of the site's hydrology. Coordination with Jackson County is critical to ensure that this peatland and its associated natural ponds and dry forests are maintained in good condition.

BR10 - Brockway Ponds Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N
Plants					
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Communities					
central poor fen	central poor fen	1997	S3		NA

BR11. BATTLE POINT – DIKE 17 COMPLEX

Location

USGS 7.5' Quadrangle:	Hatfield SE, Hatfield SW
Town-Range-Section:	T21N-R2W, sections 1-6, 8-16, 23, and 24
Approximate Size:	4812 ac.

Description of Site

Much of this wetland complex of several thousand acres has been altered by an extensive system of dikes and ditches to create impoundments for use by waterfowl. Dike 17 Wildlife Area occupies the eastern portion of the site. Major wetland types within the impoundments include sedge meadow and boggy fen. Tamarack swamp and shrub wetlands composed of speckled alder, bog birch, and willows are important but secondary types.

The western portion of the site, south of Battle Point ridge, consists of a large open peatland composed of sphagnum mosses, sedges, Canada bluejoint grass, and hardhack. Though several impoundments have also been constructed here, the impacts have been less far-reaching. Tamarack and bog birch are important woody species in some areas, with scattered small black spruce and jack pine also present. The wetland margins generally have a narrow zone of tall shrubs, especially tag alder, chokeberry, winterberry holly, and mountain holly.

The surrounding uplands to the northwest, west, and south are managed for oak and pine. Dike 17 Wildlife Area to the east is intensively managed as a feeding/resting place for migratory waterfowl, with attendant controlled burns, water level manipulation, and haying.

Battle Point, an east-west trending ridge with a bedrock core of Precambrian granite, supports a forest of Hill's/black oak on dry sandy soils. Associated trees include jack pine, white pine, big-tooth aspen, and red pine. Much of this forest, especially of the southern slopes of the ridge, has a relatively open understory, which besides the usual sedges, huckleberry, and blueberry includes sand prairie and barrens plants. Battle Point Road, a graded sandy track, runs the length of the site and provides access to Battle Point Flowage, and there is an ATV/snowmobile trail that crosses the track from north to south. Other frequent trees are white pine, jack pine, and aspen, and the groundlayer consists of Penn sedge, bracken fern, early blueberry, and big-leaved aster. Sand prairie species, such as lupine, big bluestem, and flowering spurge, are also present in openings and along roadsides.

Significance of Site

The peatland is large and has a representative biota that includes several rare plants. Resident birds include Northern Harrier, Bobolink, Sandhill Crane, American Bittern, and Sedge Wren. It is the least altered part of a large wetland complex, and adjacent to Dike 17 Flowage, which historically had a large population of eastern massasauga rattlesnakes.

The selectively-cut oak forest and woodland consists of moderately-sized black oak or Hill's oak stands on dry sandy soils of a bedrock-cored (granite, which is exposed at a small abandoned quarry), west-east running ridge.

Management Considerations

The impacts of mossing are not adequately understood. Many birds, including several uncommon species, nest in the open wetlands at the same time that moss harvest would occur. Flowage management is an important consideration, to ensure that sensitive animals, especially herptiles, are

not harmed during their hibernation periods, and that the spread of potentially invasive plants is not facilitated. Management should include protection of the most intact parts of this basin, expansion of open areas where they will most benefit sensitive species, and to manage the periphery compatibly with maintaining large open areas.

Oak forests on Battle Point Ridge should be considered for a relatively conservative forest management regime, that maintains a balance of filtered shade and openings for plants and invertebrates that do best in savanna or woodland habitats (not clear-cut "brush" barrens). To the east, at Dike 17, maintaining and expanding openings with prescribed fire and brushing is essential to provide sufficient habitat for area-sensitive grassland species such as Sharp-tailed Grouse, Northern Harrier, Sandhill Crane and American Bittern. Scattered trees or small groves of oak and pine are also needed to meet the requirements of some of the rare invertebrates present. Burn rotations need to allow for the recovery of fire-sensitive species within burned areas. The present policy of gating the lateral lanes running south from Battle Point Road to Little Bear, Big Bear, and Wilson Flowages should be continued.

BR11 - Battle Point - Dike 17 Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	green-striped darner	1997	S3	G5	SC/N	
Atrytonopsis hianna	dusted skipper	1994	S2?	G4G5	SC/N	
Botaurus lentiginosus	american bittern	2001	S3B,SZN	G4	SC/M	
Callophrys henrici	henry's elfin	1992	S2	G5	SC/N	
Callophrys irus	frosted elfin	1995	S1	G3	THR	
Cicindela patruela huberi	a tiger beetle	1997	S3	G3T2	SC/N	
Circus cyaneus	Northern Harrier	2001	S2N,S3B	G5	SC/M	
Emydoidea blandingii	Blanding's turtle	2001	S3	G4	THR	
Erynnis persius	persius dusky wing	1992	S2	G5	SC/N	
Euphyes bimacula	two-spotted skipper	1989	S2S3	G4	SC/N	
Hydroporus badiellus	a predaceous diving beetle	1997	S3?	G?	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Melanoplus fasciatus	huckleberry spur-throat grasshopper	1997	S1?	G4	SC/N	
Orphulella pelidna	spotted-winged grasshopper	1997	S1?	G5	SC/N	
Poanes massasoit	mulberry wing	1988	S3	G4	SC/N	
Psinidia fenestralis	sand locust	1996	S1S2	G5	SC/N	
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	1988	S2	G3G4T3T4	END	C
Sorex arcticus	arctic shrew	1998	S2	G5	SC/N	
Sympetrum danae	black meadowhawk	1997	S3	G5	SC/N	
Trachyrhachys kiowa	ash-brown grasshopper	1997	S2	G5	SC/N	
Williamsonia fletcheri	ebony bog haunter	1997	S3S4	G3G4	SC/N	
Plants						
Bartonia Virginica	yellow screwstem	1997	S3	G5	SC	
Carex Cumulata	clustered sedge	1997	S2	G4?	SC	
Polygala Cruciata	crossleaf milkwort	1997	S3	G5	SC	
Potamogeton Diversifolius	water-thread pondweed	1997	S2	G5	SC	
Rhexia Virginica	virginia meadow-beauty	1997	S2	G5	SC	
Utricularia Geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC	
Viola Fimbriatula	sand violet	1996	S2	G5	END	
Communities						
central poor fen	central poor fen	1997	S3		NA	
central sands pine-oak forest	central sands pine-oak forest	1997	S3	G3	NA	

BR12. MARTIN MARSH

Location

USGS 7.5' Quadrangle:	Hatfield SE
Town-Range-Section:	T21N-R1W, sections 6
	T21N-R2W, sections 1
Approximate Size:	76 ac.

Description of Site

Martin Marsh is a large, mostly open acid peatland straddling the boundary of the Black River State Forest and the adjoining Jackson County Forest. Most of this wetland is on Jackson County land. The primary community is an extensive poor fen characterized by narrow-leaved sedges and hardhack over a substrate of sphagnum mosses. Patches of shrub swamp, composed of bog birch, alder, chokeberry, and others, are also present, along with scattered stands of small tamarack. The primary land use has been the repeated commercial harvest of sphagnum moss.

Significance of Site

Detailed surveys have not been conducted here, but the site is large and had an intact hydrology. It has high potential to support some the rare plants, invertebrates, and birds that have been documented recently in similar Central Sands peatlands.

Management Considerations

The impacts of repeated sphagnum harvest are neither well documented nor well understood. Managers should keep this in mind when permitting mossing activities. This site would be an excellent candidate for inclusion in a region-wide research project to clarify the ecological impacts of sphagnum harvest. The collection of additional information on the flora and fauna of this site is desirable.

BR12 - Martin Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Polygala Cruciata	crossleaf milkwort	1997	S3	G5	SC

BR13. SPIDER PEATLANDS

Location

USGS 7.5' Quadrangle: Hatfield SE, Hatfield SW

Town-Range-Section: T21N-R2W, sections 20-22, 27, and 28

Approximate Size: 532 ac.

Description of Site

This complex consists mainly of two communities: a branching Central Sedge Poor Fen peatland partly enclosing a Central Sands Pine-Oak Forest in several of its "arms." The peatland is dominated by sphagnum mosses, narrow-leaved sedges, hardhack, Canada bluejoint grass, swamp dewberry, and large-fruited cranberry. In places, this open wetland grades into an open jack pine forest; in the south there has been a history of mossing, and this area has generally fewer woody plants. Low, dry, sandy ridges associated with the peatland basin support a dry forest composed of black (and/or Hill's) oak, with quaking aspen and red maple also common. White oak and all three native pines (jack, red, and white) are occasional. The upland forests have a history of commercial logging. Huckleberry, bracken fern, and early blueberry are dominant in the shrub and tall herb layer, while Penn sedge was common in the low herb layer. Logging lanes access these upland forests from the southeast. The entire Spider Peatlands complex is embedded in a remote area managed for pine, oak, and aspen forests, and recreation (hunting). An ATV trail occurs on an old railroad grade on the south border and southwest side of the site.

Significance of Site

The peatland has been partially mossed but is unaltered hydrologically (unditched and undiked) and quite extensive; as such, it is one of only a handful of such wetlands in the western part of the central sand plain. Several rare plants occur in these peatlands, or on the margin of the old railroad grade/ATV trail to the southwest. The site is remote and occurs not far to the southwest of the Battle Point Ridge-Dike 17 Complex.

Management Considerations

Protection of site hydrology is of major importance, and any impacts caused by construction of the old railroad grade need to be addressed. Mossing impacts are poorly understood, and any proposals to harvest moss here should be restricted to previously mossed areas. Avoiding negative impacts to rare or otherwise sensitive species is a critical consideration for this site.

BR13 - Spider Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Oeneis jutta	jutta arctic	1999	S3	G5	SC/N
Plants					
Bartonia virginica	yellow screwstem	1997	S3	G5	SC
Carex folliculata	long sedge	1997	S3	G4G5	SC
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC
Communities					
Central Poor Fen	central poor fen	1997	S3		NA
Central Sands Pine-Oak Forest	central sands pine-oak forest	1997	S3	G3	NA

BR14. RING MARSH

Location

USGS 7.5' Quadrangle: Hatfield SE

Town-Range-Section: T21N-R2W, sections 23-26

Approximate Size: 194 ac.

Description of Site

This open wetland occupies a basin to the south of the Dike 17 area. The northern, unmossed section is dominated by wide-leaved sedges and sphagnum mosses, while the southern mossed areas have wire-leaved sedges, hardhack, and white beakrush. Small tamarack, jack pine, and white birch are scattered locally in this wetland. A fringe of tamarack, black spruce, and bog birch occupies the margins. Deer trails and ruts from mossing equipment provide microhabitats for uncommon plants. Resident birds include Sandhill Crane, Sedge Wren and Pied-billed Grebe. The surrounding area contains other mossed wetlands, and the uplands are intensively managed for timber (plantation-grown pine, oak, and aspen). The dike at the north end of the site forms Tanner Flowage.

Significance of Site

The rare plants yellow screwstem and hidden-fruited bladderwort are present. This site would be ideal for studying the effects of mossing because the mossed and unmossed areas appear very different, and past records of moss harvest activities are available.

Management Considerations

Restrict mossing operations to previously affected areas, at least until the impacts are clarified. This site is an excellent candidate for inclusion in a research project on the impacts of moss harvest on the resident plants and animals of central Wisconsin peatlands.

BR14 - Ring Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Hydroporus badiellus	a predaceous diving beetle	1997	S3?	G?	SC/N
Ilybius discedens	a predaceous diving beetle	1997	S3	G?	SC/N
Plants					
Bartonia virginica	yellow screwstem	1997	S3	G5	SC
Carex folliculata	long sedge	1997	S3	G4G5	SC
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC
Communities					
central poor fen	central poor fen	1997	S3		NA
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA

BR15. CIRCLE HILL MARSH

Location

USGS 7.5' Quadrangle: Hatfield SE

Town-Range-Section: T21N-R2W, sections 25

Approximate Size: 58 ac.

Description of Site

The majority of this wetland is characterized as an acid, open fen composed of sphagnum mosses, narrow-leaved sedges, and hardhack. Small stands of shrub swamp and tamarack occur at the peatland margins. Commercial harvest of sphagnum moss has occurred almost throughout the open portions of this wetland.

Significance of Site

The hydrology of the wetland basin is intact, and several rare species have been documented here.

Management Considerations

Maintenance of site hydrology and monitoring the effects of moss harvest are the key considerations. This site is a prime candidate for inclusion in a research project designed to clarify the impacts of sphagnum harvest on vegetation composition and structure and rare species viability.

BR15 - Circle Hill Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Aeshna verticalis	Green-striped darner	1997	S3	G5	SC/N
Lycaena epixanthe	Bog copper	1997	S2S3	G4G5	SC/N
Plants					
Carex folliculata	Long sedge	1997	S3	G4G5	SC
Polygala cruciata	Crossleaf milkwort	1997	S3	G5	SC

BR16. SETTLEMENT ROAD PINE SWAMP

Location

USGS 7.5' Quadrangle: Hatfield SE

Town-Range-Section: T21N-R2W, sections 25, 26, 35, 36

Approximate Size: 168 ac.

Description of Site

This site is drained by a small stream and supports both wet-mesic White Pine-Red Maple Swamp and dry-mesic white pine-oak forest communities. Topography is gently rolling, generally descending along a south-to-north gradient. Canopy closure is generally high, and includes large white pines that exceed 20" d.b.h. In the wetter areas, the groundlayer is composed of sphagnum mosses, cinnamon fern, swamp dewberry, skunk cabbage, sedges, and winterberry holly. Many northern plants, such as goldthread, bunchberry, and bluebead lily are present. The adjoining uplands contain a significant component of oak, including white oak. Bracken fern, blueberries, huckleberry, pipsissewa, and clubmosses are present.

The upland forests of pine, oak, and aspen that surround the site have all been logged heavily in the recent past, excepting the red pine plantations to the south and west. The site is bisected by Kling Road. To the north is Ring Marsh Peatland, itself a southern outlier of the vast Dike 17 Wildlife Area wetland complex farther north.

Significance of Site

Although small and isolated by roads and recent cutting, the forest is otherwise intact and supports rare species that do not find suitable habitat in the nearby cutover areas. At least one state-threatened animal and several rare plants are present. The small headwater stream is currently protected by the surrounding forest, and is also of note as its watershed is forested and the upper reaches are not affected by impoundments.

Management Considerations

Currently the site contains the only mature forest in the vicinity, though it has been isolated by cutovers. North Settlement Road bisects the site and has impacted the hydrology locally on the upslope side (south) of the road. The forest communities should be evaluated for special management designation. Retention of high canopy closure and large trees (potentially including supercanopy emergents) are important management considerations irrespective of future land use classification, as are an increase in effective stand size, and reduction of isolation.

The amount and distribution of older forest patches, of various communities, needs to be thought out at a forest- or region-wide scale. Logging this stand at the present time would leave essentially no suitable habitat in this part of the BRSF for some of the sensitive species known to occur here.

BR16 - Settlement Road Pine Swamp Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Buteo lineatus	Red-shouldered Hawk	2002	S3S4B	G5	THR
Plants					
Carex folliculata	long sedge	1997	S3	G4G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA

BR17. WILDCAT PEATLANDS – TROWE MARSH

Location

USGS 7.5' Quadrangle: Hatfield SW

Town-Range-Section: T21N-R2W, sections 28-33

Approximate Size: 697 ac.

Description of Site

This is a large, remote, relatively undisturbed, acid peatland containing a diverse array of open wetland communities. In the eastern portion of the basin there is no direct evidence of hydrologic disturbance, although there has been past harvest of sphagnum moss on the northern and eastern edges of the site. The peatland interior is composed mostly of sphagnum mosses, sedges (both wire-leaved and broad-leaved spp.), Canada bluejoint grass, swamp dewberry, and hardhack. The northeast and northwestern edges of the eastern basin ("Wildcat Peatlands") have a more diverse, muskeg-like structure that includes scattered tamarack, bog birch, tag alder, and leatherleaf. Deer trails through the wetland support at least five rare plant species.

Small "islands" of jack pine, chokeberry, bog holly, and alder are present in the northwestern portion of the site. Resident animals include Sedge Wren, Sandhill Crane, and Northern Harrier. Golden-winged Warblers were noted at several locations along the upland-wetland interface, often where a mixture of tamarack, alder, and bog birch adjoin an upland forest.

The adjacent uplands are vegetated with dense, young monotypic stands of aspen and, in some places, mixtures of pine-oak-red maple.

Significance of Site

This peatland is significant for its size, the diversity of its vegetational mosaic, and for the presence of several rare plant species such as screwstem and crossleaf milkwort in undisturbed, apparently natural habitat. Many of the sites that currently support these plants are man-made: ditches, abandoned logging roads, or the margins of borrow pits. Here they also occur along animal trails and in small natural pools within the wetland. This presents an important monitoring opportunity. Rare birds breed here, and rare invertebrates have been also been collected.

Management Considerations

The western portion of the site ("Trowe Marsh") has been extensively ditched in the past. The need for the restoration of site hydrology should be examined. Stands of swamp conifers and the small "islands" of jack pine should be reserved from timber management proposals at this time, as they provide important habitat for several species (including rare invertebrates) that would not otherwise occur here.

The peat profile and soil water chemistry should be determined. Moss harvest should be restricted to areas that have been affected previously, and any proposals to harvest moss should be designed to avoid negative impacts to sensitive resident biota.

BR17 - Wildcat Peatlands-Trowe Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Dendroica kirtlandii	Kirtland's warbler	1989	SAN	G1	SC/M	LE

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Paradamoetas fontana	A Jumping Spider	1997	S?	G?	SC/N	
Somatochlora franklini	delicate emerald	1998	S2S3	G5	SC/N	
Somatochlora incurvata	warpaint emerald	1998	S2	G4	END	
Plants						
Bartonia virginica	yellow screwstem	1997	S3	G5	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC	
Communities						
Central poor fen	central poor fen	1997	S3		NA	

WILDCAT MOUND MACROSITE

Sites Included:

- Wildcat Ridge (BR18)
- Smrekar Ridge (BR19)

Description of Macrosite

This extensive system of Cambrian sandstone ridges supports a mosaic of forest communities that represent a variety of site conditions, age classes, and canopy composition. Dry-mesic to very dry forests are predominant, with jack pine, red pine, white pine, black/Hill's oak, white oak, red oak, red maple, and bigtooth aspen among the important canopy species.

The "macrosite" has been split into two standard sites: Smrekar Ridge and Wildcat Ridge. Boundaries follow local roads that create more or less permanent breaks in the continuous forest canopy.

Significance of Macrosite

This forested ridge system constitutes the most extensive area of intact upland forest on the property. Many forest species that are area, edge, or isolation sensitive and require or prefer large blocks of forest with high canopy closure are presently common here. Scarlet Tanager, Yellow-throated Vireo, Least Flycatcher, Ovenbird, Barred Owl, and Pileated Woodpecker are among the resident birds. Species that are associated primarily with stands of conifers include Red-breasted Nuthatch, Hermit Thrush, and Solitary Vireo. Several rare species have been documented here.

State ownership is extensive. Relatively little logging has occurred here recently. Many of the forests surrounding the ridge system have experienced logging recently.

Management Considerations

The notes from the Public Lands Surveys of the mid-1800s indicate that much of this site supported an extensive oak forest, locally mixed with pine, prior to European settlement. Maintenance of large blocks of mature upland forest is an important and appropriate consideration on this property, in the study area, and for the macrosite itself. This area affords the best opportunity on the State Forest to do this. The establishment of one or several State Natural Areas should be a future master planning consideration. Older forest is currently under-represented on the property and throughout this landscape, and there are several stands here that would make excellent candidates for representation of later forest successional stages and maybe also as "benchmarks" for one or several of the forest communities present. Phasing out the plantations within and around the site is desirable from the standpoint of compatibility and eventually increasing within and between stand diversity. Establishing and retaining ecological connections with other important sites nearby is also an important consideration.

Present uses, which emphasize non-motorized recreation, are compatible with maintaining the ecological integrity of the area. Other ownerships in the area do not offer opportunities of comparable scale or quality.

The macrosite includes an area ("Smrekar Ridge") that was designated as the "Overmeyer Hills Wild Area" in the last master plan developed for the property (DNR 1983). Silvicultural prescriptions that are permitted in "Wild Areas" are somewhat different from those that are practiced on lands that are dedicated to forest products, but the differences are meant primarily to enhance aesthetic values while allowing for some timber harvest, rather than to accommodate ecological attributes. An amendment to the property master plan several years ago allowed for the implementation of forest management

practices that had not previously occurred at the site under the “Wild Area” designation. Consideration of a complementary amendment that provided for large forest blocks, older forest, and the development and application of techniques that would be most compatible with perpetuating the special ecological opportunities this site affords is warranted. The landscape pattern of forest patches produced by timber harvest is of primary consideration here, and actions that would break the site up into a patchwork quilt of relatively small scale harvested areas should be avoided.

BR18. WILDCAT RIDGE

(Wildcat Mound Macrosite)

Location

USGS 7.5' Quadrangle:	Warrens West, Hatfield SE
Town-Range-Section:	T20N-R2W, sections 2 and 3
	T21N-R2W, sections 26, 27, 34, and 35
Approximate Size:	819 ac.

Description of Site

This site encompasses portions of a ramifying sandstone ridge that rises to a height of ca 300' above the surrounding plain, and trends northwest to southeast from Wildcat Mound to North Settlement Road. The forested ridge is dominated by oaks, though pines are dominant locally, and mixed stands of pine-hardwood forest are common. Associated canopy species include bigtooth aspen, black cherry, paper birch, and basswood. Relatively little recent logging has occurred here. The ridge is set within a context of intensively managed forest on the plain below. Dominants there are similar (pines, oaks, aspens, and some red pine plantations), though there are small stands of wet-mesic white pine-red maple forest at a few locations. Several trails cross the area, and important recreational uses include hiking, cross country skiing, birding, hunting, and camping. The same landform continues for several miles to the southeast (see "Smrekar Ridge" site description).

A xeric forest (typed as a "Central Sands Pine-Oak Forest") occurs for about one mile along the upper slopes of the sandstone ridgeline, extending from Shale Road to North Settlement Road. In some areas the steep, very dry, sandy south- and west-facing slopes are forested with a narrow band of jack pine with few other associates (mostly black oak, with some red and white pines). Elsewhere, the drier parts of the site (including the nearly level, plateau-like ridgetop) are dominated by black/Hill's oak, white pine, and big-toothed aspen, with huckleberry the dominant shrub and extensive sods of Penn Sedge constituting the bulk of the herb layer. Small groves of 9-15" d.b.h. red pine are also present. The groundlayer is sparse, but includes a few prairie species such as big bluestem, little bluestem, wild lupine, and flowering spurge.

Another extensive community at the site is a dry-mesic hardwood forest (Southern Dry-Mesic Forest), located on and north of Wildcat Mound, and in some locations along Wildcat Ridge. The mound is an eroded sandstone bluff that supports an extensive unfragmented, mostly deciduous dry-mesic forest, especially on the cooler northern and eastern slopes, and in saddles and coves along the ridge. The dominant trees are 9-15" d.b.h. red oak and white oak, though larger trees are present. The understory includes interrupted fern, lady fern, tick-trefoil, lopseed, Canada mayflower, big-leaved aster, and wild sarsaparilla. Witch hazel and maple-leaved viburnum are among the shrubs present. Very old, charred stumps were encountered, indicating past episodes of logging and wildfire. A drier forest of jack pine and black/Hill's oak occurs on south-facing slopes, with Penn sedge, bracken fern, and a scattering of prairie species.

A small White Pine – Red Maple Swamp (Smrekar-Settlement Pines) occurs at the headwaters of a small creek in the wedge between Shale Road and North Settlement Roads. The supercanopy contains 20-26" d.b.h. white pine, while smaller pines and red maples comprise the canopy. A few blow-downs and tip-ups are present. The tall shrub layer is very open, with scattered clumps of winterberry holly and speckled alder the prevalent species. Early blueberry and huckleberry are common in the low shrub layer. Important herbs include cinnamon fern and skunk cabbage, with

sphagnum mosses dominant in the groundlayer. Resident birds include Veery, Barred Owl and Pileated Woodpecker. There are pine plantations immediately adjacent to this stand of swamp forest on the north and east.

Site Significance

This site is contiguous with the "Smrekar Ridge" site. Together they present an outstanding opportunity to manage a large area of unfragmented upland hardwood-conifer forest. The Wildcat Mound dry-mesic oak forest is particularly significant in that it is one of the best examples of this community type in the BRSF and, perhaps, within the study area. The rare plants, long sedge and bog fern, are present in the White Pine-Red Maple Swamp, which has some old-growth characteristics. Several rare lepidopteran species (Karner blue, frosted elfin, and Ernestine's moth) are known from small openings and patches of overgrown barrens areas along Shale Road. Sand violet, a Wisconsin endangered species, is locally frequent along the hiking/ski trails on Wildcat Mound proper, and shadowy goldenrod inhabits dry cliffs, which are frequent on the upper slopes.

Management Considerations

This is an excellent site at which to represent some of the older forest successional stages and patch sizes that are now rare or absent on the State Forest and in the surrounding landscape. Dry southern exposures, openings, trail edges, and roadsides support a few prairie species. Hiking/ski trails are found throughout the site but do not compromise integrity of the forests. All trails should be periodically monitored for the presence of invasive species.

BR18 - Wildcat Ridge Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Dendroica kirtlandii	Kirtland's warbler	1989	SAN	G1	SC/M	LE
Erynnis persius	persius dusky wing	1990	S2	G5	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Trachyrhachys kiowa	ash-brown grasshopper	1999	S2	G5	SC/N	
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Viola fimbriatula	sand violet	1997	S2	G5	END	
Communities						
central sands pine-oak forest	central sands pine-oak forest	1997	S3	G3	NA	
southern dry-mesic forest	southern dry-mesic forest	1997	S3	G4	NA	

BR19. SMREKAR RIDGE

(Wildcat Mound Macrosite)

Location

USGS 7.5' Quadrangle:	Warrens West
Town-Range-Section:	T20N-R1W, sections 7
	T20N-R2W, sections 1, 2, and 11-13
Approximate Size:	1008 ac.

Description of Site

This site extends along the summit and slopes of a 300-foot high sandstone ridge (with outlying spurs and conical knobs) that trends northwest-southeast for three miles, from North Settlement Road to the east boundary of the Forest and south nearly to County Highway O. The ridge is forested, mostly with varying mixtures of pines, oaks, and, in some areas, aspens. On the drier sites, the canopy is composed mostly of jack pine and black/Hill's oak, with some red pine, white oak, paper birch, and bigtooth aspen. Understory dominants include Penn sedge, bracken fern, huckleberry and blueberry. The summit ridge, a "hogback" with hiking and cross-country ski trails and a long-abandoned shale quarry, is mostly forested but includes openings and thinly timbered areas that support a few sand prairie and barrens plants such as flowering spurge, goat's rue, bird's-foot violet, and alum-root. Generally, the xeric forests are prevalent on south and west slopes, along the ridgetop, and on sandstone spurs and knobs that branch out from the main ridge. Isolated knobs in the southern part of the site support stands of maturing jack pine and red pine. White pine is now an important sapling and subcanopy species in many areas, especially on the lower slopes. There is an older stand composed of large white pine, red pine, white oak, and black/Hill's oak that has some old-growth characteristics and is inhabited by resident birds that include many "northern" species such as Blackburnian Warbler, Black-throated Green Warbler, Solitary Vireo, Hermit Thrush, and Red-breasted Nuthatch.

There are several coves and saddles along the main ridge that support more mesophytic vegetation, with red and white oaks dominant, and red maple an important associate. Other trees include black cherry, bigtooth aspen, and basswood. Canopy trees are in the 9-15" d.b.h. class but larger individuals are present. Shrubs include witch hazel, hazelnut, maple-leaved viburnum, and blackberries (*Rubus spp.*). The herb layer supports interrupted fern, lady fern, tick-trefoils (*Desmodium spp.*), and lopseed. A small north-facing escarpment of moist sandstone cliffs features some uncommon "northern" plants such as showy mountain-ash (*Sorbus decora*).

The ridge is situated within an extensive area of dry pine-oak-aspen forests, with many red pine plantations situated around the base of the ridge. To the east are some abandoned agricultural lands (one parcel was recently acquired by the state) and a few scattered private residences. Ecological context is excellent, as several other important inventory sites occur to the northwest, south, and southwest.

Significance of Site

The site has excellent context. It is part of a sandstone ridge complex that extends northwest for several miles to Wildcat Mound, and just to the southwest is the Smrekar Creek Headwaters Complex. Many forest interior birds occur here, and there are several small patches of forest that now have, or are developing, old-growth structural characteristics. Several rare plant species, including sand violet and shadowy goldenrod, are present.

Management Considerations

Key management considerations include: maintaining large patches of unfragmented forest with high canopy cover; representing older successional stages of both mixed conifer-hardwood forest and dry-mesic hardwood forest; employing the use of prescribed fire and alternative silvicultural methods in forest management to maintain fire-dependent forest communities and increase missing structural features; periodic monitoring for the presence of invasive species; and maintaining connections with other important sites in the vicinity. Long periods of fire suppression have probably increased the abundance of woody vegetation in this area and reduced the prairie and barrens components of the fauna and flora. Prairie species are now confined to open edges (trails and roadsides) and steep slopes around sparsely forested rock outcrops. Steep south slopes and transitional areas to the level plain at the base of the ridge may offer localized opportunities to maintain these species. In general, there are better locations on and around the State Forest to emphasize prairie and savanna vegetation. The recreational uses that are presently emphasized on this site (hiking, cross-country skiing, birding, hunting, camping) are compatible with maintenance of important ecological characteristics. Big-tree silviculture can complement areas of older forest by retaining scattered large trees but should not be viewed as a substitute for older intact forest.

BR19 - Smrekar Ridge Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Buteo lineatus	red-shouldered hawk	2000	S1N,S3S4B	G5	THR	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Polygala cruciata	crossleaf milkwort	1959	S3	G5	SC	
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC	
Viola fimbriatula	sand violet	1997	S2	G5	END	
Communities						
central sands pine-oak forest	central sands pine-oak forest	1997	S3	G3	NA	
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA	

BR20. KETCHUM CREEK HEADWATERS

Location

USGS 7.5' Quadrangle:	Warrens West
Town-Range-Section:	T20N-R2W, sections 11-14
Approximate Size:	504 ac.

Description of Site

This complex site consists of three adjoining communities ranging from southwest to northeast: a Central Poor Fen (Whitney Marsh), a White Pine – Red Maple Swamp (Ketchum Pines); and a Northern Dry-Mesic Forest (Smrekar Pines).

The Central Poor Fen is an acid peatland on the north side of County Highway O. It is dominated by sphagnum species mosses, narrow-leaved sedge, leatherleaf, Canada bluejoint, and hardhack. Common "true bog" species are better represented here than in many other central sands peatlands. Tamarack becomes prominent towards the margins of this peatland. Mossing is ongoing here.

The White Pine – Red Maple Swamp is dominated by large (12-24" diameter) second-growth white pines and smaller red maples and yellow birch. It slopes downhill from north to south. The groundlayer is locally very wet and sphagnous, with seeps and puddles present in places. Winterberry holly is a common shrub, and tag alder becomes dominant where this community grades in the south into the Central Poor Fen (Whitney Marsh) with a tamarack fringe. Common low shrubs and herbs include cinnamon fern and skunk cabbage along with northern species such as bluebead and bunchberry. An excellent northern avifauna is present. Girdled red oaks are present at the north (upland) boundary of the stand. To the northeast are Smrekar Road and the Smrekar Pines upland oak community.

The Northern Dry-Mesic Forest (Smrekar Pines) extends from the previous community to the northeast across Smrekar Road, where the bulk of the site is located. It is a mature, second-growth stand of large white pines, red pines, Hill's oak, white oak, and red maple on gently sloping (upwards to the northeast) dry to dry-mesic, silty and loamy sands. Understory shrubs include huckleberry, early blueberry, and American hazelnut. The groundlayer is not diverse; the commonest species are bracken fern and Penn sedge. Many northern bird species are present.

Significance of Site

The fen is a rather small, but the avifauna includes a number of northern species. Three rare plant species are present: crossleaf milkwort, yellow screwstem, and hidden-fruited bladderwort.

The pine-maple swamp is probably the highest quality examples in the BRSF and is one of the best in Wisconsin. It has large populations of the rare plants bog fern and long sedge. Rare invertebrates are also present. A state-threatened bird is present.

This site has good quality second-growth pines and hardwoods and is important as a corridor connecting wetlands to the southwest, to the large Smrekar Ridge site to the east. The dry-mesic forest is also significant for the presence of "northern" breeding birds such as the Pine, Blackburnian, and Black-throated green Warblers, Red-breasted Nuthatch, and Hermit Thrush.

Management Considerations

For the fen, a moratorium on further mossing should be considered. The pine-maple swamp is already designated as Ketchum Creek Pines State Natural Area. The dry-mesic forest merits serious consideration for special management designation recognizing its ecological values.

BR20 - Ketchum Creek Headwaters Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Erynnis persius	persius dusky wing	1990	S2	G5	SC/N	
Hemidactylium scutatum	four-toed salamander	1998	S3	G5	SC/H	
Ilybius ignarus	diving beetle	1998	S3	G?	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1994	S2S3	G5T2	SC/FL	LE
Somatochlora franklini	delicate emerald	1997	S2S3	G5	SC/N	
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Epilobium palustre	marsh willow-herb	1958	S3	G5	SC	
Polygala cruciata	crossleaf milkwort	1959	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC	
Communities						
central poor fen	central poor fen	1997	S3		NA	
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA	
northern sedge meadow	northern sedge meadow	1980	S3	G4	NA	
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA	

BR21. HIDDEN FEN

Location

USGS 7.5' Quadrangle: Warrens West

Town-Range-Section: T20N-R2W, sections 10 and 15

Approximate Size: 75 ac.

Description of Site

This site contains several hydrologically connected but vegetatively discontinuous patches of wetland. Community types include Central Poor Fen, Alder Thicket, Tamarack Swamp, and small, managed patches of White Pine-Red Maple Swamp.

Significance of Site

Among the rare species documented here are two globally rare invertebrates. The headwaters of Pigeon Creek are just to the northwest, and the wetlands there are in good condition and should be managed in similar fashion.

Management Considerations

Maintain the integrity of site hydrology at all times, and implement forest management practices that are compatible with meeting the habitat needs of the rare invertebrate species known to be present. The Red-shouldered Hawk record is quite old (1975), and while we have no more recent records for this species here, it is desirable to try to accommodate it in future forest management scenarios by providing adequate habitat.

BR21 - Hidden Fen Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Buteo lineatus	red-shouldered hawk	1975	S1N,S3S4B	G5	THR
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N
Williamsonia lintneri	ringed boghaunter	1999	S2S3	G3	SC/N
Plants					
Carex cumulata	clustered sedge	1962	S2	G4?	SC

BR22. PIGEON CREEK HEADWATERS

Location

USGS 7.5' Quadrangle: Warrens West

Town-Range-Section: T20N-R2W, sections 2, 3, 10, 11, and 15

Approximate Size: 131 ac.

Description of Site

Pigeon Creek originates in valleys at the base of the Wildcat-Smrekar Ridge system, and flows through dry pine-oak forest and open wet meadows before becoming impounded near the Pigeon Creek campground. The hydrology is intact above the impoundment, and the stream is bordered by stands of native vegetation. Commercial forestry is the primary land use, with recreational use also significant.

Significance of Site

Several rare invertebrates are residents of the stream, and also use the adjoining wetlands and forest during certain stages of their life cycles.

Management Considerations

Protection of stream hydrology, water quality, and water quantity are the critical considerations. Management of the adjacent forest must leave trees at the stream corridor edge if the site is to provide secure habitat for the adult stages of the rare species present. Activities associated with road maintenance are potential management issues, as there are several stream crossings.

BR22 - Pigeon Creek Headwaters Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Buteo lineatus	red-shouldered hawk	1975	S1N,S3S4B	G5	THR	
Cicindela patruela huberi	a tiger beetle	1997	S3	G3T2	SC/N	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Hydrobius melaenum	a water scavenging beetle	1997	SU	G?	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1992	S2S3	G5T2	SC/FL	LE
Somatochlora tenebrosa	clamp-tipped emerald	1997	S2	G5	SC/N	
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N	
Williamsonia lintneri	ringed boghaunter	1999	S2S3	G3	SC/N	
Plants						
Carex cumulata	clustered sedge	1962	S2	G4?	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA	

BR23. SHARPTAIL PEATLANDS

Location

USGS 7.5' Quadrangle: Millston, Warrens West

Town-Range-Section: T20N-R2W, sections 9, 10, and 16

Approximate Size: 378 ac.

Description of Site

This wetland complex occurs on the northwest side of Settlement Road opposite the Pigeon Creek State Forest Campground. Most of the wetland basin contains a large open peatland composed of sphagnum mosses, sedges, and hardhack. Parts of this wetland have been ditched and impounded. Sphagnum mosses have been harvested in other areas. In areas subjected to recent mossing, narrow-leaved sedges and white beakrush are prominent. Unmossed areas feature a greater diversity of woody species, including scattered tamarack and ericaceous shrubs.

To the northeast of the open peatland is a second growth wet forest composed of white pine and red maple. Yellow birch is a canopy associate. The understory is open, with scattered thickets of winterberry holly, huckleberry, and speckled alder. The groundlayer is composed mostly of sphagnum mosses, cinnamon fern, skunk cabbage, and goldthread. The microtopography is hummocky, and small pools of standing water are frequent in the hollows. To the northwest of the White Pine-Red Maple Swamp is a tamarack swamp.

The entire wetland complex is embedded in extensive upland forests (pine, oak, and aspen) that are managed for commercial products. Some of the pine stands were planted.

Significance of Site

Several rare species are present, among them, plants and birds. The wetlands have good overall context and size, but have been hydrologically altered by the construction of ditches and dikes. All of the forests, with the possible exception of some of the smaller tamarack stands, are second growth. Some of the forests are maturing and beginning to develop structural attributes of older forests that are uncommon or rare in this landscape.

Management Considerations

Avoid further disturbance to site hydrology. Consider allowing some of the wet white pine forest to develop characteristics of old-growth forests. Monitor impacts of past moss harvest, and do not open new areas to this activity until the effects are understood.

BR23 - Sharptail Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Somatochlora incurvata	warpaint emerald	1997	S2	G4	END
Plants					
Carex folliculata	long sedge	1997	S3	G4G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC
Communities					
central poor fen	central poor fen	1997	S3		NA
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA

BR24. WASHBURN MARSH

Location

USGS 7.5' Quadrangle:	Millston, Warrens West, Hatfield SW
Town-Range-Section:	T20N-R2W, sections 4, 5, 8, 9, and 32-34
	T20N-R2W, sections 4, 5, 8, 9, and 32-34
Approximate Size:	894 ac.

Description of Site

This complex consists of a large open acid peatland, which grades into shrub swamp and conifer swamp. The open peatland is dominated by sphagnum mosses, wire-leaved sedges, and ericaceous shrubs, with insectivorous plants locally common. The open peatland is drained in the northwest by a small stream that has cut through the moss and underlying peat. Moss has been repeatedly harvested from the margins of this wetland. Mossed areas are dominated by few-seeded sedge and white beakrush. Overall, the site's hydrology is intact, with no ditches or dikes noted.

The conifer swamp is composed of small tamarack and black spruce, with most trees in the 3-6" d.b.h. class, and only 9-15 feet tall. A few paper birch, red maple, and small white pine are also present. The tall shrub layer is dense, composed mostly of speckled alder, chokeberry, huckleberry, mountain holly, and winterberry holly. Common herbs and low shrubs include sphagnum mosses, three-seeded sedge, swamp dewberry, and Labrador tea. Locally, cinnamon fern and skunk cabbage are common, and become more so upslope where the canopy becomes increasingly dominated by white pine and red maple. Second-growth stands of White Pine-Red Maple Swamp forms a narrow fringe along the peatland margins in some areas.

The surrounding landscape is mostly forested, with second or third-growth stands of pine, oak, and aspen. Commercial forestry and recreation are the major land uses.

Significance of Site

This remote peatland complex is significant for its large size, intact hydrology, the quality and extent of some of its natural communities, and the number of rare and uncommon species it supports. The site contains one of the more acid open peatlands on the state forest (approaching a true bog), and one of only a few conifer swamps in which black spruce is a significant component. The natural outlet channel on the northwest side of the bog, deeply cut into a thick bed of sphagnum mosses, may be unique. Both rare plants and rare animals occur in this wetland complex. The avifauna is diverse and includes several uncommon or rare species. Among the avian residents are Sandhill Crane, Northern Harrier, LeConte's Sparrow, Yellow-bellied Flycatcher, and Yellow-rumped Warbler. The state-threatened Henslow's Sparrow was recorded from this wetland during June, 1981, but could be relocated here or at any other site on the BRSF during the present survey.

Management Considerations

Protection of site hydrology is of paramount importance. In particular, care should be taken to avoid disturbing the unusual peatland outlet channel in the northwestern portion of the site. A moratorium on moss harvest has been requested within ¼ mile of this drainage, owing to the presence of rare species there. At other locations, the removal of moss should be permitted only from areas that have previously been subjected to harvest. Maintaining forested conditions around the wetland is important for a number of sensitive species, and should include patches of older conifers. The boundary of the established State Natural Area should be examined, and as warranted, reconfigured to better represent and protect the natural features present.

BR24 - Washburn Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Ammodramus leconteii	Le Conte's sparrow	1997	S2B,SZN	G4	SC/M	
Botaurus lentiginosus	american bittern	2001	S3B,SZN	G4	SC/M	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Dendroica kirtlandii	Kirtland's warbler	1989	SAN	G1	SC/M	LE
Somatochlora incurvata	warpaint emerald	1997	S2	G4	END	
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC	
Communities						
open bog	open bog	1997	S4	G5	NA	
tamarack (poor) swamp	tamarack (poor) swamp	1997	S3	G4	NA	

BR25. STANTON PINES

Location

USGS 7.5' Quadrangle: Millston

Town-Range-Section: T20N-R2W, sections 7, 8, 17, and 18

Approximate Size: 240 ac.

Description of Site

This wetland complex consists of intergrading Tamarack Swamp and White Pine – Red Maple Swamp Communities. The tamarack swamp occurs in the western part of the wetland with one extension into the wet pine-maple forest swamp. It consists of a closed to semi-open stand of 5-9" in diameter tamaracks, with an understory containing Canada bluejoint, tag alder, bunchberry, starflower, swamp raspberry, woolgrass, and pink lady's-slipper. The pine-maple swamp to the east is dominated by white pine, red maple, and tamarack and has recently been selectively logged for white pine. In the understory, sphagnum mosses, cinnamon fern, and skunk cabbage are abundant.

This site is embedded in a matrix of managed upland forest (mostly dry types on sandy soils) composed of mixtures of pine, oak, and aspen, as well as some pine plantations. Recreation is also important, as evidenced by hunting tree stands within this site.

Significance of Site

This site is remote and hydrologically intact, but recent selective logging has opened the canopy of the pine forest and altered stand structure. Compared with other forests of this type in the ecoregion, there is potential for restoration here. The White Pine-Red Maple Swamp community has a limited statewide distribution, supports rare disjunct plant species, and has high potential to support rare animals if left relatively undisturbed and well buffered.

Management Considerations

Protection of site hydrology and maintenance of high canopy closure are two of the key management needs if the site is to support sensitive species. Avoiding the creation of excess forest edge when managing the surrounding uplands is an important contextual consideration.

BR25 - Stanton Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Atrytonopsis hianna	dusted skipper	1994	S2?	G4G5	SC/N
Clemmys insculpta	wood turtle	1933	S3	G4	THR
Plants					
Carex cumulata	clustered sedge	1959	S2	G4?	SC
Carex folliculata	long sedge	1997	S3	G4G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
northern dry-mesic forest	northern dry-mesic forest	1981	S3	G4	NA
tamarack (poor) swamp	tamarack (poor) swamp	1997	S3	G4	NA
White Pine-Red Maple Swamp	white pine-red maple swamp	1997	S2	G3G4	NA

BR26. LOWER PIGEON CREEK BARRENS

Location

USGS 7.5' Quadrangle: Millston

Town-Range-Section: T20N-R2W, sections 16, 17, and 20

Approximate Size: 42 ac.

Description of Site

Level sands on the south side of lower Pigeon Creek are vegetated with a brushy stand of cutover jack pine-scrub oak that contains small, scattered openings. Within these openings and along logging access roads that cross the site are patches of sand prairie vegetation that includes plants such as lupine, prairie phlox, little bluestem, June grass, rock cress, birdfoot violet, and prairie buttercup. The western portion of the site has been planted to red pine.

Significance of Site

Several rare butterflies have been documented here, including the Karner blue butterfly and the frosted elfin.

Management Considerations

The rapid re-growth of woody vegetation will close in the barrens openings rendering the habitat unsuitable for the rare lepidoptera dependent on sun-loving prairie plants. Most of the sites that support remnant sand prairie vegetation in this vicinity are roadsides or other sorts of rights-of-way and are vulnerable to disturbance that could degrade or destroy them. Assess this site with others that contain similar features and select the most viable to actively manage to promote long-term habitat for sensitive species.

BR26 - Lower Pigeon Creek Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Callophrys henrici	henry's elfin	1997	S2	G5	SC/N
Clemmys insculpta	wood turtle	1933	S3	G4	THR
Plants					
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR
Carex cumulata	clustered sedge	1959	S2	G4?	SC

BR27. STARLIGHT WETLANDS

Location

USGS 7.5' Quadrangle:	Warrens West
Town-Range-Section:	sections 2
	sections 18 and 19
	sections 13, 14, 22-26, 34, and 35
Approximate Size:	2058 ac.

Description of Site

This large wetland complex is located south of CTH O, west of Starlight Road, and several miles northeast of Interstate 94. A cranberry farm and an artificial impoundment are located immediately to the southwest of the site.

The open fen ("Central Poor Fen") community is a large peatland dominated by a narrow-leaved sedge (*Carex oligoperma*) over a dense carpet of sphagnum moss. Woody species such as hardhack, swamp dewberry, and cranberries are also common. The more accessible portions of this community have a history ofrepeated sphagnum harvest. Recently mossed areas are presently composed of white beakrush and few-seeded sedge, over bare peat. In some areas there are extensive patches of the broad-leaved sedge (*Carex utriculata*). The margins of the open wetlands support scattered small tamarack and, occasionally, jack pine. These species also occur as "islands" of small trees. More extensive stands of these swamp conifers, some with a substantial component of black spruce, are found within the peatland's interior. Animals resident in the open peatlands include Savanna Sparrow, Sedge Wren, Sandhill Crane, and Northern Harrier.

The black spruce-tamarack swamp communities occur primarily in the southeastern portion of the wetland basin. Characteristic understory plants include Sphagnum spp., Labrador tea, three-seeded sedge, and huckleberry. On the upslope margins of these wet, acid conifer swamps there is a transition to a White Pine-Red Maple Swamp community. Yellow birch is present as a minor canopy component. The recent harvest of canopy pines has left most of these stands in a very open condition. These forests are established on shallow moss peat over moist sand and feature an understory of sphagnum mosses, cinnamon fern, skunk cabbage, winterberry holly, and the central Wisconsin disjuncts, Massachusetts fern and long sedge. Seepages are frequent and occasional spring runs are found within this forest type.

These wet coniferous forests are noteworthy for the number of northern species they support. Among the birds, the northern species include Red-breasted Nuthatch, Hermit Thrush, Winter Wren, Canada Warbler, Pine Warbler, Blackburnian Warbler, and Black-throated Green Warbler. Yellow-rumped warbler and Yellow-bellied Flycatcher occur locally in spruce-tamarack stands. The more obligate northern birds are most common in larger stands with high canopy closure.

North and east of the wetland communities the uplands support dry to dry-mesic forests of red oak, black oak, red maple, and white oak. Associates include bigtooth aspen and black cherry. The understory is quite open, with a tall shrub layer of American hazelnut, huckleberry, bracken fern and early blueberry in the low shrub/tall herb layer, and Penn sedge and big-leaved aster as common low herbs.

A stand of oak-dominated dry to dry-mesic hardwood forest to the east of the wetlands has a cohort of large oaks (to ca 24" d.b.h.) and features an open understory of Pennsylvania sedge, bracken fern, and

early blueberry. The relatively sparse sapling-tall shrub stratum includes American hazelnut and small white pine. A very rare native grass was collected in this stand. Widely scattered large red pines occur in this stand.

Significance of Site

This site is large and contains a diverse mosaic of communities representative of the Central Sands. At least portions of these communities are relatively intact in terms of their structure and composition.

The wetlands support a number of rare plant species, including hidden-fruited bladderwort, long sedge, bog fern, yellow screwstem, crossleaf milkwort. The presence of Canada ricegrass in dry hardwood forest is of potential significance, as this is the only extant documented station in central Wisconsin and the species is very rare in the north.

Among the animals, rare invertebrates occur in the open fen. Many regionally uncommon birds are summer residents, with “northern” species of neotropical migrants especially well-represented. Several rare birds are residents, as well.

Management Considerations

Protection of site hydrology is essential, and it is especially important to protect the intact headwaters area of Beltz Creek, including the adjoining forest. The impacts of periodic moss harvest are not well understood, and additional information regarding the impacts of moss harvest is needed to make appropriate management recommendations. Given the size, diversity, and relatively intact nature of this complex, consideration should be given to designating a significant portion of it for special management. The site has high potential to conserve both rare and representative natural communities and species.

The remaining stands of relatively intact black spruce-tamarack swamp and White Pine-Red Maple Swamp support the greatest numbers of sensitive forest species and these should be retained wherever possible.

BR27 - Starlight Wetlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	green-striped darner	1997	S3	G5	SC/N	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Hydroporus badiellus	a predaceous diving beetle	1997	S3?	G?	SC/N	
Lycaena epixanthe	bog copper	2001	S2S3	G4G5	SC/N	
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	1992	S2	G3G4T3T4	END	C
Somatochlora franklini	delicate emerald	1997	S2S3	G5	SC/N	
Plants						
Bartonia virginica	yellow screwstem	1958	S3	G5	SC	
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1998	S3	G4G5	SC	
Epilobium palustre	marsh willow-herb	1958	S3	G5	SC	
Polygala Cruciata	Crossleaf Milkwort	1959	S3	G5	SC	
Thelypteris Simulata	Bog Fern	1997	S3	G4G5	SC	
Utricularia Geminiscapa	Hidden-Fruited Bladderwort	1997	S3	G4G5	SC	
Communities						
Black Spruce Swamp	Black Spruce Swamp	1997	S3?	G5	NA	
Central Poor Fen	Central Poor Fen	1997	S3		NA	
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1997	S3	G4	NA	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Northern Sedge Meadow	Northern Sedge Meadow	1980	S3	G4	NA	
Southern Dry-Mesic Forest	Southern Dry-Mesic Forest	1997	S3	G4	NA	
White Pine-Red Maple Swamp	White Pine-Red Maple Swamp	1997	S2	G3G4	NA	

BR28. RUDD HILLS

Location

USGS 7.5' Quadrangle:	Warrens West
Town-Range-Section:	T19N-R1W, sections 6
	T19N-R2W, sections 1
	T20N-R1W, sections 31
	T20N-R2W, sections 25 and 36
Approximate Size:	362 ac.

Description of Site

The Rudd Hills consist of ramifying sandstone hills and ridges offering ca 200' of local relief, located in the southeastern corner of the Forest. The mosaic of community types includes overgrown oak barrens (Hill's and/or black oak), oak woodland, xeric stands of nearly pure red pine stands on steep north-facing slopes, very dry jack pine forest on south-facing slopes, and mixed white pine-oak forest on the lowest slopes. Periodic selective logging occurs at the site, and there are several pine plantations along its margins. In general, the understory is floristically depauperate, with bracken fern, blueberry, and huckleberry the dominant groundcover. In some places, especially in the oak woodland and in openings on the ridgelines, there is a sand prairie component with big bluestem, Indian grass, and goat's rue.

The site is bounded by Interstate 94 to the southwest, and by managed upland forest of pine, oak, and aspen elsewhere. Private lands occur to the east and south, and State Forest land to the north. The extensive wetlands of the Starlight complex are in close proximity to this site.

Significance of Site

The Rudd Hills contain a good representation of the dry forests and woodlands associated with Cambrian sandstone bedrock geology. The isolation of the site is one of its most significant features. Several rare plant species occur here. The oak woodland community in the southwestern part of the site, although small and with a closed canopy, has a very open understory and better herbaceous plant diversity than is usual for stands of this type and would benefit from prescribed burning. At least one site on Black River, preferably several, should have a management emphasis designed to retain the full complement of natural communities characteristic of the dry sandstone ridge formations. Compare the Rudd Hills with other sites containing similar features, such as the Wildcat Ridge Complex.

Management Considerations

Fire suppression and logging have favored white pine at the expense of the light dependent members of the barrens community, especially in the northwestern part of the site. Both the restoration of barrens habitat and the maintenance of dry forest communities are important here.

BR28 - Rudd Hills Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Clemmys insculpta	wood turtle	1933	S3	G4	THR
Plants					
Carex cumulata	clustered sedge	1959	S2	G4?	SC

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC
Communities					
oak barrens	oak barrens	1997	S2	G2?	NA

BR29. MILLSTON RAILROAD PRAIRIE

Location

USGS 7.5' Quadrangle: Warrens West, Millston

Town-Range-Section: T20N-R2W, sections 27, 28, and 34

Approximate Size: 14 ac.

Description of Site

This narrow strip of sand prairie is located between US Highway 12 and a railroad right-of-way, extending for slightly over a mile just southeast of Millston. Historically, it was part of a jack pine barrens and indeed a few scattered pines are present, but r.o.w. maintenance activities have removed the trees. Scattered thickets contain American hazelnut, prairie willow, and Hill's or black oak grubs. The dominant grasses and forbs are little bluestem, junegrass, flowering spurge, and species of asters, goldenrods, and milkweeds. Parts of the site are now quite weedy, and contain many exotic plants. The uncommon grass (*Tridens purpureus*) is present on bare, unstabilized sand dunes on the northeast side of the railroad adjoining Interstate 94.

The site is embedded in a matrix of commercial forest land consisting of dry, sandy Hill's oak and jack pine forests to the northeast and selectively cut White Pine – Red Maple Swamps to the southwest across Old U.S. Highway 12.

Significance of Site

The overall diversity of prairie plants at this site is fairly high. A state-threatened plant is present.

Management Considerations

Coordination with the owners and managers of the r.o.w. is needed if the site is to continue to support a complement of native prairie species. Heavy equipment was used to install a cable recently, and this led to a great deal of compaction and soil disturbance.

BR29 - Millston Railroad Prairie Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	1992	S2	G3G4T3T4	END	C
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
sand prairie	sand prairie	1997	S2		NA	

BR30. ROBINSON CREEK PINES

Location

USGS 7.5' Quadrangle:	Millston
Town-Range-Section:	T20N-R2W, sections 19, 20, and 30
Approximate Size:	261 ac.

Description of Site

This site borders a stretch of Robinson Creek just west of the Village of Millston and north of County Highway 'O' at the western boundary of the BRSF. The low terraces along the creek are vegetated by a mature wet-mesic forest of large white pine and red maple. Associates include yellow birch, paper birch, and red oak. Characteristic understory plants include sphagnum mosses, cinnamon fern, skunk cabbage, and two disjunct plants, Massachusetts fern and long sedge. Thickets of winterberry holly and speckled alder are frequent. The canopy is broken only by natural gaps due to windthrow, and large snags and coarse woody debris are present.

On the level to gently rolling sands above the terraces, the forest is dry to dry-mesic, and the canopy includes red and jack pines, along with white pine. Understory plants include American hazelnut, huckleberry, early blueberry, partridgeberry, bracken fern, wintergreen, trailing arbutus, and moccasin flower. Much of this area was logged in the mid 1990s, primarily to salvage jack pine affected by an outbreak of jack pine budworm.

Many northern birds are residents of the conifer forest, including Pine, Blackburnian, Black-throated Green, and Canada Warblers, Hermit Thrush, Winter Wren, Red-breasted Nuthatch, and Northern Raven. Pileated Woodpecker and Barred Owl are also present.

Robinson Creek and its tributary, Wyman Creek, are fast, clear, cool to coldwater streams of a rich amber hue.

The surrounding area is forested and managed for forest products. Pine plantations occur to the north and west. Lake Lee, an impounded stretch of Wyman Creek, is just upstream from this site.

Significance of Site

The site contains a significant, older stand of the geographically restricted White Pine-Red Maple Swamp community. This forest supports at least two rare plants and a resident avifauna that includes many birds more characteristic of northern Wisconsin. The entire length of Robinson Creek is significant for its aquatic biota.

Management Considerations

This site is small and linear and is, therefore, especially susceptible to the negative impacts of habitat fragmentation and stand isolation. The boundary of the existing State Natural Area should be examined carefully and adjusted as deemed appropriate to ensure that the natural features it contains are protected. Management of adjoining forested lands needs to be conducted in an especially sensitive way, and every attempt to manage this and nearby sites to the south to promote extensive areas of older conifer forest and associated sensitive wildlife species should be taken.

A number of home sites have been developed around Lake Lee, and a plan is needed to address home owners' concerns over fire threats while meeting resource protection needs.

BR30 - Robinson Creek Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Buteo lineatus	red-shouldered hawk	2001	S1N,S3S4B	G5	THR	
Chromagrion conditum	aurora damselfly	1989	S3	G5	SC/N	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Ilybius ignarus	diving beetle	1997	S3	G?	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Somatochlora elongata	ski-tailed emerald	1997	S2S3	G5	SC/N	
Sorex palustris	water shrew	1997	S2	G5	SC/N	
Stylurus scudderi	zebra clubtail	1997	S3	G4	SC/N	
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1985	S3	G4G5	SC	
Thelypteris simulata	bog fern	1992	S3	G4G5	SC	
Communities						
alder thicket	alder thicket	1980	S4	G4	NA	
stream--slow, soft, cold	stream--slow, soft, cold	1980	SU		NA	
white pine-red maple swamp	white pine-red maple swamp	1985	S2	G3G4	NA	

BR31. MILLSTON PINES

Location

USGS 7.5' Quadrangle: Millston

Town-Range-Section: T20N-R2W, sections 29 and 30

Approximate Size: 317 ac.

Description of Site

This site supports an extensive pine forest. The uplands are dominated by a mixture of medium-size white and red pines and various oaks. American hazelnut, bracken fern, and early blueberry are the understory dominants. Much of the site supports a wet forest of white pine-red maple, over winterberry holly, cinnamon fern, and skunk cabbage. The most intact patches contain large trees exceeding 15" d.b.h., and support sensitive wildlife species not well adapted to open canopy conditions. Large populations of two rare plants also occur here. There is generally good reproduction of white pine in both harvested and unharvested areas. The southern part of the site supports a young, brushy forest of pine, oak, and aspen.

Several open sedge meadows, poor fens, tamarack swamps, and headwaters streams occur as small patch inclusions within the matrix of pine forest.

Resident animals include many birds characteristic of extensive "northern" forests, such as Blackburnian, Pine, and Canada Warblers, Winter Wren, Northern Raven, and Red-breasted Nuthatch. A state-threatened species is also present.

Significance of Site

Selective logging has been extensive in the northern part of the site in recent years, with a consequent loss of large trees and a significant opening of the canopy. The remaining intact areas are important as they represent older successional stages of a geographically restricted community and support sensitive wildlife species. The inclusionary streams, wet meadows, and tamarack stands are essentially undisturbed, add diversity to the community mosaic, and are an important source of water for the biologically significant Robinson Creek just to the north.

Management Considerations

The wet white pine-red maple forests are better developed in this region than anywhere else in the state. Older stands have high potential to support a diverse animal community that includes rare or otherwise sensitive species, as well as two rare disjunct plant species. Older forest is currently rare on the state forest and throughout the central sands region. This type is especially important to represent in the older size/age classes because of its high values to rare species and its poor representation elsewhere in the state.

The use of heavy equipment during logging operations can easily damage soils and alter drainage patterns. Winter logging restrictions are not a guarantee that damage will not occur.

BR31 - Millston Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Buteo lineatus	red-shouldered hawk	2001	S1N,S3S4B	G5	THR	
Lycaeides melissa samuelis	Karner blue butterfly	2001	S2S3	G5T2	SC/FL	LE

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Communities						
white pine-red maple swamp	white pine-red maple swamp	2001	S2	G3G4	NA	

BR32. PARADISE VALLEY PINES

Location

USGS 7.5' Quadrangle: Millston, Warrens West

Town-Range-Section: T20N-R2W, sections 28, 29, and 32-34

Approximate Size: 460 ac.

Description of Site

This site contains a mature White Pine-Red Maple Swamp on nearly flat, wet, peaty soils between Millston Road to the west and Woodland Road to the northeast. The canopy dominants are large to medium-size white pine and red maple. Common or characteristic understory plants are sphagnum mosses, cinnamon fern, skunk cabbage, goldthread, bluebead lily, and woodland sedges. Winterberry holly is the most common shrub, and thickets of sapling white pine are scattered throughout the stand.

At least 3 rare plant species are present, one of them represented by a huge population. Resident animals include Canada, Blackburnian, and Pine Warblers, Veery, Red-breasted Nuthatch, and Pileated Woodpecker. One state-threatened animal has been documented here.

A similar stand, formerly known as “Poison Pines” because of the poison sumac present, is located about one mile to the southeast Paradise Valley Pines – North. The two stands are separated by a cutover swamp forest of tamarack, aspen, pine, and maple.

The surrounding uplands of pine, oak, and aspen are all managed for commercial forest products.

Significance of Site

Mature stands of this geographically restricted community with intact canopies are becoming increasingly scarce. The rare plant species bog fern, straw sedge, and long sedge are present, as is the state-threatened Red-shouldered Hawk. Northern birds are also well-represented here, by species such as Northern Raven, Canada warbler, Blackburnian warbler, Black-throated Green Warbler, Hermit Thrush, and Red-breasted Nuthatch.

Management Considerations

This site could be linked with Poison Pines in a larger, landscape-scale long-term restoration project. In the short-term, the older stands of intact forest merit protection as good examples of an uncommon community, and because they afford habitat to sensitive species that is becoming increasingly scarce. The northernmost stand is very wet, with skunk cabbage particularly abundant. It would therefore be highly susceptible to damage from heavy equipment, even under winter logging only constraints.

BR32 - Paradise Valley Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Atrytonopsis hianna	dusted skipper	1997	S2?	G4G5	SC/N	
Buteo lineatus	red-shouldered hawk	2001	S1N,S3S4B	G5	THR	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Plants						
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Carex straminea	straw sedge	1960	S1	G5	SC	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
northern dry-mesic forest	northern dry-mesic forest	1980	S3	G4	NA	
northern sedge meadow	northern sedge meadow	1980	S3	G4	NA	
white pine-red maple swamp	white pine-red maple swamp	2001	S2	G3G4	NA	

BR33. MILLSTON RIDGE

Location

USGS 7.5' Quadrangle:	Millston
Town-Range-Section:	T19N-R2W, sections 4 and 5
	T20N-R2W, sections 29-33 and 36
Approximate Size:	761 ac.

Description of Site

This mile-long, 300-foot high sandstone and shale ridge is located along the southern boundary of the State Forest, south of Habelman, Smothers, and Millston Roads and adjacent to Fort McCoy Military Reservation. The ridge is forested with a dense to open forest of small- to medium-diameter trees of black and/or Hill's oak, jack pine, big-toothed aspen, and paper birch, here classified as a Southern Dry Forest. The ridge has been logged in the past and active logging occurs near the base of the ridge. The shrubby understory is dominated by hazelnut and bramble, while the low shrub and herb layer has bracken fern, blueberry, Penn sedge, and huckleberry. There is also some red maple, white pine, and red oak in several north-facing, more mesic "coves." In general, however, the forest is xeric, and the north- projecting "spurs" often have very dense growth of mature jack pine. The north base of the ridge is a patchwork of recently clear-cut oak-pine stands, red pine plantations, and sandy old fields and pastures. In a broader context, the site is located in a large, sparsely populated area of forest and barrens. Two other communities occur on the southwest flank of the ridge: Oak Woodland dominated by moderate-sized white oaks with an open poor understory of Penn sedge, bracken fern, and big-leaved aster, and an Oak Barrens with a fairly rich sand prairie forb understory in the southwest corner of the site and forest. An old abandoned shale quarry occurs near the former tower lookout tower site at the west end of the ridge. The access road leading to the tower site is severely rutted and impassable.

Significance of Site

This is one of a number of high, sandstone-cored ridges that occur in the southern part of the Forest. While not as extensive as the Wildcat Mound-Smrekar Ridge complex, Millston Ridge is isolated and supports a number of rare invertebrate species and plant species. The oak barrens at the southwest base of the ridge is particularly noteworthy and, although small, is perhaps the best example of that community in the Forest, with a good structure and long sightlines (lack of understory shrubby vegetation). The understory is diverse, with many sand prairie species and a lack of a monotypic Penn sedge understory.

Management Considerations

The north-facing spurs that are densely forested with mature jack pine appear to pose a catastrophic fire threat, perhaps due in part to the suppression of smaller, more frequent fires. There appears to have been some disking and planting of red pines in the oak barrens area on the southwest side of the ridge. The oak barrens type is rare in this area, and consideration should be given to managing this area as a barrens, with the periodic use of fire. Pine plantations may not be the most appropriate use of this area.

BR33 - Millston Ridge Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Callophrys irus	frosted elfin	1997	S1	G3	THR	
Chlosyne gorgone	gorgone checker spot	1997	S3	G5	SC/N	
Cicindela patruela huberi	a tiger beetle	1999	S3	G3T2	SC/N	
Clemmys insculpta	wood turtle	1933	S3	G4	THR	
Diadophis punctatus edwardsii	northern ringneck snake	1997	S3?	G5T5	SC/H	
Lycaeides melissa samuelis	Karner blue butterfly	2001	S2S3	G5T2	SC/FL	LE
Sorex arcticus	arctic shrew	1998	S2	G5	SC/N	
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Carex cumulata	clustered sedge	1959	S2	G4?	SC	
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC	
Talinum rugospermum	prairie fame-flower	1997	S3	G3G4	SC	
Viola fimbriatula	sand violet	1997	S2	G5	END	
Communities						
oak barrens	oak barrens	1997	S2	G2?	NA	
oak woodland	oak woodland	1997	S1?		NA	
southern dry forest	southern dry forest	1997	S3	G4	NA	
southern dry-mesic forest	southern dry-mesic forest	1997	S3	G4	NA	
white pine-red maple swamp	white pine-red maple swamp	2001	S2	G3G4	NA	

BR34. CASTLE MOUND PINE FOREST

Location

USGS 7.5' Quadrangle: Black River Falls

Town-Range-Section: T21N-R4W, sections 23 and 24

Approximate Size: 152 ac.

Description of Site

The primary feature of this site is an old growth white pine-red pine forest (Northern Dry-Mesic Forest) covering the slopes and crest of a mile long, 200-foot-high castellated Cambrian sandstone butte that runs northwest-southeast. The groundlayer is composed primarily of sapling white pine and red maple, huckleberry, early blueberry, common wintergreen, and bracken fern. The lower slopes are more mesic than those occurring at higher elevations, where bedrock is at or very near the surface. The dry sandstone cliff exposures support mosses, lichens, and ferns, including several rare plant species. The resident avifauna includes many northern species, including Pine, Black-throated Green, and Blackburnian Warblers, Red-breasted Nuthatch, Hermit Thrush, Northern Raven, and Solitary Vireo.

A State Forest campground occurs at the northwest base of the Mound, with managed dry-mesic oak and pine forests to the south and west. New housing developments on the outskirts of the city of Black River Falls are being constructed just north of the Mound.

Significance of Site

This is arguably the finest stand of old growth pine in the Central Sand Plains. Several rare plants occur here, and several resident species of northern birds are near their southern breeding limits. The Cooper's hawk is also a nesting species.

Management Considerations

Castle Mound is designated as a State Natural Area. The most pressing management problem is the continued spread of the pernicious exotic shrub glossy buckthorn, which is common toward the north end of the mound on the lower, more mesic slopes of the old growth pine forest. Eradication will be difficult, but it should be a management priority. Lesser problems are the impacts of the high volumes of human foot traffic on the Mound, resulting in volunteer trails, soil erosion and compaction, vegetative denudation at higher elevations, and graffiti on the rocks. The major conservation limitation of the site is its isolation from other significant forested areas, its close proximity to roads on three sides, and the growth of the city of Black River Falls. Wherever feasible, steps should be taken to reduce edge, increase forest block size, and curb incompatible use.

BR34 - Castle Mound Pine Forest Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Buteo lineatus	red-shouldered hawk	1974	S1N,S3S4B	G5	THR
Plants					
Lycopodium porophilum	rock clubmoss	1997	S3	G4	SC
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC
Viola fimbriatula	sand violet	1991	S2	G5	END
Communities					
northern dry-mesic forest	northern dry-mesic forest	1997	S3	G4	NA

LOWER BLACK RIVER MACROSITE

Primary Sites

- Catfish Eddy Bottoms/Perry Creek Gorge (BR35)
- Hawk Island Complex (BR36)
- Manchester Bottoms (BR37)

Description of Macrosite

This site borders the Black River and the lower gorge of a tributary stream, Perry Creek, along the western edge of the state forest annex just to the south of the city of Black River Falls. Dry-mesic forests dominated by white and red pine occur on sandy slopes bordering the river terraces, and occasionally on the higher ridges near the river. In several locations the slopes are drained by numerous spring seeps, several of which coalesce into small streams that run to the Black River. The lower terraces support floodplain forest, with small patches of more mesic hardwoods present. Blackhawk Island, the largest state-owned island within the State Forest, is included within the site boundary. The gorge of Perry Creek, a short tributary of the Black River, features wet, moss-covered sandstone cliffs.

Significance of MacroSite

The site includes mature stands of several forest communities that have the potential to support sensitive species. These are known to support both rare plants and rare animals. The mossy seeps within Perry Creek gorge support rare invertebrates. A rare reptile uses portions of the site and adjoining areas as a breeding area. This site borders a free-flowing stretch of the Black River, which runs unimpeded from Black River Falls to its junction with the Mississippi approximately 50 miles downstream.

Management Considerations

These include increasing the area of older forest where feasible, and extending protection along both banks of the Black River. Allowing the development of old-growth forest characteristics in appropriate forest communities is important. The steep sandy slopes are fragile, especially where laced with spring seepages, and would benefit from additional protection. The aggressive exotic shrub, glossy buckthorn (*Rhamnus frangula*) has gained a foothold in the northern part of the site and measures to control are needed. The restoration of cleared lands on Blackhawk Island and at several locations elsewhere within the site should be considered. Use of the park at the mouth of Perry Creek should be monitored, particularly the foot trail that ascends Perry Creek gorge.

BR35. CATFISH EDDY BOTTOMS / PERRY CREEK GORGE

(Lower Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Black River Falls
Town-Range-Section:	T21N-R4W, sections 25-27, 34 and 35
Approximate Size:	260 ac.

Description of Site

This site occurs along the east bank of the Black River south of Black River Falls, including Perry Creek Gorge, the Black River floodplain above and below the mouth of Perry Creek, and the spring and seepage laced slopes to the north of Perry Creek.

Just below the mouth of Perry Creek is a mature, cathedral-like stand of older floodplain forest composed of silver maple, green ash, river birch, hackberry, and basswood. This stand possesses old-growth characteristics, including large trees, standing snags, coarse woody debris, and tip-up mounds. The undulating ridge-and-swale microtopography supports several distinctive herbaceous associations. Spring ephemerals carpet the ridges, while the swales contain a flora composed of characteristic floodplain forest species such as ostrich fern, wood nettle, green dragon, cardinal flower, and false dragonhead. Soils are silts and sands. No recent logging has occurred here. Litter from floods ranges up to a depth of a few feet in debris piles. The site's natural flood regime is altered by the operation of an upstream dam at Black River Falls. A forest of similar composition and structure borders the Black River to the north, along the edge of the state forest boundary.

The lower reaches of Perry Creek flow through a deep narrow gorge flanked by moist Cambrian sandstone cliffs. The gorge is forested with large to medium-size white pine, red oak, red maple, and paper birch. Characteristic understory plants include bracken fern, early blueberry, Canada mayflower, and large-leaved aster. Recent floods and windstorms have toppled trees, resulting in local erosion of the gorge slopes. Rare invertebrates and rare plants are present.

To the north of the Perry Creek mouth are forested slopes and terraces. White and red pines, red oak, white oak and red maple are typical canopy dominants. Site conditions are generally dry-mesic, but due to the undulating topography and the numerous springs and seepages present, wet-mesic stands of white pine-red maple are also present, as are small patches of black ash swamp, alder thicket and sedge meadow. Several of the springs form runs that flow westward to the Black River through miniature sandstone gorges. The site was selectively logged within the past twenty years, and though the canopy was not greatly disturbed, logging equipment disrupted some of the seepage areas. More problematically, the aggressive invasive shrub glossy buckthorn (*Rhamnus frangula*) is now locally established, and appears to have spread along logging trails.

The adjacent uplands to the east are nearly level, sandy, and dry, and the vegetative cover ranges from young to medium-aged stands of xeric pine-oak forest and pine plantations. A public park with boat landing and a large parking lot, mowed lawn, foot trails, and footbridge across the mouth of Perry Creek occurs in the center of the site. A landfill and an airport occur just to the southeast, and a large active gravel mine is situated to the west across the Black River. Private residences are located just northeast of the site.

Significance of Site

This site contains small but significant stands of high quality floodplain forest, which are integral components of an ecologically valuable river corridor. The dry-mesic pine-oak forests in Perry Creek

Gorge and along the Black River just to the north of Perry Creek are in generally good condition and host a high diversity of valuable microsites, including moist cliffs, seepages, springs, and spring runs. Some of these features support rare plants and invertebrates. The Louisiana Waterthrush, a state special concern species, was found here at two locations in 2001. The potential for additional rare species, e.g. birds, is high, and appropriate surveys should be conducted in the future.

Management Considerations

The site is an integral part of an ecologically important major river corridor. Community diversity is high, and a number of rare plant and animal species have been documented. Considerations for management include:

- maintaining high canopy closure and allowing the continued development of old-growth characteristics in both the forested portions of the floodplain and in the dry-mesic white pine-oak forests
- increased protection for the steep and fragile slopes along Perry Creek to the north along the Black River
- protection of site hydrology, to maintain both water quality and water quantity.
- monitoring use in the developed areas
- control of invasive species
- affording a high level of protection to features capable of supporting populations of rare species
- increasing forest stand size, and reducing high contrast edge.

BR35 - Catfish Eddy Bottoms/Perry Creek Gorge Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Cymbiodyta blanchardi	a water scavenging beetle	1998	SU	G?	SC/N
Ochrotrichia riesi	a purse casmaker caddisfly	1998	S1?	G?	SC/N
Ophiogomphus sp 1 nr *aspersus*	barrens snaketail	1998	S2	G2	SC/N
Seiurus motacilla	louisiana waterthrush	2001	S3B,SZN	G5	SC/M
Plants					
Callitriche heterophylla	large water-starwort	1958	S2	G5	THR
Lycopodium porophilum	rock clubmoss	1997	S3	G4	SC
Viola fimbriatula	sand violet	1960	S2	G5	END
Communities					
floodplain forest	floodplain forest	2001	S3	G3?	NA
moist cliff	moist cliff	2001	S4		NA
northern dry-mesic forest	northern dry-mesic forest	2001	S3	G4	NA

BR36. HAWK ISLAND COMPLEX

(Lower Black River Macrosite)

Location

USGS 7.5' Quadrangle:	Black River Falls, Shamrock, and Stenulson Coulee
Town-Range-Section:	20N-R4W, sections 4 and 5
	T21N-R4W, sections 22, 27, 28, 33, and 34
Approximate Size:	431 ac.

Description of Site

This island in the Black River is accessible by water, or, when waters are low, by driving a vehicle across a shallow channel at the end of Haugstad Road. The island is low (maximum 15-20 feet above the Black River) and consists mostly of alluvium (moist sand to loamy sand) arranged in a ridge-and-swale manner. The majority of the island is second-growth Floodplain Forest, but an abandoned field and a red pine plantation occur on the southwestern part of the island.

The dominant trees of the floodplain forest community are silver maple, green ash, and river birch. Important understory plants include wood nettle, ostrich fern, cutleaf coneflower, and many sedges. The highest ridges on the eastern part of the island are more mesic and support open to very brushy stands of sugar maple, basswood, and hackberry. Remnant butternut trees are associated with the more mesic sites, and this disappearing species is distributed at scattered locations around Hawk Island. The mesic ridges sometimes support lush stands of spring ephemerals. On portions of the island, and the adjoining mainland, there is a dense understory of Missouri gooseberry and prickly ash, probable indicators of past heavy grazing. Dutch elm disease eliminated most of the large elms, but saplings and small trees of both American and red elms are still present.

A narrow terrace immediately to the east of the island contains floodplain forest that is developing old-growth characteristics. Patches of rich ground flora are present. A white pine plantation occurs on the northern part of this terrace. The adjoining slopes support a mature dry-mesic forest composed of oaks, maples, and basswood, with scattered groves of large white pine. Low sandstone cliffs border the narrow channel along the southeastern part of Hawk Island. Spring seepages are associated with the cliffs and toeslopes.

The surrounding landscape includes additional floodplain forest, old pastureland, the Black River Falls airport, and, to the east, scattered residences. An active gravel mine and farms are located on the west side of the Black River.

Significance of Site

The rare plants Assiniboine sedge, Short's rock-cress, ginseng, and butternut are present. Rare animals documented here in 2001 include Red-shouldered Hawk, Cerulean Warbler, and Prothonotary Warbler. Though logging, grazing, and farming have occurred in the not-too-distant past, patches of older intact forest occur on both the island and the adjoining east bank. This includes stands of mature dry-mesic white pine and hardwood forest on the upland slopes east of the island. State ownership along the Black River south of Black River Falls is patchy and tends to be linear. This site has high potential to provide secure habitat for sensitive animal species that will be difficult to accommodate elsewhere in the southern part of the Forest without a major boundary expansion.

Management Considerations

The site is an integral part of the forested Black River corridor, and provides important habitat for many animal and plant species. The sensitive animal species present are all associated with larger stands of mature forest, with high canopy closure. Management considerations include allowing the development of old-growth characteristics, increasing forest patch size, the eventual removal of the pine plantations, encouraging reforestation of the abandoned openings with appropriate native species, and restricting vehicular access by gating the road leading down to the ford at the north end of the island. Illegal dumping of trash has been a problem here in the past.

Very few stands of older intact floodplain forest or southern mesic forest are adequately protected in this part of the state, and this is an important management consideration here. Exotic, potentially invasive, species have become established in some areas. These include day lily, celandine poppy, and glossy buckthorn.

BR36 - Hawk Island Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Buteo lineatus	red-shouldered hawk	2001	S1N,S3S4B	G5	THR
Clemmys insculpta	wood turtle	1991	S3	G4	THR
Dendroica cerulea	cerulean warbler	2001	S2S3B,SZN	G4	THR
Laccobius reflexipennis	a predaceous beetle	1997	S1S2	G?	SC/N
Protonotaria citrea	prothonotary warbler	2001	S3B,SZN	G5	SC/M
Seiurus motacilla	louisiana waterthrush	2001	S3B,SZN	G5	SC/M
Plants					
Carex assiniboinensis	assiniboine sedge	1997	S3	G4G5	SC
Communities					
floodplain forest	floodplain forest	2001	S3	G3?	NA
northern dry-mesic forest	northern dry-mesic forest	2001	S3	G4	NA

BR37. MANCHESTER BOTTOMS

(Lower Black River Macrosite)

Location

USGS 7.5' Quadrangle: Melrose

Town-Range-Section: T20N-R4W, sections 5 and 8

Approximate Size: 85 ac.

Description of Site

This site supports a mesic to wet-mesic hardwood forest on terraces with ridge and swale topography just above the floodplain of the Black River in the extreme southwest corner of the BRSF. The forest canopy contains a mix of medium-sized sugar maple, basswood, hackberry, white ash, and bitternut hickory, with no clear dominants and no conifers present. The forest has been selectively cut several times and is missing structural features characteristic of older maple-basswood forests. The shrub layer is dominated by Missouri gooseberry, possibly the result of past grazing by cattle. The herbaceous layer has numerous spring ephemerals such as yellow trout-lily, woodland phlox, and Dutchman's-breeches, along with many woodland sedge species. Several abandoned river oxbows within the site contain small ephemeral ponds. Just to the north of the forest is a State Forest canoe campground with marginal road access, and a mature pine plantation. Floodplain forest occurs to the west; the east and south include mix of abandoned pasture and second-growth hardwood forest with one private residence.

Significance of Site

This site is most significant for its rich mesic hardwood forest. No such stands are currently protected on the BRSF. This is a very rare type in the Central Sands ecoregion, where it occurs sporadically on terraces of the larger rivers. It is reminiscent of forests in the southernmost two tiers of Wisconsin counties, rather than those of central Wisconsin. No rare plant species were noted save for a few dead and dying butternut trees. Wild Turkey and Cooper's Hawk are among the avian residents of the site, and a Red-Shouldered Hawk nests in the vicinity. Ecological significance is presently tempered by site isolation, past logging, and grazing. However, restoring a forested corridor along the Black River would have many ecological benefits, such as connecting patches of isolated forest, increasing forest block size, providing dispersal corridors, providing habitat for sensitive species, and preventing potentially damaging developments.

Management Considerations

Considerations include allowing the development of old-growth characteristics, reducing the dominance of Missouri gooseberry, and extending protection to adjoining forests outside of the current BRSF boundary. Additional surveys of private lands to the west and south are desirable, pending the outcome of future landowner contact.

BR37 - Manchester Bottoms Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Apalone Mutica	midland smooth softshell turtle	1997	S3	G5	SC/H
Buteo Lineatus	red-shouldered hawk	1976	S1N,S3S4B	G5	THR
Communities					
Southern Mesic Forest	southern mesic forest	1997	S3	G3?	NA

RECENT FINDINGS

This section provides a brief summary of features examined since the bulk of biotic inventory efforts on the Black River State Forest were concluded in 2000. More recent field surveys have yielded several new occurrence records for natural communities and rare species. Following data processing during the winter of 2003, maps and associated tables will be revised to reflect any boundary revisions and the locations of new element occurrences.

Stanton Creek Pines

T20N-R2W-part of N1/2NE1/4 of section 17: This is a new site that contains a small stand of older red and white pine forest on a peninsula between two headwaters creeks. The major wetland communities bordering the streams are primarily (Central) Poor Fen and Alder Thicket. At least 2 rare plant species are present, and the potential for rare animals is high. It is important to retain this stand for old-growth or other special designation because a high percentage of other stands in the vicinity have been logged recently and it will be many decades before they recover and develop the structural characteristics of a mature, intact forest.

Arbutus Pine-Oak Forest

T22N-3W-part of the NW1/4 of section 1: This site includes an upland stand of dry-mesic mixed forest (red pine-white pine-white oak-black oak) that grades into a Wet-Mesic Forest (white pine-red maple-yellow birch) that borders a small headwaters stream that enters Lake Arbutus. A state threatened animal is resident here and the potential is high for other rare species. Additional survey work is desirable to refine boundaries and complete a more thorough evaluation of the site for rare species. This site does **not** include nearby stands to the south that were recently evaluated for timber harvest.

Overmeyer Hills

T20N-R2Wparts of sections 12 and the S1/2 of 1: This site needs boundary refinements owing to recent timber harvests and additional field survey by BER staff that have yielded more detailed delineations of the most critical areas to maintain. Small but significant stands within the site are developing old-growth characteristics that are now rare in this landscape and merit serious consideration for retention through the master planning process. In the current Forest Master Plan (WDNR 1983), this is a designated “Wild Area,” with amendments that provide for additional access to timber.

Miscellaneous

Potential for Pine Barrens management is relatively high in much of the area between Morrison Creek (east to approximately the Oxbow Pond on Morrison Creek) and Dike 17 Wildlife Area. Some areas between White Creek and Morrison Creek might also be considered for the incorporation of barrens management into a landscape scale planning unit. This would potentially ensure the viability of a now globally rare plant community, and many populations of rare and declining species, including the federally Endangered Karner blue butterfly and the regionally rare Sharp-tailed Grouse. We would not recommend the conversion of unproductive “scrub” oak or jack pine stands in this area to red pine plantations without a more detailed assessment of ecological potential. The same broad perspective could be applied to areas west of Battle Point Flowage to Wildcat Road, where it would be possible to establish connections with the existing Bauer-Brockway State Natural Area and Wauzee Park.

A number of other sites were surveyed by BER staff following the 2002 Black River State Forest’s annual planning meeting. Rare species were found at several of these sites. Associated management issues can be resolved at the State Forest staff level and should not affect the master planning process.

APPENDIX C

Meadow Valley Wildlife Area Site Descriptions

Site descriptions for the 12 Primary Sites that occur within the Meadow Valley Wildlife Area. See the main text for more details on site selection, methods, and definitions.

Table of Sites

MV01. MEADOW VALLEY FLOWAGE

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Finley, Mather
Town-Range-Section:	T20N-R2E, sections 2-11
	T21N-R2E, sections 31-36
Size:	5853

Description of Site

This large wetland complex consists of a five mile long (east-west) by 2 mile wide (north-south) peatland that was probably originally a mixture of boggy meadow (Central Poor Fen), shrub swamp, and tamarack swamp. The hydrology has been altered by an extensive system of ditches and dikes. Impounded areas of open water occur. The historically dominant natural communities now exist only as scattered, usually small remnants. The impoundments contain beds of emergent and submergent aquatic macrophytes and seasonal mudflats. A number of rare aquatic plants are present, including Torrey's bulrush, Farwell's water-milfoil, water-thread pondweed, and prickly hornwort. If these species were present historically, they must have occupied small pools of open water within peatlands or perhaps occurred on the margins of the small ponds that are very sparsely distributed across the central sands landscape.

Among the common emergent aquatic plants are bulrushes, rushes, bur-reeds, spikerushes, three-way sedge, and arrowhead. Floating-leaved aquatic species include both yellow and white pond-lilies, and watershield. The boggy meadow remnants are dominated by sphagnum mosses, tussock and narrow-leaved sedges, bog birch, cotton-grasses (*Eriophorum* spp.), willows, and hardhack. Slightly elevated "islands" within the wetlands support stands of young jack pine, aspen, white pine, paper birch, red maple, and black or Hill's oak.

The site is managed primarily for waterfowl production, but has also benefited rare or otherwise sensitive animals such as Sedge Wren, American Bittern, and Northern Harrier. There are two track roads on the dike berms. A small tamarack swamp occurs in the northwestern corner of the site, which is adjacent to the Hog Island Pine-Oak Forest upland site described elsewhere in this report. To the southeast is the Kingston Pines and Peatlands site.

Significance of Site

The size of this site is significant, but its hydrology, and therefore the natural communities present, has been significantly disrupted. The site currently supports many rare or uncommon plant and animal species.

Management Considerations

No modifications to the existing management regime are recommended at this time. Because of the extent of the hydrologic alterations and the number of sensitive species whose habitat needs are currently met, restoration of the former natural communities that occurred on the site isn't a priority consideration now. Periodic monitoring for vegetation change and, especially, the presence of invasive species is an important consideration.

MV01 - Meadow Valley Flowage Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Botaurus lentiginosus	american bittern	1999	S3B,SZN	G4	SC/M	
Chlidonias niger	black tern	1999	S3B,SZN	G4	SC/M	
Cygnus buccinator	trumpeter swan	1999	S1B,SZN	G4	END	
Gavia immer	common loon	1999	S3S4B,SZN	G5	SC/M	
Haliaeetus leucocephalus	bald eagle	1992	S2N,S3B	G4	SC/FL	LT,PD
Hemileuca sp 3	Midwestern fen buckmoth	1996	S3S4	G3G4Q	SC/N	
Ixobrychus exilis	least bittern	1999	S3B,SZN	G5	SC/M	
Plants						
Bartonia virginica	yellow screwstem	1998	S3	G5	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Ceratophyllum echinatum	prickly hornwort	1998	S2	G4?	SC	
Myriophyllum farwellii	Farwell's water-milfoil	1997	S3	G5	SC	
Polygala cruciata	crossleaf milkwort	1998	S3	G5	SC	
Potamogeton confervoides	algae-like pondweed	1975	S2	G4	THR	
Potamogeton diversifolius	water-thread pondweed	1997	S2	G5	SC	
Scirpus torreyi	Torrey's bulrush	1998	S2S3	G5?	SC	
Strophostyles leiosperma	small-flowered woolly bean	1997	S2	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1997	S3	G4	NA	
Northern Wet Forest	Northern Wet Forest	1981	S4	G4	NA	
Southern Sedge Meadow	Southern Sedge Meadow	1981	S3	G4	NA	
Tamarack (Poor) Swamp	Tamarack (Poor) Swamp	1997	S3	G4	NA	

MV02. KINGSTON PINES AND PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Mather
Town-Range-Section:	T20N-R2E, sections 7, 8, 17-20, 29, and 30
Size:	2120

Description of Site

This site contains two mapped communities; an open boggy meadow (Central Poor Fen) and a Central Sands Pine-Oak Forest. Both occur on nearly flat to rolling sandy terrain between Big Lake to the southwest and Kingston Flowage to the northeast. The forest is quite dry, composed of medium-size second-growth red pine, white pine, and black (or Hill's) oak. Old stumps and charred snags are present. The pines and oaks both exhibit good regeneration. The shrub layer is variable in density and consists of brambles (*Rubus* spp.), huckleberry, American hazelnut, and prairie willow. The low shrub and herb strata support early blueberry, whorled loosestrife, bracken fern, and locally extensive sods of sedges. There is also a component of low ericaceous shrubs other than blueberry, and occasional prairie grasses and forbs, including wild lupine. The site includes a small wet-mesic forest of swamp hardwoods and white pine-red maple along one of the few free-flowing stretches of the East Branch of Beaver Creek.

The conifer-dominated areas support many northern birds and mammals, including Northern Raven, Hermit Thrush, Red-breasted Nuthatch, Pine, Yellow-rumped, and Canada warblers, fisher and porcupine. There are also fairly recent records (late 1970s-early 1980s) for Northern Goshawk and Saw-whet Owl.

The site is partly bisected by a two-track access road leading to Kingston Flowage. The open wetlands are dominated by sphagnum mosses and sedges. A small tamarack swamp is also present. The wetlands need additional survey work.

The major land uses in the vicinity are commercial forestry, cranberry production, waterfowl production, and recreation. Vast wetlands (Bear Bluff Peatlands) occur to the west.

Significance of Site

The site is extensive, has mature patches of dry upland conifer forest, no significant exotics, and excellent animal diversity. A number of rare or otherwise sensitive species have been documented here. This site may represent the best opportunity in the eastern part of the study area to manage an extensive pine-dominated forest. The wetlands have been less affected by hydrologic alterations than many others nearby, and the harvest of sphagnum moss no longer occurs here.

Management Considerations

Major considerations include the maintenance of an extensive upland conifer-dominated forest, allowing old-growth attributes to develop in some stands, and maintaining intact ecotones between lowlands and uplands. Protection of the free-flowing portion of Beaver Creek and the adjoining forest is a rare opportunity in this landscape and also warrants major consideration. Barrens management at this site is less important than at other locations in the landscape although, in appropriate areas, small patches might be maintained or enhanced.

MV02 - Kingston Pines and Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Accipiter gentilis	northern goshawk	1981	S2N,S2B	G5	SC/M
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR
Lanius ludovicianus	loggerhead shrike	2001	S1B,SZN	G4	END
Plants					
Bartonia virginica	yellow screwstem	1998	S3	G5	SC
Carex cumulata	clustered sedge	1997	S2	G4?	SC
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
Central Poor Fen	Central Poor Fen	1998	S3		NA
Central Sands Pine-Oak Forest	Central Sands Pine-Oak Forest	1998	S3	G3	NA
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1979	S3	G4	NA
Northern Wet Forest	Northern Wet Forest	1979	S4	G4	NA
Other					
Bird Rookery	Bird Rookery	1985	SU		SC

MV03. SCOTT FLOWAGE PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
Counties:	Jackson, Monroe
USGS 7.5' Quadrangle:	Mather, Warrens East
Town-Range-Section:	T19N-R1E, sections 1-5, and 8-11
	T20N-R1E, sections 33-36
Size:	2811

Description of Site

This large peatland complex is located north of Monroe County Trunk Highway E and includes the Scott Flowage. The primary plant community is a boggy meadow (Central Poor Fen on organic soils of the Dawson Peat and Loxley Mucky-Peat series. Lacustrine sands underlie the peat and muck soils. The open wetland is dominated by sphagnum mosses, narrow-leaved and tussock sedges, and hardhack. Other common plant species are woolgrass, several species of cotton-grasses, chokeberry, bog birch, and various willow species. Cranberries and leatherleaf represent the acid-loving ericaceous shrubs. The eastern portion of the wetland is less disturbed than the western part, and is interspersed with upland "islands" and peninsulas of second-growth xeric forest of oak, aspen, and pine. Scattered trees or small islands of oak, pines, red maple, and aspen all occur throughout the peatland. The western part of the site has been greatly altered by historical ditching, followed by diking and impoundment (Scott Flowage). At the flowage edges the boggy mat grades into an emergent marsh composed of such species as beggars-tick, manna grass, Small's spikerush, arrowhead, bog goldenrod, water horehound, and grass-leaved goldenrod. Near the peatland margins there are small stands of swamp conifers, mostly tamarack-dominated, with lesser amounts of black spruce.

Animals utilizing the peatlands include Sedge Wren, Sandhill Crane, Ring-necked Duck, Green-winged Teal, Northern Harrier, Sharp-shinned Hawk, and Blanding's Turtle.

The site is bordered on the northeast, north, and southwest by more disturbed, mossed, ditched, and diked peatlands. Several of the rare animals documented here in the 1980s, for example Black Tern and Henslow's Sparrow, could not be relocated during the current survey project.

The surrounding landscape is utilized for timber production, recreation, and cranberry cultivation. The federally endangered Karner blue butterfly occupies restricted, linear barrens remnants along the access road south of the flowage.

Significance of Site

This large peatland is managed as part of Meadow Valley Wildlife Area. The US Fish and Wildlife Service is the owner, but the site is managed by the WDNR. Many rare or otherwise sensitive animals are resident here. Surrounding uplands could be managed as either extensive forest or barrens, or a mixture of both.

Management Considerations

Protection of site hydrology is a key management issue. No specific management changes are recommended at this time, though commercial moss harvest should be deferred, at least until more data on harvest impacts are available to managers. Additional survey work on birds and selected invertebrates, e.g., lepidopterans, is highly desirable. Periodic monitoring for the presence of invasive plant species is also needed.

MV03 - Scott Flowage Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	green-striped darner	1982	S3	G5	SC/N	
Ammodramus leconteii	Le conte's sparrow	1999	S2B,SZN	G4	SC/M	
Botaurus lentiginosus	American bittern	1999	S3B,SZN	G4	SC/M	
Cicindela patruela huberi	a tiger beetle	1975	S3	G3T2	SC/N	
Circus cyaneus	Northern harrier	1999	S2N,S3B	G5	SC/M	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1992	S2S3	G5T2	SC/FL	LE
Lycaena epixanthe	Bog copper	1998	S2S3	G4G5	SC/N	
Plants						
Thelypteris simulata	Bog fern	1997	S3	G4G5	SC	
Communities						
Central Poor Fen	Central Poor Fen	1997	S3		NA	
Northern Wet Forest	Northern Wet Forest	1982	S4	G4	NA	
Open Bog	Open Bog	1982	S4	G5	NA	

MV04. MATHER TAMARACKS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
Counties:	Monroe, Juneau
USGS 7.5' Quadrangle:	Mather, Shennington
Town-Range-Section:	T19N-R1E, sections 1, 12, and 13
	T19N-R2E, sections 7, 8, 17, and 18
Size:	959

Description of Site

This tamarack swamp straddles State Highway 173 and a powerline right-of-way on the Monroe-Juneau County line. The substrate is sphagnum peat over sand and loamy sand. Much of the forest is apparently young, composed of relatively small trees. Open patches of boggy fen (Central Poor Fen) dominated by sphagnum mosses, narrow-leaved sedges, and hardhack are treated as inclusions.

The wetland margins grade into a fringe of White Pine-Red Maple Swamp where there are larger (to 10" in diameter) tamaracks, white pine, and paper birches in the overstory. Common understory shrubs include tag alder, huckleberry, winterberry holly, bog holly, early blueberry, and chokeberry. The groundlayer is composed of sphagnum mosses, skunk cabbage, Canada bluejoint grass, tussock sedge, swamp dewberry, and cinnamon fern. The best developed tamarack forest occurs in this area. At least 3 rare plants are present: bog fern, long sedge, and crossleaf milkwort. Detailed animal surveys have not been conducted, but the site supports Nashville Warbler (common), White-throated Sparrow, Golden-winged Warbler, Sharp-shinned Hawk, Hermit Thrush, and snowshoe hare, all "northern" species that are approaching their southern range limits in central Wisconsin. Primary land use is recreation (hunting). The site is embedded in gently rolling sandy terrain that is utilized for timber production. Local cover types include oak (mostly Hill's and/or black), pine plantations, and some aspen. Extensively ditched open peatlands occur immediately to the east of the site.

Significance of Site

The site contains a good representative of a central Wisconsin tamarack swamp and supports a number of rare or otherwise notable plant and animal species.

Management Considerations

Maintenance of site hydrology is the paramount management consideration, though care needs to be taken when managing the adjoining upland forest to avoid excessive forest fragmentation and exposure of the shallow-rooted swamp conifers to excessive wind impacts.

MV04 - Mather Tamaracks Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	green-striped darner	1982	S3	G5	SC/N	
Clemmys insculpta	wood turtle	1985	S3	G4	THR	
Erynnis persius	persius dusky wing	1979	S2	G5	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1982	S2S3	G5T2	SC/FL	LE
Plants						
Carex folliculata	long sedge	1997	S3	G4G5	SC	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1998	S3	G4G5	SC	
Communities						
Tamarack (Poor) Swamp	Tamarack (Poor) Swamp	1997	S3	G4	NA	

MV05. NORWAY RIDGE ROAD PINES AND PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe
USGS 7.5' Quadrangle:	Shennington
Town-Range-Section:	T19N-R1E, sections 13, 14, and 23
Size:	293

Description of Site

This complex consists of a pair of communities near the western edge of the bed of extinct Glacial Lake Wisconsin. The upland ridge (Norway Ridge) supports a xeric forest of mixed oak and pine. To the south is a boggy meadow on sedge and moss peat. The site is bisected from southwest to northeast by State Highway 173, and is embedded in an area utilized principally for timber products and recreation.

The upland forest is on Boone and Tarr Sands and is composed mostly of oaks with scattered jack, white, and red pine in the canopy, plus occasional bigtooth aspen, paper birch, and red maple. The sapling layer is sparse to moderate in density, consisting mostly of black and white oaks, red maple, and white pine. The shrub layer is low and sparse, with huckleberry, early blueberry, and American hazelnut the most common species. Characteristic herbs include Penn sedge, bracken fern, Canada mayflower, and big-leaved aster. Characteristic resident birds include Scarlet Tanager, Red-eyed and Yellow-throated Vireos, Great-crested Flycatcher, Eastern Wood Pewee, Whip-poor-will, and Ovenbird.

A few barrens/sand prairie species are present, such as flowering spurge, lupine, purple milkwort, and stiff coreopsis. These plants and others typically found in more open habitats are quite common on the margins of Norway Ridge Road, where a population of the federally endangered Karner blue butterfly is present.

The peatland to the south is an open, wet, acidic meadow dominated by wire-leaved sedges, bluejoint, and, in some places, sphagnum mosses. Hardhack is common, but ericads are scarce or absent except on drier hummocks and along upland margins where leatherleaf and large-fruited cranberry are common. Bog birch and tamarack are also characteristic of the hummocks, while on the wetland margins tall shrubs such as chokeberry, tag alder, and winterberry holly are prevalent. Several rare plant species are present. Sedge Wren, Golden-winged Warbler, and Nashville Warbler are among the resident birds.

Wetland hydrology is relatively intact, though the presence of Hwy. 173 and associated maintenance activities have had localized impacts. There has been no ditching or recent mossing in this wetland.

Significance of Site

The peatland is significant in that virtually all other large wetlands in the vicinity have been ditched, diked, or mossed. With the exception of a stand bordering Hwy. 173, the upland oak-pine forest has had no recent disturbance, is mature, relatively large, and supports species generally associated with older closed canopy forest.

Management Considerations

Maintenance of site hydrology is the key consideration for the wetland communities. Fire suppression has influenced the structure of the upland forest, but the current availability of successional stages, patch sizes, and composition in the local landscape should be carefully assessed at a landscape level before making future silvicultural decisions. Most of the forests in the area are young, frequently logged, and occur in small patches. There is a need for better representation of large patches of older forest somewhere in this landscape.

A portion of this site would be appropriate to manage to create or maintain barrens conditions. Prescribed fire should be considered as a tool compatible with certain silvicultural treatments if a barrens community is deemed worthy of restoration here. The basis of selecting specific areas at which to attempt this should be based on the diversity and abundance of prairie flora and associated animals, especially rare invertebrates. Currently, the most sensitive barrens species are associated mostly with roadsides and utility corridors, where they are vulnerable to damage or destruction. During a recent logging operation along Norway Ridge Road, considerable damage occurred to the prairie flora occupying the shoulder. In addition, the disturbance appears to have fostered the spread of the highly invasive spotted knapweed to areas formerly dominated by native prairie species (including wild lupine).

MV05 - Norway Ridge Road Pines and Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Callophrys irus	frosted elfin	1987	S1	G3	THR	
Cicindela patruela huberi	a tiger beetle	1999	S3	G3T2	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1987	S2S3	G5T2	SC/FL	LE
Plants						
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
central sands pine-oak forest	central sands pine-oak forest	1997	S3	G3	NA	
tamarack (poor) swamp	tamarack (poor) swamp	1997	S3	G4	NA	

MV06. NORWAY RIDGE ROAD POWERLINE ROW

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe
USGS 7.5' Quadrangle:	Shennington
Town-Range-Section:	T19N-R1E, sections 24-26, 35, and 36
	T19N-R2E, sections 19
Size:	349

Description of Site

The site encompasses several corridors, including a road, powerline right-of-way, and several ditches that support rare species. The power line site supports rare barrens lepidoptera (e.g., Karners), and the shrubby wetlands support resident Golden-winged Warblers.

Significance of Site

Several rare plants occur here. Most of this site is highly disturbed and altered, but there is a small but hydrologically intact occurrence of an open peatland.

Management Considerations

Monitor site conditions and the population of twining screwstem, an Atlantic Coastal Plain species known from only one other location in Wisconsin. Protect undisturbed wetlands from further hydrologic manipulations, monitor vegetation changes, and allow stands of natural red and white pine in the vicinity to age and develop mature forest characteristics. Older forests with intact canopies are needed to provide habitat for many species that occur in this landscape but do not thrive in small patches of younger forest.

MV06 - Norway Ridge Road Powerline ROW Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Bartonia paniculata	Twining screwstem	1998	S1	G5	SC
Bartonia virginica	Yellow screwstem	1998	S3	G5	SC
Polygala cruciata	Crossleaf milkwort	1998	S3	G5	SC
Communities					
Central Poor Fen	Central Poor Fen	1994	S3		NA

MV07. ATWOOD AVENUE PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe
USGS 7.5' Quadrangle:	Wyeville
Town-Range-Section:	T19N-R1E, sections 17, 19, 20, and 21
Size:	492

Description of Site

The site is centered around a second-growth White Pine-Red Maple Swamp that grades into a mixed composition dry forest of pine-oak-aspen on the upslope side and into an open acid peatland on the downslope side. The White Pine-Red Maple Swamp includes patches of older forest that are developing important structural features such as large trees, tip-ups, snags, and coarse woody debris. The sparse shrub layer is composed primarily of winterberry holly and speckled alder. Both white pine and red maple are reproducing within the stand. Frequent understory species include skunk cabbage, goldthread, Canada mayflower, starflower, and swamp dewberry. Several rare plant species are present. The major soil type is Dawson Peat.

The open peatland is composed of sphagnum mosses, sedges, hardhack, and willows. The upland forest of pine and oak is managed commercially, with stumps evident throughout. Newson Loamy Sand is the main upland soil type. A large cranberry farm occurs just to the south of the site.

Significance of Site

This site contains Monroe County's most intact occurrence of the regionally restricted white pine-red maple swamp community. Several rare plant species are present. Golden-winged warblers have been recorded during the breeding season in the shrubby margins of the open peatland.

Management Considerations

Important considerations include incorporating the development of forest attributes such as high canopy closure, large trees, snags, and protection of site hydrology into forest management plans. If feasible, effective forest block size should be increased. A breeding bird survey has the potential to yield records of rare or uncommon species and is recommended for the future.

MV07 - Atwood Ave Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Carex cumulata	clustered sedge	1997	S2	G4?	SC
Carex folliculata	long sedge	1997	S3	G4G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
white pine-red maple swamp	white pine-red maple swamp	1997	S2	G3G4	NA

MV08. MONROE COUNTY FLOWAGE

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe
USGS 7.5' Quadrangle:	Shennington, Wyeville
Town-Range-Section:	T19N-R1E, sections 33 and 34
Size:	900

Description of Site

This large artificial impoundment is located in the bed of extinct Glacial Lake Wisconsin, and was created in the 1950s and 1960s by plugging a ditch and dike system dug earlier in the century in an unsuccessful attempt to drain the site for agricultural use. Soils include Palms Muck, Dawson Peat, and Wautoma Sand. The flora is diverse and includes the following emergent aquatics: cat-tail, bur-reed, manna-grass, three-way sedge, spikerushes, arrowhead, and bulrushes. Floating-leaved aquatics include water-shield, various pondweed species, and yellow and white water-lilies. Adjoining some of the flowage's shorelines, principally the eastern and northern sides, there are remnant peatlands that may be described as central poor fen inclusions. These are dominated by sphagnum mosses, tussock sedge, narrow-leaved sedges, woolgrass, and hardhack, and grade into slender willow shrub-carrs in some places, and small fragmented patches of jack and red pines, red maple, and huckleberry in other places. Rare plants documented here include crossleaf milkwort and forked hornwort.

Monroe County Flowage is part of the Meadow Valley Wildlife Area, which is owned by the US Fish and Wildlife Service and managed by the Wisconsin DNR. The site is set in a rolling, mostly forested landscape of low sandy hills that is managed for timber production and recreation. Numerous peatlands (poor fen, tamarack swamp, and shrub swamp) occupy low spots between the ridges. Commercial harvest of sphagnum mosses was formerly widespread in the more open peatlands. As is the typical condition of central sand wetlands, hydrology has been greatly altered by a maze of ditches and dikes.

Significance of Site

Emergent marshes are far less uncommon than other wetland types in this part of the state. Monroe County Flowage contains one of the region's larger examples. Overall diversity of aquatic macrophytes is high, several rare plants are present, and the site provides suitable breeding habitat for nesting Black Tern, American Bittern, Ring-necked Duck, Common Loon, Green-winged Teal, Marsh and Sedge Wrens, Northern Harrier and Blanding's Turtle. Bald Eagle and Osprey frequently forage here.

Management Considerations

Apart from periodic monitoring for birds, herptiles, rare plants, and the presence of invasive species, no additional management recommendations are offered at this time. The Bureau of Endangered Resources should be contacted if flowage drawdowns are contemplated to ensure that guidelines to protect sensitive species are incorporated into the management plans.

MV08 - Monroe County Flowage Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Chlidonias niger	black tern	1999	S3B,SZN	G4	SC/M
Emydoidea blandingii	Blanding's turtle	1991	S3	G4	THR
Plants					
Ceratophyllum echinatum	prickly hornwort	1998	S2	G4?	SC
Polygala cruciata	crossleaf milkwort	1998	S3	G5	SC
Communities					
emergent aquatic	emergent aquatic	1998	S4	G4	NA
northern sedge meadow	northern sedge meadow	1982	S3	G4	NA

MV09. DANDY CREEK SWAMP

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe
USGS 7.5' Quadrangle:	Shennington
Town-Range-Section:	T18N-R1E, sections 1
	T19N-R1E, sections 35, 36
Size:	211

Description of Site

This site, on a slightly elevated area within a sedge-willow wetland in the bed of extinct Glacial Lake Wisconsin, supports a swampy forest composed mostly of Hill's oak and white pine, up to ca 20" in diameter. There are smaller, but mature, oaks of four other species (bur, white, swamp white, and red) in the canopy, plus a few red pines, red maples, aspens, and ashes. The sapling layer is composed of oaks and red maple; the tall shrub layer consists primarily of American hazelnut and gray dogwood. The herb layer is rich for the Meadow Valley landscape, and includes interrupted and cinnamon ferns, wood anemone, big-leaved aster, sessile-flowered bellwort, and wild geranium. Classification of this forest is uncertain, as both wet-mesic and dry-mesic elements are present. The soils are poorly drained Newson Loamy Sands. The area has been periodically logged and adjacent wetlands ditched. Adjacent areas are used for recreation, timber production, and wildlife habitat. There is private property to the south.

Significance of Site

Although this forest remnant is small, the site somewhat fragmented, roads are nearby, and the hydrology has been altered, it is nevertheless the only "hardwood swamp" of this composition mapped within the Black River State Forest / Meadow Valley Landscape.

Management Considerations

More information on stand history is needed. For now, we suggest the deferral of commercial logging until this and any similar sites can be more fully assessed and we have a better understanding of site hydrology.

MV09 - Dandy Creek Swamp Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Emydoidea Blandingii	Blanding's turtle	1991	S3	G4	THR
Communities					
Hardwood swamp	hardwood swamp	1997	S3	G4	NA

MV10. BLUEBERRY TRAIL COMPLEX

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Monroe, Juneau
USGS 7.5' Quadrangle:	Shennington
Town-Range-Section:	T18N-R1E, sections 1
	T18N-R2E, sections 5 and 6
	T19N-R1E, sections 25 and 36
	T19N-R2E, sections 29-32
Size:	1686

Description of Site

This complex encompasses the floodplain of Beaver Creek, and lands to the north and west that include a mosaic of saturated peatland communities such as Central Poor Fen, Tamarack Swamp, and White Pine – Red Maple Swamp. The 197-acre floodplain forest community is about 1.5 miles long and 0.2-0.3 miles wide, and is composed of river birch, various oaks, bigtooth and trembling aspens, red maple, and white pine, The shrub and herb layer are depauperate. In low areas this forest grades into Sedge Meadow, Alder Thicket, Central Poor Fen, willow swamp (shrub-carr), or Tamarack Swamp. Small patches of these types are treated as inclusions within the floodplain forest. Beaver Creek itself is deeply entrenched in sand and has steep banks. Just to the north of the creek and adjoining hardwood-dominated bottomlands is a 71-acre wet-mesic forest dominated by white pine and red maple. Canopy associates include oaks, aspens, and tamarack. This forest has developed on somewhat poorly drained sands and mucks of the Meehan-Newson and Newson-Dawson Complexes. Common understory species include cinnamon fern, sedges, skunk cabbage, huckleberry, bluebead lily, and bracken fern. A layer of living sphagnum mosses overlies shallow muck or peat in many areas within this forest.

To the north of this stand are several separate polygons that together comprise an 81-acre central poor fen on saturated peat of the Meehan-Dawson Complex. Common species here are sphagnum mosses, narrow-leaved sedges, bluejoint, and hardhack. Scattered small trees of tamarack, jack pine, and red maple are present. Rare plant species occurring in this complex include bog fern, long sedge, crossleaf milkwort, yellow screwstem, and Virginia meadow-beauty. Uplands to the north of Beaver Creek are vegetated with second-growth forest of oaks, aspens, pines, and red maple.

Blueberry Trail, a two-track road, traverses the upland parts of the site from west to east on the north side of Beaver Creek. Cranberry farms occur about one mile southeast of the site, and a large impoundment on Beaver Creek (Eagle Nest Flowage) is located about 1.5 mile east (upstream) from the site.

Significance of Site

This site is significant for its stretch of free-flowing, meandering stream, and relatively undisturbed stands of floodplain forest, White Pine-Red Maple Swamp, Tamarack Swamp, and open bog/poor fen. Most small streams in the Meadow Valley landscape have been ditched, straightened, or impounded. The communities to the north of the creek are embedded in a more or less natural landscape with intact ecological gradients. A number of rare species were documented here, including Red-Shouldered Hawk, Cerulean Warbler, Golden-Winged Warbler, and meadow beauty.

Management Considerations

Options for a special management and protection designation should be thoroughly explored with the Juneau County and Meadow Valley managers. This site contains a relatively intact complex of both rare and representative natural features, some of which occur at few other sites in central Wisconsin. Maintenance of a core area of older, closed canopy forest is important to maintain sensitive forest wildlife and provide for under-represented forest successional stages.

MV10 - Blueberry Trail Complex Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Clemmys insculpta	wood turtle	1985	S3	G4	THR	
Dendroica cerulea	cerulean warbler	1999	S2S3B,SZN	G4	THR	
Emydoidea blandingii	Blanding's turtle	1997	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Seiurus motacilla	louisiana waterthrush	1999	S3B,SZN	G5	SC/M	
Spharagemon marmorata	northern marbled locust	1998	S2S3	G5	SC/N	
Plants						
Bartonia virginica	yellow screwstem	1998	S3	G5	SC	
Carex folliculata	long sedge	1998	S3	G4G5	SC	
Juncus marginatus	grassleaf rush	1959	S2	G5	SC	
Polygala cruciata	crossleaf milkwort	1998	S3	G5	SC	
Potamogeton pulcher	spotted pondweed	1938	S1	G5	END	
Rhexia virginica	Virginia meadow-beauty	2001	S2	G5	SC	
Thelypteris simulata	bog fern	1998	S3	G4G5	SC	
Communities						
Central Poor Fen	Central Poor Fen	1998	S3		NA	
Floodplain Forest	Floodplain Forest	1997	S3	G3?	NA	
Northern Dry Forest	Northern Dry Forest	1982	S3	G3?	NA	
Northern Dry-mesic Forest	Northern Dry-mesic Forest	1982	S3	G4	NA	
Northern Sedge Meadow	Northern Sedge Meadow	1982	S3	G4	NA	
Northern Wet Forest	Northern Wet Forest	1982	S4	G4	NA	
White Pine-Red Maple Swamp	White Pine-Red Maple Swamp	1998	S2	G3G4	NA	

MV11. COUNTY TRUNK HIGHWAY H BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Mather, Shennington
Town-Range-Section:	T19N-R2E, sections 5, 8, 9, 16, 17, 20, 21, 28, and 29
Size:	874

Description of Site

This large area of disturbed xeric forest/pine barrens borders Juneau County Trunk Highway H. Currently the vegetation can be characterized as young shrubby forest with relatively high canopy closure except where recent logging has created small gaps and openings. The site is a nearly level upland on Friendship Sand in the bed of extinct Glacial Lake Wisconsin. Jack pine and Hill's/black oak dominate the forest, with most trees in the 1"-5" d.b.h. size class and occasional individuals reaching 11" d.b.h. A few scattered red and white pines are present. The sapling layer consists of mostly Hill's/black oak, but jack pine saplings are locally abundant. Shrubs are moderately dense, with early blueberry, huckleberry, and sweet fern common. In many places Penn sedge dominates the depauperate understory; in other areas prairie plants such as big and little bluestem, goldenrods, and asters are frequent. The site and surrounding areas are used for timber production, recreation, and wildlife management. Karner blue butterflies occur with their food plant, wild lupine, along some of the more open prairie roadsides and in other openings.

Significance of Site

Though this site is heavily overgrown with trees and shrubs due to a prolonged period of fire suppression, there is some potential for management to maintain important components of the barrens community, such as the Karner blue butterfly and frosted elfin.

Management Considerations

Periodic controlled burns are recommended in appropriate areas to maintain or restore barrens composition and structure. Timber sales can also be used to aid in the maintenance of the more open conditions needed by the most sensitive barrens species.

MV11 - County Trunk Highway H Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Callophrys irus	frosted elfin	1988	S1	G3	THR	
Clemmys insculpta	wood turtle	1985	S3	G4	THR	
Erynnis persius	persius dusky wing	1990	S2	G5	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Plants						
Rhexia virginica	Virginia meadow-beauty	1932	S2	G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1998	S3	G4G5	SC	
Communities						
Pine barrens	pine barrens	1997	S2	G2	NA	

MV12. SUK AND CERNEY PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Cutler, Shennington
Town-Range-Section:	T18N-R2E, sections 1-4 and 9-15
	T18N-R3E, sections 6-8, 17, and 18
	T19N-R2E, sections 25-27 and 33-36
	T19N-R3E, sections 31
Size:	9270

Description of Site

This vast near-level saturated peatland in the bed of glacial Lake Wisconsin is a complex mosaic of Central Poor Fen (the unforested areas) and young xeric forests of oak and pine on low, sandy "islands" and "peninsulas." These patchwork-patterned uplands are the remnants of dunes formed thousands of years ago following the natural drainage of now extinct Glacial Lake Wisconsin. The dominant plants in the open wetlands are narrow-leaved sedges (especially *Carex oligosperma*) and Canada bluejoint grass. Other common species are hardhack, cotton-grasses, and bog birch. The wetlands generally have the aspect of a sedge meadow, though some areas support a deep layer of sphagnum mosses, ericaceous shrubs, and insectivorous plants and should be considered Poor Fen or Open Bog. Pitcher plants, orchids, and a more diverse complement of sedges occupy these more acidic sphagnous peatland patches. Overall, in the areas surveyed, sphagnum mosses make up less than 50% of the vegetation mat.

Though detailed animal surveys have not yet been conducted throughout this site, the residents include Sedge Wren, Nashville Warbler, Golden-winged Warbler, Northern Harrier, Sharp-shinned Hawk, and Southern Bog Lemming.

There are scattered individuals (typically very small) or copses of tamarack (and rarely, black spruce). The wetland margins tend to be occupied by a zone of tall shrubs composed of speckled alder, winterberry holly, bog holly, chokeberry, bog birch, and willows. The sandy islands and ridges often support dense stands of jack pine or black/Hill's oak over a Penn sedge-dominated groundlayer. Huckleberry, early blueberry, bracken fern, and a few barrens-associated plants are also typically present.

The surrounding landscape is used for commercial forestry (aspen and jack pine), game species management, and recreation. There has been some ditching on the margins of the site and these ditches largely form its perimeter; but, overall, the hydrology appears relatively intact. An east-west running town road forms the site's southern border. There is a small impoundment or flowage on its eastern margin.

Significance of Site

This site is significant for its large size, relatively intact hydrology, complex mosaic of communities representative of this ecoregion, and the rare or otherwise important species that it supports.

Management Considerations

Management potential exists to promote the development and maintenance of Pine Barrens and sand prairie communities adjacent to and even within the site. Periodic prescribed burning is an appropriate management strategy to consider for at least some of the uplands, as much of this ecosystem complex is well-adapted to, and ultimately dependent, on fire. Avoiding widespread disruption of site hydrology is important, and we are

recommending that a significant portion of the site receive consideration for special management designation to protect the natural communities present, as well as the natural processes that support them.

MV12 - Suk and Cerney Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	Green-striped darner	1998	S3	G5	SC/N	
Cicindela patruela huberi	a tiger beetle	1998	S3	G3T2	SC/N	
Clemmys insculpta	Wood turtle	1985	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1999	S2S3	G5T2	SC/FL	LE
Somatochlora incurvata	warpaint emerald	1998	S2	G4	END	
Spharagemon marmorata	northern marbled locust	1998	S2S3	G5	SC/N	
Williamsonia fletcheri	Ebony bog haunter	1999	S3S4	G3G4	SC/N	
Williamsonia lintneri	Ringed boghaunter	1999	S2S3	G3	SC/N	
Plants						
Ceratophyllum echinatum	prickly hornwort	1938	S2	G4?	SC	
Rhexia virginica	Virginia meadow-beauty	1974	S2	G5	SC	
Scirpus torreyi	Torrey's bulrush	1997	S2S3	G5?	SC	
Communities						
central poor fen	central poor fen	1994	S3		NA	
northern sedge meadow	northern sedge meadow	1981	S3	G4	NA	
pine barrens	pine barrens	1979	S2	G2	NA	
shrub-carr	Shrub-carr	1981	S4	G5	NA	

APPENDIX D

Wood County Wildlife Area Site Descriptions

Site descriptions for the Primary Sites that occur within the Wood County Wildlife Area. See the main text for more details on site selection, methods, and definitions.

WC01. BALL ROAD FLOWAGES

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	City Point
Town-Range-Section:	T21N-R1E, sections 13
	T21N-R2E, sections 3-10 and 15-18
	T22N-R2E, sections 32 and 33
Approximate Size:	3360

Description of Site

The site is part of a 13,000-acre peatland encompassing much of the heavily ditched Ball Road Flowages. The least altered are is a 831-acre central sedge poor fen located to the north of the most ditched area and to the east of an extensive cranberry cultivation area. The poor fen is dominated by sphagnum mosses, various sedges, hardhack, bog birch, woolgrass, and cottongrass. There is some ditching even in this area (running west-east), with two track roads on the dike berms. There is a Muskeg or Tamarack Swamp inclusionary community in the west-central part of the site; surrounding this is a narrow fringe of Open Bog with pitcher plants and other typical species. To the south, the fen grades into more of a Northern Sedge Meadow community with grasses, sedges, rushes, and forbs dominant.

Significance of Site

Extensive ditching has compromised site hydrology and some of the natural values. However, owing to its large size and context, as well as its content, values for many wildlife species remain very high, particularly for certain grassland birds, and species dependent on conifer swamps. A number of the animals found here are rare or uncommon, and are quite specialized in their habitat needs. Among these are the Sharp-tailed Grouse, Northern Harrier, American Bittern, Golden-winged Warbler, Connecticut Warbler, and LeConte's Sparrow. Several rare plants have been documented in the site's wetlands.

Management Considerations

Expanding the area of open wetland is a key management consideration, as is maintenance of the larger, better-developed conifer swamps. Periodic prescribed burning and, perhaps, additional measures such as mechanical brush control are needed in areas being encroached upon by aspen and willow. Restoration of barrens vegetation or sand prairie should be considered for appropriate upland sites. Clarification of the long-term impacts of the extensive hydrologic manipulations that have occurred here is also needed.

WC01 - Ball Road Flowages Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Cygnus buccinator	trumpeter swan	1999	S1B,SZN	G4	END
Tympanuchus phasianellus	sharp-tailed grouse	1999	S2B,S2N	G4	SC/M
Plants					
Bartonia virginica	yellow screwstem	1998	S3	G5	SC
Didiplis diandra	water-purslane	1997	S2	G5	SC
Myriophyllum farwellii	Farwell's water-milfoil	1997	S3	G5	SC

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Potamogeton diversifolius	water-thread pondweed	1997	S2	G5	SC
Utricularia geminiscapa	hidden-fruited bladderwort	1998	S3	G4G5	SC
Communities					
central poor fen	central poor fen	1997	S3		NA

WC02. SOUTH BLUFF TAMARACKS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R2E, parts of Sections 15, 22 and 23
Approximate Size:	310

Description of Site

This site features a remote, forested peatland in the bed of extinct Glacial Lake Wisconsin, dominated by relatively large tamarack up to approximately 8" d.b.h. Near its margins, it grades into tamarack bog, Muskeg, and Alder Thicket. The organic soils are peats of the Dawson and Greenwood series, with the water table quite near the surface. A thick layer of sphagnum mosses dominates the groundlayer of this swamp. Characteristic vascular plants include huckleberry, swamp dewberry, early blueberry, cinnamon fern, and sedges. In more open areas the frequent species are Canada bluejoint grass, tussock sedge, large-fruited cranberry, tag alder, balsam willow, and wool-grass.

The site is near the southern margin of a large, mostly open boggy meadow (Central Poor Fen) that has been extensively ditched and diked with attendant alterations in hydrology (see notes on "Ball Road Flowage"). An old corduroy logging road leads into the site.

To the south is a xeric upland forest on sands, managed primarily for commercial forest products and game animals. Forest dominants include young trembling aspen, white pine, red maple, Hill's and bur oaks. Two-track logging roads are common.

Significance of Site

This is one of the more mature, relatively undisturbed examples of this community type within the project area. The local hydrology is intact, though most of the non-forested peatlands in the vicinity have been modified by ditching, diking, and road construction.

Management Considerations

This tamarack swamp merits consideration for special management designation. There are few protected stands of this forest community in the central sands. Compare with other similar surveyed stands in the landscape.

WC02 - South Bluff Tamaracks Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
northern dry-mesic forest	northern dry-mesic forest	1980	S3	G4	NA
northern sedge meadow	northern sedge meadow	1980	S3	G4	NA
northern wet forest	northern wet forest	1980	S4	G4	NA
tamarack (poor) swamp	tamarack (poor) swamp	1997	S3	G4	NA

WC03. SOUTH BLUFF

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R2E, parts of Sections 23-26, 30, and 36
Approximate Size:	484

Description of Site

South Bluff is a steep, barren, northwest to southeast trending Cambrian sandstone outcrop approximately one mile long and 170 feet high, located in vast flat sandy uplands and peatlands in the bed of extinct Glacial Lake Wisconsin. The primary soil associated with the bluff is Plainbo Sand. The most extensive plant community is a mixed forest of oaks and pines. Canopy trees include Hill's/black oak, bur oak, red maple, paper birch, red pine, and white pine. The site has been periodically logged and burned, but is currently recovering well. The understory dominants are huckleberry and bracken fern. The north side of the bluff has a somewhat moister second-growth forest that supports tall shrubs such as witch hazel and maple-leaved viburnum. Typical herbs are wild sarsaparilla, big-leaved aster, and starflower.

There is an unused fire tower atop the western end of the ridge that can be accessed via a two-track road. The surrounding landscape is utilized for recreation, wildlife habitat, and commercial forest products.

Significance of Site

The site contains a relatively intact stand of a regionally important forest community. The bluff itself constitutes an interesting geological feature.

Management Considerations

No management recommendations or suggestions are offered at this time, thought the forest might be considered for extended rotation or the development of old-growth characteristics. Compare with other stands of this community type in the project area.

WC03 - South Bluff Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
northern dry-mesic forest	northern dry-mesic forest	1980	S3	G4	NA
northern sedge meadow	northern sedge meadow	1980	S3	G4	NA
northern wet forest	northern wet forest	1980	S4	G4	NA
southern dry-mesic forest	southern dry-mesic forest	1997	S3	G4	NA

WC04. COUNTY TRUNK HIGHWAY X SAND PRAIRIE

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	City Point, Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 15
Approximate Size:	6

Description of Site

This site contains dry sand prairie/barrens vegetation within a powerline right-of-way and along roadsides. Common plants include big and little bluestem, Indian grass, Canada bluegrass, Penn sedge, lupine, and many other prairie species, as well as barrens species such as sweet fern, poverty oatgrass, and early blueberry. The rare dwarf milkweed and Karner blue butterfly are present. The soils are Plainfield Sands. The site occurs in a matrix of second-growth Hill's oak – red pine – red maple forest. To the west is Corner Marsh, to the east a low quality sedge meadow/poor fen, and farther east, the Yellow River Bottoms (Babcock site). Private property abuts the southern and eastern margins of the site. In general, the surrounding area is managed for recreation, wildlife, and timber production.

Significance of Site

Conservation limitations include small site size and the linear configuration nature of the richer prairie patches. Although vulnerable to inadvertent disturbance or destruction, the prairie areas support several rare species and constitute one of the better examples of this community type in the project area. Sand prairies have been greatly diminished in the Central Sands landscape and everywhere else within their Wisconsin range.

Management Considerations

Periodic controlled burns and mechanical brushing are the preferable options for controlling encroaching woody vegetation. The use of herbicides in the right-of-way to control unwanted woody species could be damaging to both the rare plants and, indirectly, to the rare invertebrates that occur here. The potential for expansion of the prairie vegetation beyond the right-of-way should be explored carefully. In the meantime, it is important to work with the managers responsible for right-of-way maintenance to avoid unnecessarily damaging the site.

WC04 - County Trunk Highway X Sand Prairie Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR
Communities					
sand prairie	sand prairie	1997	S2		NA

WC05. WOOD COUNTY WILDLIFE AREA TAMARACKS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Wood
USGS 7.5' Quadrangle:	City Point
Town-Range-Section:	T21N-R2E, part of Section 31
Size:	315

Description of Site

This site contains a tamarack-black spruce swamp embedded in a large, hydrologically modified peatland in the bed of extinct Glacial Lake Wisconsin, in the southwestern corner of Wood County. The substrate is thick sphagnum moss and sedge peat over lacustrine sand. The trees in this swamp are small, densely stocked, and range up to 5" d.b.h. Canopy associates include white pine, red maple, and paper birch. The groundlayer is characterized by large sphagnum moss hummocks, with plentiful huckleberry, swamp dewberry, cinnamon fern, and various sedges. The site is located within a huge modified peatland encompassing over 50 square miles, with cranberry cultivation to the north, west, and east. Ditches and dikes have manipulated water levels in much of the surrounding wetland. Besides cranberry production, the adjacent lands and waters are managed for wildlife, timber production, and recreation. A north-south running town road occurs along the western boundary of the site.

Significance of Site

The site contains an intact bog forest of tamarack and black spruce bog forest. Several rare plants have been documented here.

Management Considerations

Maintain site hydrology to the degree possible with respect to this forest. The stand merits consideration for special management recognition and designation owing to its maturity, generally unmanipulated condition, and lack of similar opportunities elsewhere. More detailed animal work is warranted, especially for birds and invertebrates. Forested "islands" to the north and east of the mapped conifer swamp should also be surveyed in the future.

WC05 – Wood County Wildlife Area Tamaracks Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Plants					
Bartonia virginica	yellow screwstem	1998	S3	G5	SC
Carex cumulata	clustered sedge	1997	S2	G4?	SC
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Potamogeton diversifolius	water-thread pondweed	1997	S2	G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Communities					
Northern Wet Forest	Northern Wet Forest	1997	S4	G4	NA

APPENDIX E

Sandhill Wildlife Area Site Descriptions

Site descriptions for the Primary Sites that occur within the Sandhill Wildlife Area. See the main text for more details on site selection, methods, and definitions.

SH01. GALLAGHER FLOWAGES

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 4-6
	T22N-R3E, sections 20, 28, 29, and 31-34
Size:	2110

Description of Site

The Gallagher Flowages are extensively ditched and diked peatlands. The hydrologic manipulations date from the early 1900s as part of a failed attempt to cultivate the area. A fire burned the site in the 1930s, and when the land was acquired by public agencies in the 1950s and 60s, the old ditches were plugged to create flowages to benefit waterfowl and other wildlife. In open water areas, the flowage vegetation currently consists of stands of submergent and emergent aquatic macrophytes. Away from the influences of the ditches and dikes, sedge-dominated wet meadows and shrub swamp are typical vegetation types. The boggy meadows are characterized by various sedges, Canada bluejoint grass, hardhack, and other plants adapted to saturated, acidic peat and relatively low nutrient levels. Sphagnum mosses form the substrate in some areas. Shrub swamps are composed primarily of willows, bog birch, speckled alder, bog holly, and chokeberry.

The peat generally occurs as a thin layer, over sand that was part of the bed of extinct Glacial Lake Wisconsin. The adjacent sandy uplands are mostly forested, and managed at varying intensities to benefit wildlife (emphasizing game species), recreation, and timber products. Common trees include black and white oaks, pines, aspens, and red maple. Most of the Gallagher Flowages are within the Sandhill State Wildlife Area. Wood County Forest land occurs to the south, west, and east, and there is privately owned agricultural land to the north.

Significance of Site

Rare plants and animal species have been documented here, but the highest overall value is for the large numbers of migratory birds that use the site as a staging area. Waterfowl, cranes, shorebirds, raptors, and other groups all utilize the area heavily. The wetlands also provide significant breeding habitat for a number of sensitive birds. In general, the communities have been significantly affected by hydrologic manipulations or timber harvest. Native plants remain dominant, however, and no invasives problems were noted other than local infestations of reed canary grass.

Management Considerations

No management modifications are recommended at this time. Periodic monitoring for the presence of invasive species is desirable, followed by appropriate control measures as needed. Monitoring schemes designed to track population changes in use of this area by mammals, birds (including non-game species) and herptiles are especially desirable.

SH01 - Gallagher Flowages Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Acris crepitans blanchardi	Blanchard's cricket frog	1981	S1	G5T5	END	
Chlidonias niger	black tern	1999	S3B,SZN	G4	SC/M	
Cicindela patruela huberi	a tiger beetle	1998	S3	G3T2	SC/N	
Clemmys insculpta	wood turtle	1992	S3	G4	THR	
Cygnus buccinator	trumpeter swan	1999	S1B,SZN	G4	END	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Hemileuca sp 3	midwestern fen buckmoth	1991	S3S4	G3G4Q	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Plants						
Ceratophyllum echinatum	prickly hornwort	1998	S2	G4?	SC	

SH02. NORTH BLUFF

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 5-8
Size:	132

Description of Site

This site contains second-growth "Southern Dry-Mesic Forest" on the slopes and summit of a 200-foot high quartzite outcrop known locally as North Bluff. The bedrock rises abruptly from the nearly level sandy bed of extinct Glacial Lake Wisconsin. A severe fire burned this site and much of the surrounding area in the 1930s. Canopy trees include red oak, bur oak, red maple, bigtooth aspen, white pine and red pine, most of which are small. The sapling layer is composed of red maple, oak, and a few pines. There is a well-developed shrub layer of witch-hazel, maple-leaved viburnum, choke cherry, gray dogwood, brambles (*Rubus* spp.), American hazelnut, huckleberry, rose, poison-ivy, and northern bush-honeysuckle. The dominant understory herbs are Penn sedge, bracken fern, big-leaved aster, wild sarsaparilla, whorled loosestrife, starflower, and interrupted fern. Soils are Plainfield Sands and Fenwood Silt Loam.

There is an abandoned quarry at the north end of the site and a lookout tower at the summit. At the west and southeast bases of the bluff are two small old fields (of 8 and 18 acres) that are managed to maintain and promote sand prairie vegetation by periodic burning. The site is encircled by a two-track road. Beyond this there are extensive peatlands, altered by a system of dikes and ditches and currently managed for waterfowl and other wildlife.

Significance of Site

Rare invertebrates (a butterfly and a tiger beetle) have been documented near the bluff base. Protected examples of "Southern Dry-Mesic Forest" communities are uncommon in the central sands landscape, though this stand has been disturbed by logging and fire and is somewhat transitional, as it includes conifers and several "northern" understory species.

Management Considerations

Vehicular travel and use of logging equipment could easily lead to erosion on the steep sandy slopes. A consideration would be to allow the forests to mature and develop old-growth attributes. Limitations include small stand size and isolation.

SH02 - North Bluff

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Cicindela patruela huberi	a tiger beetle	1998	S3	G3T2	SC/N	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Communities						
Southern Dry-mesic Forest	Southern Dry-mesic Forest	1997	S3	G4	NA	

SH03. QUAIL POINT FLOWAGE PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 4, 5, 8, 9, 16, and 17
Size:	906

Description of Site

This peatland is located in the bed of extinct Glacial Lake Wisconsin between Bluegrass Flowage and Quail Point Flowages within Sandhill State Wildlife Area. Historically the primary wetland community was a boggy wet meadow (Central Poor Fen) on soils classified as Cathro Mucky Peat, Dawson Peat, and Greenwood Peat. These organic soils overlie lacustrine sand deposits. The dominant meadow plants are sphagnum mosses, tussock and narrow-leaved sedges, hardhack, and woolgrass.

To the west of this relatively intact peatland, plugged ditches have created two impounded flowages. The old drainage ditches are lined with willows (e.g., slender willow) and speckled alder. Other characteristic plant species include Canada bluejoint grass, several manna grasses (*Glyceria spp.*), various sedges (*Carex, Scirpus, Eriophorum*), and the invasive reed canary grass. Beds of emergent, floating-leaved, and submergent aquatic macrophytes occupy some of the shallow open water areas. Rare plants and animals are resident here.

The area is managed mainly for waterfowl. Site hydrology has been affected by ditch, dike, and road construction. The open meadow supports many resident birds that prefer this type of habitat, including Sedge Wren, Swamp Sparrow, Northern Harrier. Golden-winged Warblers are resident along the brushy peatland margins.

Significance of Site

The site supports several rare species and receives significant use by migratory waterfowl and other birds.

Management Considerations

Understanding the impacts of hydrologic alterations may be important to certain sensitive species, including herps, nesting birds, and invertebrates. Other than periodic monitoring of selected taxa, no management recommendations are offered at this time. Populations of invasive species also need to be monitored and controlled as appropriate and feasible.

SH03 - Quail Point Flowage Peatlands

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Acris crepitans blanchardi	Blanchard's cricket frog	1981	S1	G5T5	END	
Chlidonias niger	Black Tern	1999	S3B,SZN	G4	SC/M	
Clemmys insculpta	wood turtle	1992	S3	G4	THR	
Diadophis punctatus edwardsii	northern ringneck snake	1990	S3?	G5T5	SC/H	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Hemileuca Sp 3	midwestern fen buckmoth	1991	S3S4	G3G4Q	SC/N	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Ixobrychus exilis	Least Bittern	1999	S3B,SZN	G5	SC/M	
Lycaeides melissa samuelis	Karner blue butterfly	1993	S2S3	G5T2	SC/FL	LE
Podiceps grisegena	Red-necked Grebe	1999	S1B,SZN	G5	END	
Plants						
Potamogeton diversifolius	water-thread pondweed	1997	S2	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
Central Poor Fen	central poor fen	1997	S3		NA	

SH04. SANDHILL RIFLE RANGE

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 4 and 5
Size:	78

Description of Site`

This site consists of several low, forested ridges within Sandhill State Wildlife Area that have been used as sources of sand and gravel. The quarrying has created areas of unvegetated sand and gravel, and some of the pits contain water. The unusual site conditions have attracted several uncommon and rare species.

Significance of Site

Though the site is far from pristine it supports several rare invertebrates that require open or partially open conditions. Blanding's Turtles have also been recorded from this site during their breeding season.

Management Considerations

Significance of the rare species populations needs to be determined by the NHI Zoologist and Sandhill staff. At this time, limiting management activities to those that have created and will maintain the conditions that are favorable to these species is the most prudent course.

SH04 - Sandhill Rifle Range Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Acris crepitans blanchardi	Blanchard's cricket frog	1984	S1	G5T5	END	
Cicindela lepida	little white tiger beetle	1998	S2S3	G4	SC/N	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Orphulella pelidna	spotted-winged grasshopper	1998	S1?	G5	SC/N	

SH05. BISON PRAIRIE

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 3 and 4
	T22N-R3E, sections 33 and 34
Size:	496

Description of Site

This site, located within Sandhill State Wildlife Area, is dedicated to sand prairie/oak barrens restoration. It occurs on the nearly flat, poorly drained bed of an extinct glacial lakebed, about one-mile west of the Yellow River. The featured community type is quite open and prairie-like, and grades into more brushy vegetation that has a higher density of oak grubs and scattered pine. In the most intact part of site, the dominant grasses are big and little bluestem, indian grass, and Canada bluegrass (an exotic); common forbs include goldenrods, wild lupine, asters, bird's-foot violet, and the exotic sheep sorrel. To the southwest, the more open barrens grades site grades into Hill's oak barrens with a Penn sedge understory with sweet fern, blueberry, brambles, and little other floristic diversity. Parts of the site have been cultivated and grazed (by cattle) in the past. The site was recently burned via prescription to reduce woody cover. Areas with high canopy cover are also very brushy, with scattered oak trees and numerous oak grubs. The southeastern edge of the site grades into a wetland of shrub swamp and sedge meadow. Wetland dominants include bog birch, willows, sedges and Canada bluejoint grass.

Significance of Site

Site is significant in that it represents a hands-on attempt to restore rare biotic communities – sand prairie and oak barrens – using a combination of innovative methods. Several rare species are present, including the federally Endangered Karner blue butterfly, the frosted elfin, and dwarf milkweed.

Management Considerations

The site is actively managed using tree harvest, mechanical brushing, prescribed fire, and grazing - by a captive herd of bison. This should continue, unless monitoring at the community or rare species levels indicates that changes may be needed. The two track roads, bison trails, wallows, and watering holes create disturbed habitats; these should be monitored periodically to check for invasive species (and certain rare natives that might utilize such habitats, such as fameflower).

SH05 - Bison Prairie Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Callophrys irus	frosted elfin	1996	S1	G3	THR	
Emydoidea blandingii	Blanding's turtle	1998	S3	G4	THR	
Erynnis persius	persius dusky wing	1993	S2	G5	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Communities						
Sand Prairie	Sand Prairie	1997	S2		NA	

SH06. YELLOW RIVER BOTTOMS - BABCOCK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Babcock, Quail Point Flowage
Town-Range-Section:	T21N-R3E, sections 10, 11, 14, and 15
Size:	300

Description of Site

This site encompasses a mature deciduous floodplain forest along the Yellow River northwest of Babcock, within Sandhill State Wildlife Area. Common trees include silver and red maples, river birch, basswood, and red oak. The canopy is composed of large trees, with a good mix of size and age classes. There are few shrubs except for thickets of prickly ash. Saplings of red oak and basswood are present. The diverse herblayer includes spring ephemerals such as trout-lily, and rich site indicators such as Virginia waterleaf, woodland phlox, and green dragon are all common. This assemblage of understory plants is highly localized and relatively rare within the study area. At least one state threatened bird is present.

Adjacent forests have been periodically logged, at varying intensities. The Yellow River, which flows through the site, is a stream of extremely low gradient, with many meanders, oxbows, sloughs, and ponds. The soils are seasonally saturated or inundated, composed of glacial lake deposits and alluvial sediments. Local land uses include wildlife protection, recreation, and commercial timber production. Pine plantation monocultures occur on some of the nearby uplands.

Significance of Site

The site is relatively undisturbed, mature, has significant old-growth attributes, and a rich flora. At least one rare species has been documented here, and others, especially animals, are likely to occur. This stretch of the Yellow is an important component of a highly significant riverine corridor that is threatened by intensive timber harvest and, in some areas, cranberry farm development.

Management Considerations

Maintenance of mature, intact stands of Floodplain Forest is a high priority along the Yellow River corridor. Other opportunities are limited at this time and appear to be dwindling. It is recommended that this site be permitted to continue developing old-growth attributes, while retaining high canopy closure, to ensure that there are locations where sensitive animals preferring or dependent on intact stands of older forest can find secure habitat.

SH06 - Yellow River Bottoms

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Cicindela patruela huberi	a tiger beetle	1970	S3	G3T2	SC/N
Clemmys insculpta	wood turtle	1992	S3	G4	THR
Emydoidea blandingii	blanding's turtle	1998	S3	G4	THR
Rana catesbeiana	bullfrog	1998	S3	G5	SC/H
Plants					
Platanthera flava var *herbiola*	pale green orchid	1994	S2	G4T4Q	THR
Communities					

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
floodplain forest	floodplain forest	1997	S3	G3?	NA

APPENDIX F

Primary Aquatic Sites Within the Black River State Forest / Meadow Valley Landscape

Aquatic Site descriptions have been arranged alphabetically by waterbody name. These descriptions are limited to physical and biotic aspects of each site that pertain to aquatic features. Several of the Terrestrial Sites described in Appendices B-G contain additional information for terrestrial features that are associated with these aquatic sites and repeat some aquatic species mentioned here.

AQ01. BRANDY CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Wyeville, and Tunnel City.
Town-Range-Section:	T18N-R1E, parts of Sections 7-9; T18N-R1W, parts of Sections 1-2, 12, 33; and T19N-R1W, parts of Sections 28, 33-35.
Size:	Linear feature approximately 7.2 mi. long; about 5 mi. are in the study area.

Description of Site

A soft slightly acid brown tributary to Mill Creek. Sand and silt are the predominate substrates. Average width is 8ft. The site begins as a 1st order stream in upland forest of the Melrose Oak Forest and Savanna south of Warrens. Here it is cool enough to support trout. It is immediately impounded by two dams as it leaves the bluff lands of origin. After a few miles it reaches the Central Wisconsin Sand Plain and then flattens out. Here it has natural conditions for about a mile and a half. Downstream it is impounded for a cranberry operation, and below that to its mouth it is ditched.

Significance of Site

Middle section below the cranberry marsh is remarkably rich in abundance and diversity of aquatic invertebrates and stood out among the other streams sampled in the eastern part of the study area. The riffle areas had good populations of lotic species, and the shoreline areas, with their overhanging vegetation and undercut banks, had rich populations of predominantly lentic species. This stream may be a biotic refuge for aquatic macroinvertebrates for the general area, especially for lentic species that fly to streams to overwinter or avoid drought. The Special Concern water scorpion *Nepa apiculata* was discovered along the shoreline. While only sampled once, this site featured 39 aquatic invertebrate species including three Special Concern taxa, one of which is restricted to a few small, cool sandy streams in Wisconsin.

Management Considerations

This stream site is included because of the richness of aquatic invertebrate taxa despite a number of factors apparently causing degradation. Ditching, numerous impoundments and runoff were noted by field surveyors as the primary causes of degradation. Considerable silt was also noted. The upper section was formerly classified as a trout stream but is no longer being managed as such.

AQ02. BLACK RIVER

Location (Within the study area)

Subsection:	Central Wisconsin Sand Plain (222Ra), Neilsville Sandstone Plateau (222Rb), and Melrose Oak Forest and Savanna (222Lb)
USGS 7.5' Quadrangle:	Hatfield, Merrillan, Black River Falls, and Melrose.
Town-Range-Section:	T20N-R4W, parts of Sections 5, 8, 16-17, 20, 30-31; T21N-R4W, parts of Sections 1-2, 11, 14-15, 22, 27-28, 33; and T22N-R3W, parts of Sections 2-3, 9-10, 16-17, 20, 29-31; T22N-R4W, parts of Section 36; T23N-R3W, parts of Sections 35-36.
Size:	Linear feature approximately 148 mi. long; about 30 mi. are in the study area (~12 mi. are in the Black River State Forest).

Description of Site

A fast, large (6^{th} order) warm soft water stream with light brown water that borders the western edge of the study area and is the major stream in the area. Below Black River Falls, the Black River flows 62 miles without impoundment to the Mississippi. From the beginning of this segment at Lake Arbutus downstream to Black River Falls (about 13 river miles) the substrate is predominately gravel, boulders, rubble, bedrock and sand. At Black River Falls the river begins cut into sedimentary rather than igneous rock. As a result, the river here quickly flattens out and the bottom is dominated by gravel and sand downstream through the rest of the study area (to the Jackson/Monroe county border - about 17 river miles). In the Central Plain portion of its course, the Black River has formed a shallow steep sided trench, which is about 50 - 75 ft. lower than the adjacent uplands. As a result tributary streams from the east (which are generally low gradient) here descend rapidly cutting deep narrow gorges in their last few miles before entering the Black. Due to the large area of agricultural use of the watershed upstream of the study area, the narrowing of the river valley in the study area and flow manipulations due to the hydroelectric plant at Hatfield, the Black River is very subject to extreme fluctuations in flow and water levels.

Significance of Site

The 30 miles of Black River in the study area are very rich and contain about 200 species of macroinvertebrates including one Endangered, two Threatened and 18 Special Concern species. Five of the invertebrate species present are considered globally rare or imperiled. Fish diversity is also significant with 72 species, including 4 Threatened and 3 Special Concern species - two of which are globally rare. Mussel diversity was highest of the study area streams sampled with 13 species found alive including one Threatened and one Special Concern species. However densities were relatively low, and one species (*Cyclonaias tuberculata*) was only represented by dead shells. Much of the fish and mussel diversity is limited to the section below the dam at Black River Falls where substrate diversity and connectivity are greater. Also present here is a significant population of the state Threatened wood turtle, although numbers are greatly diminished since 1994.

Management Considerations

Flow fluctuations, both natural and those related to operation of two hydroelectric plants and high percentage of agricultural land in the watershed, are the primary management concerns. In the section above Black River Falls much of the river bottom is scoured by high flow extremes with the result of bare bedrock and unstable sand substrates. Over two miles of river channel directly below the Hatfield dam are de-watered by diversion of flow through a pipe for hydroelectric operation. Below Black River Falls flow fluctuations and riprapping of sandbanks appear to be the major concerns. Also some large-scale rock and sand quarries are situated very close to the river, both above and below Black River Falls. During this project inventory staff noted significant

turbidity, silt and sediment, livestock pasturing, barnyard runoff, septic systems, and urban and construction runoff as factors negatively affecting water quality.

AQ03. EAST FORK BLACK RIVER

Location

Subsection:	Neilsville Sandstone Plateau (222Rb)
USGS 7.5' Quadrangle:	Hatfield, Hatfield NE, City Point NW, City Point, City Point NE, Spaulding, Pittsville, Lindsey.
Town-Range-Section:	T22N-R1E, parts of Sections 19-22, 25-27; T22N-R2E, parts of Sections 4, 10, 14-15, 21-23, 28-30, 32; T22N-R1W, parts of Sections 5-11, 13-14, 24; and T22N-R2W, parts of Sections 1-6, 31, 36.
Size:	Linear feature approximately 44 mi. long; about 32 mi. are in the study area (3.3 mi. are in the Black River State Forest).

Description of Site

A medium-sized (5^{th} order) warm, fast, brown-water stream with very soft water that approximately parallels the north edge of the study area. The bottom is mostly sand with rubble, bedrock, and silt also present. Alternating long pools and riffles are characteristic of much of this stream. A few rapids are found in the lower 10-12 miles before the river enters Lake Arbutus. With the exception of cranberry operations in the City Point area, the watershed and shoreline are mostly forested or natural wetlands, especially in the study area. Annual fluctuations in flow are great.

Significance of Site

The major stream in the northern part of the study area, the East Fork has high macroinvertebrate diversity with 107 species including ten of Special Concern and three globally imperiled. There are also 30 fish species present, but none with special status. Along the East Fork Campground below the last rapids downstream to Lake Arbutus containing the best density of freshwater mussels in study area and good diversity with eight species (three Special Concern). Also found in this area are a series of open and partially wooded seeps which harbor two Special Concern beetle species.

Management Considerations

Good perceived water quality with no significant pollutant sources or habitat problems noted during this survey. Much of the headwaters in Clark County are considered intermittent. Increase of protective ownership or management in the watershed would help insure the viability of this system.

AQ04. HALLS CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra) and Neilsville Sandstone Plateau (222Rb)
USGS 7.5' Quadrangle:	Fair Child, Alma Center, Merrillan, and Black River Falls.
Town-Range-Section:	T22N-R3W, parts of Sections 6-7, 18-19, 30; T22N-R4W, parts of Sections 1, 12-13, 15-18, 22, 25-27, 35-36; and T22N-R5W, parts of Sections 1-2, 12-13, 21, 27-28, 34-35.
Size:	Linear feature approximately 18.7 mi. long; about 4.3 mi. are in the study area boundary (0.75 mi. are in the Black River State Forest).

Description of Site

A small to moderately sized (5^{th} order), light brown, very soft stream that originates in the Western Coulee and Ridges Ecological Landscape and is tributary to the Black River. The upper portion above Trow Lake Dam (a.k.a. Stockwell Creek) is predominantly sandy with a variety of other substrates. This section has a number of negative impacts including urban runoff, two impoundments, and a significant amount of agricultural land in the watershed. Below Trow Lake, Halls Creek is better protected and this is where the ecologically significant features are found. Here the substrate is more diverse with gravel, bedrock, rubble, sand and boulders. The lower few miles are deeply entrenched with steep slopes or cliffs with seeps and meander ponds adding to habitat diversity.

Significance of Site

Ninety species of aquatic invertebrates and 28 fish species (none with special status) have been found here including 10 Wisconsin Special Concern taxa (of which three are globally rare). The eight species of mussels is high for a stream this size.

Management Considerations

Poor condition of the watershed above Trow Lake and two permanent dams are the major management concerns. There also is an abandoned dam at SW1/4 S18 T22N R3W, Jackson County (Camp Bradfield) which still maintains a three-foot head due to the remnant structure.

AQ05. HAY CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Hatfield, and Hatfield SW.
Town-Range-Section:	T22N-R2W, parts of Sections 29, 30, 32; T22N-R3W, parts of Sections 22-25.
Size:	Linear feature approximately 5.5 mi. long; all are in the study area (4.8 mi. are in the Black River State Forest).

Description of Site

This small stream originates in open wetlands in the Central Sands and is immediately impounded to form the Staffon Flowage. Below the flowage the stream is un-dammed although the WDNR Dam Database shows a dam (Amos Elliott Dam) near its mouth at Morrison Creek (nothing was noted in 1997). The water is very soft and medium brown in color. Trout were not recorded but some of the invertebrates found in the lower section are indicative of cold water. Upstream the predominant bottom type is sand with small amounts of gravel and rubble. Downstream the amount of rubble and gravel increases. Lowermost portion of creek is 2nd order in size and is somewhat entrenched with small seeps exposed along the banks.

Significance of Site

This stream was chosen by the WDNR Regional Fish and Habitat Program as a reference site because of the intact condition of this small stream system and to monitor change due to a cranberry marsh in the headwaters. Ninety species of aquatic invertebrates and seven fish (none with special status) have been recorded, but one species is considered globally rare.

Management Considerations

Cranberry operations near the headwaters of Hay Creek have the potential to cause decreased flow, increased water temperature and chemical contamination downstream. are cause for and impoundments near the headwaters are the primary concern for this stream.

AQ06. HEMLOCK CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Babcock, Lake Dexter, Vesper, Sherry, and Arpin.
Town-Range-Section:	T21N-R3E, parts of Sections 1, 12-13, 23-24; T22N-R3E, parts of Sections 25, 26; T22N-R4E, parts of Sections 4-5, 8, 17, 19-20, 30-31; T23N-R4E, parts of sections 1, 12-14, 22-23, 27, 33-34; T23N-R5E, parts of Sections 6-7.
Size:	Linear feature approximately 26.2 mi. long; about 10.4 mi. are in the study area.

Description of Site

A small, 4th order, light brown, soft, warm water stream originating in agricultural uplands north of the study area and tributary to the Yellow River. Sand, gravel and rubble are the predominate bottom types. As it enters the Central Sands the stream channel becomes highly meandered and divided forming an unusual complex of wooded islands and extensively braided channels.

Significance of Site

This stream is known to harbor 54 aquatic invertebrate and 21 fish species including the State Threatened redfin shiner. The unique physical nature of the lower half provides a variety of habitats for aquatic and wetland species.

Management Considerations

A dam and flowage are upstream of the study area. Cranberry flowages drain directly into Hemlock Creek in the study area and are potential sources of decreased flow, increased water temperature and chemical contamination in Hemlock Creek.

AQ07. JAY CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Warrens West, Warrens East, and Wyeville.
Town-Range-Section:	T19N-R1W, parts of Sections 2-3, 10-13; T20N-R1W, parts of Sections 16, 21, 28, 33-34; T19N-R1E, parts of Sections 7, 18.
Size:	Linear feature approximately 9.7 mi. long; all are in the study area.

Description of Site

Jay Creek originates in the uplands just south of Knapp Mound and then flows through extensive wet forest for several miles. East of Warrens the creek is impounded as it enters a huge complex of cranberry marshes. The water is very soft and light brown with a moderate flow. Soft sand and muck are the predominate substrates. Undercut banks in highly meandered areas and oxbows in wet forest riparian zones offer additional habitat for aquatic organisms. Cold and cool water species are supported.

Significance of Site

Unlike many streams in the study area, Jay Creek is not impounded in its upper reaches. Also, the watershed appears to be in a relatively natural condition. Limited sampling has found 20 macroinvertebrate species including two Special Concern dragonflies and four fish species (none with special status). One of the dragonflies is a southern species which is very rare dragonfly in Wisconsin and another is a rare dragonfly associated with northern streams. About one and one half miles of stream frontage of Jay Creek and tributaries are protected as part of the Jay Creek State Natural Area.

Management Considerations

Continue to maintain the BRSF portion of watershed in a natural condition and expand acreage designated as State Natural Area upstream of the existing SNA.

AQ08. MADISON CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Millston.
Town-Range-Section:	T20N-R3W, parts of Sections 21-22, 28.
Size:	Linear feature approximately 1.5 mi. long; all are in the study area.

Description of Site

A 1st order cold, soft headwater stream originating in the sloped forested wetlands south of Oak Ridge and tributary to Robinson Creek. There are a number of very old beaver impoundments in the headwaters - some of them still active and providing a series of ponds. Open herbaceous vegetation borders the stream and impoundments.

Significance of Site

Brook trout and 36 species of aquatic invertebrates, including two SC taxa, were detected in the one survey done during this project. Although small, this stream appeared to be little altered by human activity and supported high invertebrate diversity for a cold water system.

Management Considerations

Beaver impoundments in this system appeared to be very old and undoubtedly add to the diversity of this site. Removal of beaver dams would not be recommended a this time. Maintenance of the overall forested or barrens landcover in the watershed would help maintain the quality of this site.

AQ09. MORRISON CREEK SYSTEM

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Hatfield NE, Hatfield SW, Hatfield SE, Hatfield, and Spaulding.
Town-Range-Section:	T21N-R1W, parts of Sections 7, 10-12, 15-17; T21N-R2W, parts of Sections 1-2, 12; T22N-R2W, parts of Sections 12, 13-18, 19-20, 27-29, 34-35; and T22N-R3W, parts of Sections 18, 23-24.
Size:	Linear feature approximately 25.3 mi. long; all are in the study area (15.8 mi. are in the Black River State Forest).

Description of Site

This site includes Mollies and Pollies creeks.

Morrison Creek is a very soft, medium sized (5th order), brown-water stream. An excellent variety of substrates are present, especially in the last few miles, and include sand, boulder, bedrock, rubble, gravel, and silt. The headwater area includes the extensive wetlands forming the Bear Bluff complex in the Central Plain as well as uplands along State Trunk Highway 54. East of the Black River State Forest, Morrison Creek is impounded by the Potter Flowage, and a number of associated cranberry bogs are located here. Shortly after it enters the State Forest its southern tributaries are impounded by the series of flowages in the Dike 17 Wildlife Area.

A significant tributary on the BRSF is the nearly eight mile long Mollies Creek. This is also a very softwater stream with brown water. The upper half of Mollies is ditched but appears to be recovering its former channel in places. The lower half-mile of Mollies is entrenched in sandstone as it approaches Morrison Creek. There is a small scenic waterfall in this segment. Just above the waterfall a very cold clear softwater tributary joins Mollies Creek.

Morrison Creek itself is not impounded in its last 24 miles. Above Oxbow Pond an uncommon softwater spring emerges near the bank and flows a few feet into Morrison Creek. Below Oxbow Pond the Morrison valley becomes noticeably more entrenched resulting in a dramatic gorge below CTH K to the Ho Chunk Indian Reservation. Here the stream enters a terrace where it meanders through lowland forest for its last mile before entering the Black.

Significance of Site

This stream was included because its lower section has excellent macroinvertebrate diversity (41 species) and composition for a waterbody this size. Four species are Special Concern; one of these is globally imperiled and two are globally rare. In addition some 21 fish species (none with special status) are found here. Mollies Creek has some 10 fish species (none with special status). No mussel species were found, probably because the water temperature is too low on average. A wide range of additional aquatic habitats related to the stream valley are found here including oxbows, floodplain wetlands, seeps, and at least one softwater spring and spring run.

Management Considerations

Flowages and ditches in the headwaters are the major concerns. Some of these are related to Cranberry marsh operation, some to the Dike 17 Wildlife Area and some have no current utility. Removal of flowages should be considered whenever feasible as has already happened on Black River State ownership.

AQ11. PERRY CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Black River Falls.
Town-Range-Section:	T21N-R4W, parts of Sections 26-27, 34-35.
Size:	Linear feature approximately 2.8 mi. long; all are in the study area (and all are in the Black River State Forest).

Description of Site

Perry Creek originates in Central Poor Fens just southwest of the old Jackson County Iron Mine. As these wetlands coalesce into surface flow as unnamed streams, they are impounded by an extensive system of cranberry flowages. The portion of this system named Perry Creek begins below the flowages and is only two miles long. Here the stream becomes entrenched in sandstone bedrock creating a steep valley with long sections of low, wet moss covered cliffs. Water is cold, light brown, and very soft warming to a cool water stream in the lower section. Sand and muck are predominant substrates in the upper section changing to shallow sand and gravel or sandstone bedrock downstream.

Significance of Site

High diversity of aquatic invertebrates (39 species) for a cool water system plus at least six fish species (none with special status) are known. Above the flowages the tributary streams are considered trout waters. Included in this site is a stretch of wet sandstone cliffs, which support a number of very rare aquatic insects. These rare taxa include two species of water scavenger beetles, a hebrid bug only previously know from one site in Wisconsin, and a state record caddisfly. This caddisfly is madicolous, living in very shallow water where there is a continuous coat of diatoms, other algae, and a cushion of moss or liverworts through which the water trickles. This is the first record of this species anywhere in 57 years, and represents one of only three sites known anywhere. The stream proper has one dragonfly species considered globally imperiled.

Management Considerations

Some significant turbidity was noted during one sample session done for this project. The proximity of Perry Creek Road to wet sandstone cliffs is of concern because of potential erosion, incompatible road maintenance, or vehicular accidents. The degree of headwater alteration is extensive and restoration should be considered.

AQ12. ROBINSON CREEK

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Shamrock, Millston, and Warrens West.
Town-Range-Section:	T20N-R2W, parts of Sections 19-23; T20N-R3W, parts of Sections 19-24, 28-29; and T20N-R4W, parts of Sections 15-16, 22-24.
Size:	Linear feature approximately 16.5 mi. long; all are in the study area (5.2 mi. are in the Black River State Forest).

Description of Site

A medium sized (4^{th} to 5^{th} order) stream with light brown, very soft, cool water with mostly sand substrate. Other substrates include bedrock in the lower section, with silt and gravel scattered throughout. The stream originates as about 12 headwater steams coming out of a portion of the Overmeyer Hills between Warrens and Millston. These streams quickly coalesce in an unnamed flowage. Below this flowage drainage from another flowage (Harkner Flowage) joins as Rudd Creek. The stream segment named Robinson Creek originates in the extensive Starlight Wetlands complex of the Central Sands as the outlet of a large unnamed flowage and in its first few miles has several cranberry flowages as tributaries. The stream meanders through a shallow, sterile sandy valley below Millston where its banks define a narrow zone of more mesic vegetation, which includes numerous seeps, alder thickets, and White Pine Red Maple Swamp. Below Millston, its southern tributaries originate in the Western Uplands. Over two miles above STH 27 Robinson Creek forms a series of shallow bedrock rapids and falls and forms a steep sided valley as it descends rapidly to its mouth at the Black River.

Significance of Site

High diversity of aquatic invertebrate species (60 taxa) plus 32 fish species make this stream an important feature. Several of these species are considered rare including two dragonflies, one damselfly, one stonefly, and one predaceous diving beetle. Two of these invertebrates are globally rare. The stream is also the main drainage for the southern part of the study area. Robinson Creek Pines State Natural Area protects about one half mile of stream frontage.

Management Considerations

Flowages, especially those associated with cranberry production, are a concern for maintenance of water quality. Changes such as decreased flow, warming temperatures, or chemical contamination are possible in segments downstream from these operations. One dam, maintained for a cranberry flowage, is located in the lower portion of the stream.

AQ13. YELLOW RIVER

Location (Within the study area)

Subsection:	Central Wisconsin Sand Plain (222Ra) and Neilsville Sandstone Plateau (222Rb)
USGS 7.5' Quadrangle:	Kelly, Necedah, New Miner, Finley, Quail Point Flowage, Babcock, Lake Dexter, Pittsville, Lake Manakiki, Spencer South, and Riplinger.
Town-Range-Section:	T17N-R4E, parts of Section 8; T18N-R3E, parts of Sections 1, 12; T19N-R3E, parts of Sections 2-3, 11, 13-14, 24-25, 35-36; T20N-R3E, parts of Sections 3, 10, 15, 22-23, 26, 35; T21N-R3E, parts of Sections 2-3, 10-11, 14-15, 23, 26-27, 34; T22N-R3E, parts of Sections 3, 10, 14-15, 22-23, 26-27, 35.
Size:	Linear feature approximately 64 mi. long; about 26 mi. are in the study area (only 0.5 mi. are in the Sandhill Wildlife Area)

Description of Site

The major stream of the eastern part of the study area, the Yellow is a medium sized (5^{th} to 6^{th} order) warm stream with light brown, soft water, and a predominantly sand bottom. This stream originates in Clark County in the agriculture-dominated portion of the Central Plain and is impounded by Lake Dexter in the northern part of the study area. Below Lake Dexter the Yellow is extremely meandered as it enters the bed of Glacial Lake Wisconsin. Development of floodplain forests and oxbow lakes is extensive here. Downstream near Babcock, the Yellow is less meandered until the mouth of Hemlock Creek, where again the Yellow becomes very meandered with numerous oxbow lakes in its floodplain. Below Sprague the channels of the river diverge repeatedly forming a maize of small channels with eventually merge into Necedah Lake.

Significance of Site

The major stream of the eastern part of the study area the Yellow supports a good diversity of macroinvertebrate species (81) including four designated as Special Concern, plus 40 fish species, one of which is designated Special Concern and is globally rare. Floodplain forest and oxbow lakes associated with the stream corridor are extremely well developed here and provide an abundance of diverse habitats for aquatic and wetland species.

Management Considerations

Field surveyors noted some significant water quality perturbations including slime and barnyard runoff, as well as less severe impacts due to livestock grazing, croplands, bank erosion, and septic waste. Diversity of macroinvertebrates at some sites sampled was abnormally low. Continued monitoring of this system is recommended.

APPENDIX G

Site Descriptions of Sites within the Study Area but Outside of the WDNR Properties

Descriptions of sites outside of the boundaries of those WDNR properties for which new master plans will be developed in the near future. See the main text for more details on site selection, methods, and definitions.

EX01. BLACK RIVER FALLS RAILROAD TRESTLE BARRENS

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Black River Falls
Town-Range-Section:	T21N-R4W, sections 1 and 12
Approximate Size:	19

Description of Site

This site is confined to a railroad right--of-way approximately 1 km. long just south of the Black River. The vegetation includes rich patches of native plants usually associated with sand prairie and open pine barrens communities. Surrounding lands have grown up into dense forests of pine and oak, though intensive harvests have opened the canopy in many areas. Historically this site would have been part of an extensive Sand Prairie-Pine Barrens complex.

Significance of Site

This site supports the federally endangered Karner blue butterfly, and contains one of the more diverse assemblages of prairie plants noted by field botanists anywhere in the study area.

Management Considerations

Feasibility of expanding the areas that might support barrens vegetation and associated rare species have not been fully explored here. The sandy outwash plains immediately east of the Black River and north of the city of Black River Falls contain some of the richest remnant patches of prairie flora documented within the study area, but much of the land is severely overgrown with woody species and is in private ownership. Most of these patches are now confined to roadsides or utility corridors.

EX01 - Black River Falls Railroad Trestle Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1994	S2S3	G5T2	SC/FL	LE
Communities						
Pine Barrens	Pine Barrens	1997	S2	G2	NA	

EX02. BROCKWAY PONDS & PEATLANDS

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Hatfield SW
Town-Range-Section:	T21N-R3W, sections 2, 3, 11, and 12
Approximate Size:	698

Description of Site

This poorly drained, nearly level site features a complex of small ponds, at least several of which exhibit natural water level fluctuations. During low water periods, the exposed, unvegetated pond margins can support highly specialized plants, several of which are disjunct from their primary ranges along the Atlantic Coastal Plain in the eastern US. Open, sedge-dominated wetlands are present (Central Poor Fen, and/or Northern Sedge Meadow), and these are best developed toward the eastern side of the site. Patches of alder or willow dominated shrub swamp occur on the wetland margins.

The uplands surrounding the ponds and wetlands support xeric forest composed mostly of pines and oaks, with jack pine the dominant tree species prior to a recent infestation of jack pine budworm that led to intensive salvage operations over much of the site.

Significance of Site

Natural bodies of standing water are very rare in the study area and this site contains the only aggregation of such features that we documented in this landscape. Several rare plants and invertebrates occur here.

Management Considerations

Protection of pond shorelines and site hydrology are the major considerations. No active management is needed at this time, though the shoreline of at least one of the ponds has been abused by irresponsible ATV use. Jackson County is the principal owner, with the eastern edge of the site (and part of the local drainage basin) falling within the boundaries of the Black River State Forest. Management options for the surrounding uplands have not been explored fully, but could include the use of periodic prescribed fire, mechanical brushing, and timber harvest. The ponds and wetlands may need to be posted against ORV/ATV use.

EX02 - Brockway Ponds and Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Aeshna verticalis	green-striped darner	1997	S3	G5	SC/N	
Lestes eurinus	amber-winged spreadwing	1997	S3	G4	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Plants						
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Scleria reticularis	reticulated nutrush	1997	S1	G4	END	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Communities						
Central Poor Fen	Central Poor Fen	1997	S3		NA	
Coastal Plain Marsh	Coastal Plain Marsh	2000	S1	G2?	NA	

EX03. BAUER BROCKWAY BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Black River Falls, Hatfield SW
Town-Range-Section:	T21N-R3W, section 16
Approximate Size:	201

Description of Site

Bauer Brockway Barrens occupies a level sand plain bisected from southeast to northwest by Indian Grave Creek, a small, sand-bottomed softwater stream. The site was severely burned in a 1977 fire that killed or set back many of the jack pine and oak trees that then comprised the dominant vegetation. Remnant barrens and sand prairie understory species that had persisted in treeless gaps or along nearby rights-of-way prior to the fire have apparently flourished, and are now widespread and locally dominant throughout much of the site. The native flora is diverse and includes good representation of characteristic groups such as the grasses, asters, blazing stars, goldenrods, sunflowers, milkweeds, and legumes. Oak grubs and scattered growths of young jack pine are common, and dominate some areas. The barrens community supports many "prairie" invertebrates, including several rare species. The state-threatened Blanding's Turtle occurs here. Resident birdlife includes Golden-winged Warbler, Chestnut-sided Warbler, Rufous-sided Towhee, Brown Thrasher, Vesper Sparrow, Clay-colored Sparrow, Field Sparrow, and Black-billed Cuckoo.

Indian Grave Creek is flanked by small, linear patches of wetland vegetation that includes shrub swamp (speckled alder, willow, winterberry holly) and wet meadow (Carex spp., Canada bluejoint grass) communities.

Surrounding land use includes a Jackson County Park (Wazee Park, the site of an abandoned iron mine) and extensive county forest lands, which are managed primarily to produce sustainable crops of trees adapted to droughty, infertile soils. Wetlands (Alder Thicket, Poor Fen, and Northern Sedge Meadow) are common in the local landscape. Ownership of this site is by Jackson County and WDNR-ER.

Significance of Site

The structure, floristic diversity, and rare invertebrates made this site a candidate for special management status, and "Bauer Brockway Barrens" was designated as a State Natural Area in 1997. Jackson County deserves a great deal of credit for their role in facilitating the designation of this important site.

Management Considerations

Periodic prescribed burns or mechanical brushing will be needed to maintain the semi-open conditions that are required by the most sensitive members of the barrens communities, including the rare species know to be present. Periodic monitoring of the vegetation, selected species groups (e.g., birds, herptiles), or rare species is highly desirable. Other county and state forest lands, especially to the north and east, also contain remnant barrens patches. These should be examined carefully to look for opportunities to arrange the configuration of openings utilizing periodic timber sales to connect the Bauer Brockway site with large open wetlands and uplands managed to maintain open conditions in the vicinity of Battle Point and Dike 17 Wildlife Area.

EX03 - Bauer Brockway Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Atrytonopsis hianna	dusted skipper	1994	S2?	G4G5	SC/N	
Callophrys irus	frosted elfin	2000	S1	G3	THR	
Chlosyne gorgone	gorgone checker spot	1994	S3	G5	SC/N	
Emydoidea blandingii	Blanding's turtle	2001	S3	G4	THR	
Erynnis martialis	mottled dusky wing	1991	S2	G3G4	SC/N	
Erynnis persius	Persius dusky wing	1992	S2	G5	SC/N	
Grammia phyllira	Phyllira tiger moth	1993	S2	G4	SC/N	
Hesperia metea	cobweb skipper	1994	S2	G4G5	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1994	S2S3	G5T2	SC/FL	LE
Meropleon ambifuscum	Newman's brocade	1999	S3	G3G4	SC/N	
Papaipema beeriana	Liatris borer moth	1997	SU	G3	SC/N	
Schinia indiana	Phlox moth	1994	S2?	GU	END	
Communities						
Pine Barrens	Pine Barrens	1997	S2	G2	NA	

EX04. MILLSTON BURN BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Millston
Town-Range-Section:	T20N-R3W, sections 1, 2, 11, and 12
Approximate Size:	1,014

Description of Site

This site is centered on a sandstone-cored ridge that burned severely in a 1977 "wildfire." Small, multi-stemmed "scrub" oaks (black and/or northern pin) are now the dominant vegetative cover in many areas, and most of the gaps created by the fire have already closed in. Small exposures of sandstone occur on the upper slopes of the ridge in several areas. Valleys and flats north and east of the ridge support pine plantations.

The site is just north and east of Interstate Highway 94. Jackson County is the primary owner.

Significance of Site

A number of rare invertebrates and plants have been documented here, almost all of them members of barrens assemblages. For the most part, they are restricted to open edges along trails, roadsides, or cliffs, where tree cover is not dense and conditions have remained relatively favorable for them.

Management Considerations

No specific management considerations are being offered at this time, other than to recognize the desirability of maintaining areas that are presently open and support native prairie vegetation. Restoration opportunities have not been assessed but appear to be significant for portions of the site. The boundary is very generalized and in need of refinement, and was drawn broadly to encompass the occurrences of rare species present, not necessarily to represent a "management" unit.

EX04 - Millston Burn Barrens

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Atrytonopsis hianna	dusted skipper	1996	S2?	G4G5	SC/N	
Callophrys henrici	henry's elfin	1996	S2	G5	SC/N	
Callophrys irus	frosted elfin	1996	S1	G3	THR	
Chlosyne gorgone	gorgone checker spot	1996	S3	G5	SC/N	
Erynnis martialis	mottled dusky wing	1995	S2	G3G4	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1998	S2S3	G5T2	SC/FL	LE
Schinia indiana	phlox moth	1996	S2?	GU	END	
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC	
Strophostyles leiosperma	small-flowered woolly bean	1997	S2	G5	SC	
Talinum rugospermum	prairie fame-flower	1997	S3	G3G4	SC	
Communities						
Oak Barrens	oak barrens	1997	S2	G2?	NA	

EX05. GLEN CREEK BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Millston
Town-Range-Section:	T20N-R2W, sections 19 and 30
	T20N-R3W, sections 24 and 25
Approximate Size:	311

Description of Site

This site occupies droughty infertile sands on rolling terrain that slopes gently toward the confluence of Glen and Robinson Creeks. Tree cover had been reduced in some areas due to an infestation of jack pine budworm in the late 1980s-early 1990s that thinned crowns of, or killed outright, older jack pine. The native understory has responded favorably to the diminished canopy cover and includes characteristic barrens plants such as goat's rue, rough blazing star, wild lupine, western sunflower, butterfly weed, and the rare dwarf milkweed.

Similar sites on state forest lands to the east were clearcut, treated with herbicides, and planted to red pine. Robinson Creek, and its tributary Glen Creek, are both sand-bottomed, softwater streams with relatively high biological values, that are situated within scenic corridors of large white pine.

Significance of Site

Several rare species occur here, including a federally endangered animal and a state-threatened plant. Robinson Creek State Natural Area is just to the east but is limited to a narrow, forested corridor bordering the stream. Robinson Creek has high biological values from the dam at Millston downstream to the Black River. There is very little development along the stream banks for a distance of over 10 miles.

Management Considerations

Periodic burning or mechanical brushing can be used to maintain open areas, in conjunction with timber management practices that contribute to open conditions around the most sensitive barrens remnants. The County Forest staff will need to be contacted to discuss management options for this site. There is an opportunity here to maintain a small area of pine barrens and several associated rare species populations within a landscape that includes extensive county forest, a State Natural Area, and a biologically important stream.

EX05 - Glenn Creek Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Stylurus scudderi	Zebra clubtail	1997	S3	G4	SC/N	
Plants						
Asclepias ovalifolia	Dwarf milkweed	1997	S3	G5?	THR	
Communities						
Pine Barrens	Pine barrens	1997	S2	G2	NA	

EX06. MORRISON CREEK BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra), Neilsville Sandstone Plateau (222Rb)
County:	Jackson
USGS 7.5' Quadrangle:	Hatfield SE, Hatfield SW
Town-Range-Section:	T21N-R2W, sections 4 and 5
	T22N-R2W, sections 20-23, 26-28, 33, and 34
Approximate Size:	2,716

Description of Site

This extensive area of former pine barrens occurs on nearly level, sandy, soils, on Jackson County Forest land. The barrens remnants are of variable quality, with the most intact areas featuring scattered grubs Hill's/black oak and patches of jack pine, over an understory composed of species such as little bluestem, big bluestem, junegrass, lupine, western sunflower, goat's rue, blueberries, sweet fern, hazelnut, prairie willow, and blazing star. Significant parts of the site have been recently converted to red pine plantations, following salvage cuts to remove budworm-damaged jack pine. Other portions of the site are periodically cut, and managed for even-aged stands of oak and/or aspen. To the west (on State Forest land) this site is bounded by Staffon Flowage, an abandoned cranberry farm with a high quality boggy meadow (Central Poor Fen) just to the southwest. To the northwest is a state correctional facility.

The corridors of Morrison Creek and its tributaries have high biological values and encompass small but valuable patches of wetlands that also support several rare species.

Significance of Site

This is one of the larger areas of remnant barrens vegetation and lands with high barrens management potential in the bed of Glacial Lake Wisconsin east of the Black River State Forest. In size and composition this site compares favorably with the study area's other sites. Lands with similar potential occur just to the east on the Black River State Forest.

The site supports numerous rare plants and animals, including the Karner blue butterfly, a rare tiger beetle, several dragonflies, arctic shrew, and Golden-winged Warbler.

Management Considerations

Continued fire suppression and conversion to pine plantations remain the most important challenges to managing a barrens ecosystem here. The feasibility of expanding the barrens to the north and south of State Highway 54 should be explored, as should possible flexibility in the configuration and timing of conducting timber harvests. Maintenance and expansion of the semi-open barrens vegetation is an especially important consideration at this site, not only because of the substantial population of Karner Blues and other rare species, but because there is an opportunity to connect these lands with open areas to the south and east. Nearby areas on the Black River State Forest, in the vicinity of Dike 17 Wildlife Area and along Morrison Creek also represent important opportunities. Management options should be explored with Jackson County Forest staff, DNR staff from Forestry and Wildlife Management, and other interested parties.

EX06 - Morrison Creek Barrens

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Cicindela patruela huberi	a tiger beetle	1996	S3	G3T2	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1997	S2S3	G5T2	SC/FL	LE
Communities						
Pine Barrens	Pine Barrens	1999	S2	G2	NA	

EX07. MARTIN MARSH

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Hatfield SE
Town-Range-Section:	T21N-R1W, sections 5-8
	T22N-R1W, section 31
	T22N-R2W, section 36
Approximate Size:	764

Description of Site

This large basin contains an extensive boggy meadow dominated by sphagnum mosses, sedges (especially *Carex oligosperma* and *C. utriculata*), and steeplebush. Small patches of shrub swamp, dominated by either speckled alder or bog birch, are present. There are also limited areas of small swamp conifers in the basin, with tamarack or jack pine the most important tree species.

Significance of Site

This site contains a large occurrence of Central Poor Fen, albeit one that has been periodically affected by the removal of the dominant plants, the sphagnum mosses. Site hydrology is apparently intact, a rare attribute for a peatland of this size in this landscape. Rare birds, e.g., Henslow's Sparrow and Northern Harrier, were noted here in the early 1980s, but no formal bird surveys have been conducted here since then.

Management Considerations

Sphagnum moss has been harvested repeatedly from much of the basin. This site is a strong candidate for inclusion within a region-wide study to examine the effects of moss harvest. Periodic breeding bird surveys should be conducted here, as habitat conditions do not appear to have been appreciably altered since the 1980s (though no Henslow's Sparrows were found during this study at several nearby locations that had supported them in the early `80s).

EX07 - Martin Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Cicindela patruela huberi	a tiger beetle	1971	S3	G3T2	SC/N	
Emydoidea blandingii	Blanding's turtle	1999	S3	G4	THR	
Euphyes bimacula	two-spotted skipper	1989	S2S3	G4	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1993	S2S3	G5T2	SC/FL	LE
Plants						
Bartonia virginica	yellow screwstem	1958	S3	G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Communities						
Northern Sedge Meadow	Northern Sedge Meadow	1981	S3	G4	NA	
Northern Wet Forest	Northern Wet Forest	1981	S4	G4	NA	
Southern Dry-Mesic Forest	southern dry-mesic forest	1981	S3	G4	NA	

EX08. SADDLE MOUND BARRENS & DRY FOREST

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Hatfield SE, Spaulding
Town-Range-Section:	T21N-R1W, sections 3, 4, 27, 28, and 33-35
Approximate Size:	1,008

Description of Site

This large pine-oak and pine barrens is centered on Saddle Mound, an east to west trending, one mile long, 400 foot high Cambrian sandstone "hogback" outcrop, as well as a number of smaller satellite mounds (such as 300 foot high Sugar Loaf Mound) to the southeast. State Highway 54 bisects the site from west to east, and Pray Road crosses it from north to south in the western part of the complex. The entire site is situated on very dry soil, much of it nearly pure sand, with Cambrian sandstone near the surface. Shrubby jack pine and Hill's oak (3-6" in diameter and only 4-7 meters tall) currently dominate the vegetation, over a depauperate understory of Penn sedge, bracken fern, huckleberry, poverty oat-grass, and early blueberry. There are scattered, usually small, openings that support a sand prairie flora that includes species such as lupine, little bluestem, big bluestem, showy goldenrod, foxglove, common blazing-star, and smooth aster.

Saddle Mound itself has a number of small patch communities treated as inclusions, such as dry cliff, moist cliff, and northern dry and dry-mesic forest. The south facing cliffs support an assemblage of drought adapted plants, including rock spikemoss, false heather, rough goldenrod, and sand cherry; these are now quite overgrown with trees and shrubs due to long periods of fire suppression. On the moister, shadier north face of the mound there are richer, better-developed, stands of red oak, red maple, paper and yellow birches, and aspens. The understory here supports northern species such as Labrador tea (on damp acid cliffs), bluebead lily, Canada honeysuckle, showy mountain-ash, and many ferns. There is an active lookout tower on top of the mound, and some erosion in the steep, sandy access roads and trails. Several rare plants and the rare Karner blue butterfly occur at the site. The surrounding are is used for timber production, recreation, and cranberry cultivation. The small village of Pray is located about one mile to the north.

Significance of Site

This is the highest point in Jackson County and the bed of extinct Glacial Lake Wisconsin, and represents an opportunity for large scale barrens restoration, extensive dry forest management, and rare species protection.

Management Considerations

The relative merits of barrens restoration and extensive forest management, or a mixture of both, need to be compared with other, similar opportunities in the central sands. Rare species protection is also an important consideration here.

EX08 - Saddle Mound Barrens and Dry Forest Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Gomphus viridifrons	green-faced clubtail	1997	S3	G3	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1995	S2S3	G5T2	SC/FL	LE
Plants						
Huperzia porophila	rock clubmoss	1997	S3	G4	SC	
Viola fimbriatula	sand violet	1997	S2	G5	END	
Communities						
Pine barrens	pine barrens	1997	S2	G2	NA	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
White pine-red maple swamp	white pine-red maple swamp	1981	S2	G3G4	NA	

EX09. PRAY FEN

Location

Subsection:	Central Wisconsin Sand Plain (222Ra), Neilsville Sandstone Plateau (222Rb)
County:	Jackson
USGS 7.5' Quadrangle:	Hatfield SE, Spaulding
Town-Range-Section:	T22N-R1W, sections 20 and 21
Approximate Size:	157

Description of Site

This peatland is located just south of Old State Highway 54 and just west of the village of Pray. The primary community is a boggy meadow (poor fen – central type), but the best (albeit small) quality areas have a more nutrient-demanding flora than any other open peatland documented in the bed of extinct Glacial Lake Wisconsin. Sedges were more common than sphagnum mosses in the areas surveyed, and include wire-leaved, broad-leaved, and tussock-forming species. Other characteristic plants include hardhack, chokeberry, white beakrush, balsam willow, rose pogonia, grass pink orchid, round-leaved and intermediate sundews, Buxbaum's sedge, and Arethusa orchid (very rare in central and southern Wisconsin).

To the west site conditions are wetter, with Small's spikerush inhabiting shallow pools of standing water. Farther south is a fringe of alder thicket, and, south of that, a small swampy stand of second-growth white pine, red maple, jack pine, Hill's oak, cinnamon fern, skunk cabbage, and winterberry holly. Several rare plant species are present.

In a larger context, this site is embedded in an area utilized for commercial forestry, cranberry cultivation, and recreation.

Significance of Site

The ecologically richest portions of this site support more nutrient-demanding plant species than are typically found in the central sands poor fens. That factor alone makes additional protection a priority consideration. A number of rare species were documented here, including several that are rare elsewhere in the central sands. Rare animals are known to inhabit nearby forests.

Management Considerations

Site hydrology is impacted by the maintenance of roads and a railroad grade to the north, and the channelization of White Creek, which bisects the site from east to west. Any future alteration of hydrology, including restoration activities, should consider effects on the unusual aspects of this wetland. Additional data on water chemistry, nutrient levels, and water flow is highly desirable here, as is vegetation sampling. Commercial moss harvest is not recommended at this time.

EX09 - Pray Fen Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Sorex hoyi	pigmy shrew	1976	S3	G5	SC/N
Plants					
Arethusa bulbosa	swamp-pink	1998	S3	G4	SC
Bartonia virginica	yellow screwstem	1998	S3	G5	SC
Polygala cruciata	crossleaf milkwort	1998	S3	G5	SC
Communities					

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Central poor fen	central poor fen	1998	S3		NA

EX10. AMMUNDSON MARSH

Location

Subsection:	Neilsville Sandstone Plateau (222Rb)
County:	Jackson
USGS 7.5' Quadrangle:	City Point NE, City Point NW
Town-Range-Section:	T22N-R1E, sections 3, 4, 8-11, and 15-17
Approximate Size:	1606

Description of Site

This site encompasses a large, acid, open peatland currently typed as a Central Poor Fen. The dominant plants are wire-leaved sedges and sphagnum mosses. There are several small forested "islands" within the open peatland, and a 40 acre tamarack swamp in the eastern part of the basin. Water drains from the wetland into the East Fork of the Black River via at least small headwaters creeks. The ownership is approximately equally divided between Jackson County and private owners. The commercial harvest of sphagnum moss has been widespread, and has occurred frequently in some parts of the basin. Updated survey work is needed here. A small dam at the southwest corner of the site has apparently not had a significant impact on site hydrology. This wetland is bordered by nearly level, sandy uplands supporting a managed forest of pines, oaks, and aspen. Recreational use is significant. There is a commercial cranberry operation to the south of the site.

Significance of Site

This large peatland has escaped the severe hydrologic alterations that have influenced a majority of the wetlands in this region.

Management Considerations

Throughout the central sands, the impacts of mossing need additional study to enable managers to make more informed land use decisions. This site would be an excellent candidate for inclusion in such a project. Additional surveys for rare species are desirable, particularly for birds and specialized invertebrates.

EX10 - Ammundson Marsh Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Communities					
Central Poor Fen	Central Poor Fen	1980	S3		NA

EX11. SPAULDING PEATLANDS

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Spaulding
Town-Range-Section:	T21N-R1E, sections 5 and 6
	T21N-R1W, sections 1 and 12
	T22N-R1E, sections 28, 29, and 31-33
Approximate Size:	758

Description of Site

These peatlands are located in or close to the bed of extinct Glacial Lake Wisconsin. They are located to the south of State Trunk Highway 54, to the east of Lone Pine Lane, and to the north of Ellis Lane. The open wetland is a boggy meadow (Central Poor Fen) dominated by sphagnum mosses and various sedges. Small acreages of tamarack-dominated conifer swamp and shrub swamp also occupy portions of this basin**.** The southwestern portion of the wetland fen has been altered by the repeated commercial harvest of moss but basin hydrology is far less compromised than for most of the larger peatlands in the ecoregion.

At least two rare invertebrates reside in the open peatland. Several rare bird species were documented here in the early 1980s (Northern Harrier, Henslow's Sparrow). These breeding bird surveys should be rerun, as this site got limited attention during the current inventory project.

The surrounding uplands are forested with Hill's oak and jack pine and are utilized for timber production and recreation. To the south and northeast, continuations of this peatland are utilized for mossing and limited timber production.

Significance of Site

This basin is relatively unimpacted by dikes, ditches, or water control structures. Several rare animals inhabit the open wetlands.

Management Considerations

Maintain site hydrology. Spaulding Peatlands is a strong candidate for inclusion in a study on the effects of commercial moss harvest. Highway 54 crosses the north end of the wetland basin but hydrological impacts are not obviously significant. Periodic monitoring to assess vegetation changes and trends is desirable.

EX11 - Spaulding Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Oeneis jutta	jutta arctic	1999	S3	G5	SC/N
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N
Plants					
Utricularia geminiscapa	hidden-fruited bladderwort	1997	S3	G4G5	SC
Communities					
Central Poor Fen	Central Poor Fen	1980	S3		NA
Northern Sedge Meadow	Northern Sedge Meadow	1981	S3	G4	NA
Northern Wet Forest	Northern Wet Forest	1981	S4	G4	NA

EX12. DEER ISLAND CONIFER SWAMP

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	City Point, Spaulding
Town-Range-Section:	T21N-R1E, sections 5-24
	T21N-R1W, sections 12, 13, and 24
	T21N-R2E, sections 7 and 18
Approximate Size:	8,300

Description of Site

This extensive, remote, relatively undeveloped site encompasses several mapped community occurrences of Northern Wet Forest (Black Spruce Swamp, Tamarack Swamp) and White Pine-Red Maple Swamp. They occur in a level basin in the sandy bed of extinct Glacial Lake Wisconsin. The Northern Wet Forests are composed of black spruce and tamarack, with occasional white pine. Structure varies from high canopy closure to somewhat open. Seedlings and saplings of the dominant trees are at leas locally common. The major soil type is Loxley Peat. Shrub layer dominants include huckleberry, winterberry holly, swamp dewberry, and mountain holly. The herbaceous layer is composed of sphagnum mosses, cinnamon fern, narrow-leaved sedges, bunchberry, and cotton-grasses are frequent. In some areas the shrub component includes acidophiles such as bog laurel and bog rosemary.

These wet acid swamps of spruce and tamarack grade into wet-mesic stands of White Pine-Red Maple Swamp on their upland margins, most of which show evidence of selectively logging. Important shrubs include speckled alder, winterberry holly, and mountain holly. A thin but often continuous carpet of sphagnum mosses is present, and cinnamon fern and skunk cabbage are abundant. Soils are typed as Dawsil Mucky Peat of the Ironrun – Pony Creek Complex.

Large, open, sedge-dominated peatlands to the east (e.g., near Cranberry Road) are privately-owned and inaccessible, but provide good quality habitat for a number of rare species.

A sandy, often all but impassable, two-track road traverses the site from east to west and separates the two large blocks of conifer swamp. Ditches have affected site hydrology, though in some areas impacts do appear to be severe, at least at this time. Other areas may be drying out, and in some cases water level manipulations (including beaver dams) have drowned stands of trees. Low sandy ridges bordering the wetlands are forested with mixtures of species adapted to dry acid conditions that are characteristic of this region, such as oaks (including Hill's/black, white, red, and bur), aspens, red maple, and paper birch. Land control is about evenly divided between Jackson County and large private landowners (principally cranberry growers who have cultivate this crop to the east and north).

Significance of Site

This site is significant for its large size, but its quality and long-term viability may have been compromised by hydrologic modifications, especially ditching. Additional survey work is needed, with a breeding bird survey and rare plant work the highest priorities. Central Wisconsin conifer swamps constitute highly significant habitat for many northern birds, some of which are rare or highly localized in southern Wisconsin. Several rare plants were documented here.

Management Considerations

Collect additional information to better establish the site's values. Monitor changes in hydrologic regime, vegetation structure, and composition.

EX12 - Deer Island Conifer Swamp Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Chlidonias niger	Black Tern	1999	S3B,SZN	G4	SC/M	
Cicindela patruela huberi	a tiger beetle	1972	S3	G3T2	SC/N	
Haliaeetus leucocephalus	Bald Eagle	1981	S2N,S3B	G4	SC/FL	LT,PD
Hemileuca sp 3	Midwestern fen buckmoth	1970	S3S4	G3G4Q	SC/N	
Ixobrychus exilis	Least Bittern	1999	S3B,SZN	G5	SC/M	
Oporornis agilis	Connecticut Warbler	1999	S3B,SZN	G4	SC/M	
Psinidia fenestralis	sand locust	1998	S1S2	G5	SC/N	
Somatochlora incurvata	warpaint emerald	1998	S2	G4	END	
Plants						
Bartonia virginica	yellow screwstem	1997	S3	G5	SC	
Carex folliculata	long sedge	1997	S3	G4G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Thelypteris simulata	bog fern	1997	S3	G4G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1998	S3	G4G5	SC	
Communities						
Northern Wet Forest	Northern Wet Forest	1997	S4	G4	NA	
White Pine-Red Maple Swamp	White Pine-Red Maple Swamp	1997	S2	G3G4	NA	

EX13. MCKENNA CREEK PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Spaulding
Town-Range-Section:	T21N-R1W, sections 21-28
Approximate Size:	

Description of Site

This site features a second-growth stand of dry-mesic forest dominated by medium-sized white and red pines. Canopy associates include red maple and oaks. White pine is well-represented in the sapling layer. Shrubs include witch hazel, hazelnut, huckleberry, and blueberries. Common herbs are Penn sedge, bracken fern, wintergreen, starflower, Canada mayflower, and wild sarsaparilla, and clubmosses. The forest is situated on a sandy ridge near the margin of extinct Glacial Lake Wisconsin.

Goodyear Road, a sandy two-track that was formerly a railroad grade, is immediately adjacent to the site. To the east there is an extensive complex of sandy ridges interspersed with parallel fingers of peatland communities that should be surveyed in the future.

Significance of Site

This site represents one of the more intact stands of pine-dominated dry-mesic forest in the study area.

Management Considerations

Jackson County is the owner. County Forest staff should be contacted to review any existing management plans, and explore future options for this site.

EX13 - Mckenna Creek (Big Cut) Pines Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Communities					
Northern Dry-Mesic Forest	Northern Dry-mesic Forest	1997	S3	G4	NA

EX14. BEAR BLUFF PEATLANDS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Warrens East, City Point, Mather, Spaulding
Town-Range-Section:	T20N-R1E, sections 3-20 and 30
	T20N-R1W, sections 1, 2, 11-14, and 23-26
	T21N-R1E, sections 19-23 and 26-34
	T21N-R1W, sections 24-26, 35, and 36
Approximate Size:	18,680

Description of Site

This vast complex occupies the least developed portions of an area formerly occupied or strongly influenced by the bed of extinct Glacial Lake Wisconsin. The major community include open acid peatlands of bog, poor fen, and muskeg; acid conifer swamps of several types; and sandy upland forested with pine, oak, and aspen. Some of the individual community patches are quite large, covering several hundred acres. Small patch communities are also present, and these include pine barrens, alder thicket, and dry cliff. One of the larger relatively undisturbed open peatlands differs from those found at most other locations in the central sands in that ericaceous shrubs, especially leatherleaf, are among the dominants. Sphagnum mosses and sedges are the other dominant plants. In some areas a muskeg of scattered, stunted black spruce and tamarack is present. This in turn grades into a boggy forest of rather small black spruce and tamarack, with a well-developed tall shrub layer composed of huckleberry, chokeberry, winterberry holly, speckled alder, mountain holly, and bog birch. Beneath the tall shrub stratum the understory consists mostly of sphagnum mosses, sedges, and Labrador tea. At the margins of this acid conifer swamp there are sometimes stands of wet-mesic white pine-red maple swamp, that sometimes contain small amounts of yellow birch.

The extensive upland forests occur on low sandy hills, ridges, and on islands within the extensive bogs and fens. The dominant trees are pines, oaks, aspens, and paper birch, in various mixtures. Red pine plantations are prominent in some areas. Bear Bluff, a prominent 230 foot high outcrop of Cambrian sandstone, is vegetated with a second-growth forest of white and red pines, several oaks, and aspen.

Numerous rare or regionally uncommon animals and plants, many with northern affinities, are present. These include sandhill crane, northern harrier, yellow-bellied flycatcher, white-throated sparrow, raven, and timber wolf. Rare plants present include bog fern, long sedge, and cliff goldenrod. Surrounding lands are used for cranberry cultivation (to the south and east), and commercial forestry (to the north and west). Sandy two track roads traverse the western and northern margins of the site.

Significance of Site

This site encompasses a representative and relatively undeveloped portion of the Glacial Lake Wisconsin landscape. The vast peatlands and extensive forests support a high diversity of plants and animals that are either rare elsewhere in the state or are generally restricted to the north. Examples of these include timber wolf, black bear, northern goshawk, sharp-shinned hawk, sharp-tailed grouse, northern raven, saw-whet owl, many “northern “wood warblers, LeConte’s sparrow, Lincoln’s sparrow, and many rare plants and invertebrates.

Management Considerations

Though wild and relatively undeveloped, much of the site has been affected by hydrologic alterations (ditching and diking), past forest exploitation, suppression of wildfire, commercial harvest of sphagnum moss, and encroachments from agricultural developments. Fortunately, the ditches are rather distantly spaced and there are no impoundments, so the alteration has not been extreme. A significant percentage of this large site is in a few large, private ownerships.

EX14 - Bear Bluff Peatlands Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Aeshna tuberculifera	black-tipped darner	1997	S3	G4	SC/N
Aeshna verticalis	green-striped darner	1999	S3	G5	SC/N
Ammodramus henslowii	Henslow's sparrow	1994	S2S3B,SZN	G4	THR
Gavia immer	common loon	1999	S3S4B,SZN	G5	SC/M
Hemileuca sp 3	Midwestern fen buckmoth	1970	S3S4	G3G4Q	SC/N
Oeneis jutta	jutta arctic	1994	S3	G5	SC/N
Psinidia fenestralis	sand locust	1998	S1S2	G5	SC/N
Somatochlora franklini	delicate emerald	1998	S2S3	G5	SC/N
Somatochlora incurvata	warpaint emerald	1998	S2	G4	END
Somatochlora kennedyi	Kennedy's emerald	1990	S3	G5	SC/N
Somatochlora tenebrosa	clamp-tipped emerald	1989	S2	G5	SC/N
Spharagemon marmorata	northern marbled locust	1998	S2S3	G5	SC/N
Williamsonia fletcheri	ebony bog haunter	1999	S3S4	G3G4	SC/N
Williamsonia lintneri	ringed boghaunter	1998	S2S3	G3	SC/N
Plants					
Bartonia virginica	yellow screwstem	1997	S3	G5	SC
Carex cumulata	clustered sedge	1997	S2	G4?	SC
Carex folliculata	long sedge	1997	S3	G4G5	SC
Gnaphalium helleri	Catfoot	1998	S1	G4G5	SC
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC
Solidago sciaphila	shadowy goldenrod	1997	S3	G3G4	SC
Strophostyles leiosperma	small-flowered woolly bean	1997	S2	G5	SC
Thelypteris simulata	bog fern	1997	S3	G4G5	SC
Utricularia geminiscapa	hidden-fruited bladderwort	1958	S3	G4G5	SC
Communities					
Central Sands Pine-Oak Forest	Central Sands Pine-Oak Forest	1997	S3	G3	NA
Northern Dry-mesic Forest	Northern Dry-mesic Forest	1997	S3	G4	NA
Northern Wet Forest	Northern Wet Forest	1997	S4	G4	NA
Open Bog	Open bog	1986	S4	G5	NA
Tamarack (poor) Swamp	Tamarack (poor) Swamp	1997	S3	G4	NA

EX15. JAY CREEK PINE FOREST

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Jackson
USGS 7.5' Quadrangle:	Warrens East, Warrens West
Town-Range-Section:	T20N-R1W, sections 21, 22, 27, 28, 33, and 34
Approximate Size:	1,220

Description of Site

The site is located approximately three miles to the east of the southeast corner of the Black River State Forest, encompassing the headwaters and upper reaches of Jay Creek, a tributary of the Lemonweir River. Most of the site is forested, with extensive stands of older second-growth white pine-red maple swamp. Canopy associates include yellow birch, paper birch, red oak, red pine, and black spruce. The understory is composed of sphagnum mosses, skunk cabbage, goldthread, sedges, and dense growths of cinnamon fern. Thickets of winterberry holly and sapling white pine are common and scattered throughout the forest. The forest is laced with springs and spring runs that feed Jay Creek. The surrounding vegetation is a matrix of commercial managed pine-oak forest, some in private lands, the rest part of the Jackson County Forest.

The adjoining uplands typically support dry-mesic forest of white pine, red pine, red maple, black/Hill's oak, red oak, and paper birch, over hazelnut, bracken fern, early blueberry, wintergreen, and huckleberry. Stand condition is variable, but some are relatively intact, with large trees and high canopy closure.

Resident birds include Northern Raven, Red-breasted Nuthatch, Veery, Canada Warbler, Blackburnian Warbler, Black-throated green Warbler, Pine Warbler, Blue-headed Vireo, Winter Wren, and Red-shouldered Hawk.

Significance of Site

This is one of the finest examples in the state of a mature White Pine – Red Maple Swamp. Few, if any, forests of this type of comparable size or quality have been documented by the Natural Heritage Inventory elsewhere in the state. The majority of stands of this forest community are associated with the margins of extinct Glacial Lake Wisconsin in the Central Sands ecoregion.

Large populations of the rare disjunct plants bog fern and long sedge are present. The avifauna includes rare species and significant numbers of other birds that are generally rare this far south in Wisconsin.

Management Considerations

Part of this site is owned by the WDNR and has been designated as a State Natural Area. Watershed protection, increasing the area of forest within the SNA, and working with nearby landowners to maintain a high percentage of forest cover in the local landscape are key management considerations. Forest management compatibility is also important to ensure the long-term viability of both the communities and the sensitive species populations present.

EX15 - Jay Creek Pine Forest Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Animals					
Accipiter gentilis	Northern Goshawk	1982	S2N,S2B	G5	SC/M
Buteo lineatus	Red-shouldered Hawk	1994	S1N,S3S4B	G5	THR

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Somatochlora elongata	Ski-tailed emerald	1997	S2S3	G5	SC/N
Somatochlora tenebrosa	Clamp-tipped emerald	1997	S2	G5	SC/N
Plants					
Carex folliculata	Long sedge	1991	S3	G4G5	SC
Thelypteris simulata	Bog fern	1973	S3	G4G5	SC
Communities					
Northern Dry Forest	Northern Dry Forest	1981	S3	G3?	NA
Southern Dry Forest	Southern Dry Forest	1981	S3	G4	NA
Stream—Slow, Soft, Cold	Stream--Slow, Soft, Cold	1981	SU		NA
White Pine-Red Maple Swamp	White Pine-Red Maple Swamp	1981	S2	G3G4	NA

EX16. SPRAGUE-MATHER FLOWAGE BARRENS - WEST

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Finley
Town-Range-Section:	T19N-R2E, sections 1 and 6
	T20N-R2E, sections 36
Approximate Size:	350

Description of Site

This is an oak barrens on the northwest side of Sprague-Mather Flowage that has been restored to "brush prairie" status by a combination of mechanical brushing and prescribed burning. The dominant/characteristic vegetation is a mixture of heathland and sand prairie species. Especially prominent are grubs of Hill's oak (20-30% cover), little bluestem, junegrass, lupine, showy goldenrod, blueberries, azure aster, and sweet fern. Resident animals include Karner blue butterfly, common nighthawk, towhee, brown thrasher, and yellow warbler. Historical records indicate that the site was originally an open pine barrens, but pine has been locally eliminated and now Hill's oak is the dominant tree.

Surrounding lands and waters are used for resource protection and recreation. Nearby wetlands have been hydrologically altered via the construction of an extensive ditch system in the 1920s or 30s. Once the focus shifted to wildlife protection, the ditches were plugged and a dike system was built to create large flowages. Following severe fires in the 1930s and failed attempts at agriculture, the implementation of fire suppression policies had led to the development of a densely stocked, closed canopy forest of oak, pine, and aspen.

Significance of Site

The site has a good complement of prairie and barrens associated plants and animals, including the Karner blue butterfly. It is not a large site, but could be expanded.

Management Considerations

The site is being actively managed to maintain and restore a barrens community and provide habitat for associated species, including the federally endangered Karner blue butterfly.

EX16 - Sprague Mather Flowage Barrens-West Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Clemmys insculpta	wood turtle	1985	S3	G4	THR	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Communities						
Northern Sedge Meadow	Northern Sedge Meadow	1982	S3	G4	NA	
Oak Barrens	Oak Barrens	1992	S2	G2?	NA	
Shrub-Carr	Shrub-Carr	1982	S4	G5	NA	

EX17. SPRAGUE-MATHER FLOWAGE BARRENS - EAST

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Finley
Town-Range-Section:	T20N-R3E, sections 28 and 33
Approximate Size:	323

Description of Site

This site occupies a series of low, curving, sandy, infertile ridges (on the eastern border of the Sprague-Mather Flowage within Necedah National Wildlife Refuge. The primary plant community is a managed oak barrens with a brush prairie aspect. A small grove of Hill's oak woodland occurs on the eastern edge of the site. Hill's (and/or black) oak grubs 1-2.5 meters high are abundant. Characteristic groundlayer plants include little bluestem, Junegrass, sweet fern, showy goldenrod, lupine, rough blazing star, early blueberry, and western sunflower.

Rare invertebrates occur at the site, including the Karner blue and Persius dusky-wing butterflies). Resident birds include Common Nighthawk, Eastern Kingbird, Rufous-sided Towhee, Brown Thrasher, Chestnut-sided and Yellow Warblers, Black-billed Cuckoo, and Eastern Bluebird.

The site occurs on an ancient dune system created shortly after now extinct Glacial Lake Wisconsin drained. Surrounding lands are used primarily for resource protection and recreation. In the past, this landscape was greatly modified by drainage schemes, attempts at agriculture, and severe fires.

Significance of Site

The site is small, but similar communities are located nearby and expansion or connection of the existing patches is feasible. Invasive plants are relatively scarce, and the native barrens flora is representative. A number of rare or otherwise significant animals are present.

Management Considerations

The site is currently managed by prescribed burning and mechanical brushing. A landscape-scale mosaic of uplands and wetlands provides management flexibility for fire-sensitive but disturbance dependent species (such as the Karner blue). Design of prescribed burn units needs to ensure the long-term viability of fire sensitive species that have poor dispersal capabilities, such as the Karner blue. Diverse vegetation structure should be maintained in the vicinity, but appropriate areas should be managed permanently in a semi-open barrens condition. Expansion and connection of the existing barrens remnants is an important consideration.

EX17 - Sprague Mather Flowage Barrens-East Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Hesperia leonardus leonardus	Leonard's skipper	1992	S3	G4T4	SC/N	
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Plants						
Bartonia virginica	yellow screwstem	1998	S3	G5	SC	
Polygala cruciata	crossleaf milkwort	1997	S3	G5	SC	
Utricularia geminiscapa	hidden-fruited bladderwort	1998	S3	G4G5	SC	

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Communities						
Northern Sedge Meadow	Northern Sedge Meadow	1982	S3	G4	NA	
Oak Barrens	Oak Barrens	1992	S2	G2?	NA	
Shrub-Carr	Shrub-Carr	1982	S4	G5	NA	

EX18. NECEDAH OAK-PINE SAVANNA

Map ID# EX18

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Finley
Town-Range-Section:	T19N-R2E, sections 12
	T19N-R3E, sections 7
Approximate Size:	274

Description of Site

The core of the primary community represented here is a dry jack pine – Hill's oak forest classified as pine barrens (130 acres). The site is located in the bed of extinct Glacial Lake Wisconsin about one mile south of the western end of the Goose Pool portion of the Sprague-Mather Flowage. The terrain is near-level, offering little topographic relief. The canopy is semi-open, and the understory supports many characteristic barrens and sand prairie species. Representative plants include little bluestem, junegrass, Indian grass, prairie willow, sweet fern, bastard toadflax, flowering spurge, lupine, goat's rue, bird-foot violet, slender beard-tongue, and stiff coreopsis.

The site has a history of logging, fire, and ditching in the low areas. The lowlands include patches of sedge meadow and alder thicket. The vegetation at the site prior to European settlement in the nineteenth century has been interpreted as a semi-open jack pine-oak barrens, with tree densities in the range of 2-8 trees per acre.

Significance of Site

This site occurs within the Necedah National Wildlife Refuge and was established as a State Scientific Area (now State Natural Areas program) in 1966. The barrens community is rare in the present landscape and the central sands region offers excellent opportunities for restoration. Many rare species have been documented as residents of barrens remnants in the vicinity.

Management Considerations

The site has been managed with prescribed fire since 1966 to maintain and restore the formerly widespread and abundant open barrens conditions that are relatively rare in today's landscape. No management changes are recommended, though the site is small, embedded within an extensive area of dense xeric forest, and would benefit from an expansion of the burn program.

Baseline data are available for vegetation and breeding birds and sampling should be repeated periodically.

EX18 - Necedah Oak-Pine Savanna Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1994	S2S3	G5T2	SC/FL	LE
Communities						
Alder thicket	alder thicket	1981	S4	G4	NA	
Northern dry forest	northern dry forest	1981	S3	G3?	NA	
Northern sedge meadow	northern sedge meadow	1981	S3	G4	NA	
Pine barrens	pine barrens	1986	S2	G2	NA	

EX19. NECEDAH OAK-PINE FOREST

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Necedah
Town-Range-Section:	T18N-R3E, sections 2 and 3
	T19N-R3E, sections 34 and 35
Approximate Size:	84

Description of Site

This site contains a xeric forest of Hill's oak and jack pine that originated in the 1930's, after a severe fire that burned thousands of acres in the eastern part of what is now the Necedah National Wildlife Refuge. The soils are sands of the Newton, Plainfield, and Morocco series, on gently rolling terrain in central sands. The forest understory is depauperate, with Penn sedge, bracken fern, and blueberries the dominant groundcover. Other characteristic plants include trailing arbutus, wintergreen, pipsissewa, whorled loosestrife, and moccasin flower. There are also forbs attesting to the formerly more open conditions that characterized this site and the surrounding landscape prior to the widespread implementation of fire suppression policies in the 1930s. Among these are stiff coreopsis, lupine, goat's rue, euphorbia, and purple milkwort. Representative breeding birds include Red-eyed Vireo, Ovenbird, Great-crested Flycatcher, White-breasted Nuthatch, and Eastern Wood Pewee.

The surrounding landscape is mostly forested, and managed for wildlife protection, recreation, and commercial timber production. Several small abandoned agricultural fields adjoin the forest, and a road runs along the site's southern border. An ambitious savanna restoration project is underway just a few miles to the west.

Significance of Site

Part of the Necedah National Wildlife Refuge, owned by the US Fish and Wildlife Service, this site was designated as a State Scientific Area (now the State Natural Areas program) in 1952. The site is also a designated Society of American Foresters type stand.

Management Considerations

Necedah oak-pine forest was initially established to maintain a representative stand of central sands xeric forest in an unmanaged condition. In 1998 Necedah Refuge staff requested permission from BER to implement a prescribed burning and tree removal program to restore the more open conditions formerly prevalent here. BER approved this request.

No further recommendations are made beyond encouraging both the State Natural Areas program staff (WDNR-BER) and the Necedah Refuge staff to periodically monitor the site. As quantitative baseline data exist for this occurrence, we recommend that the vegetation sampling be repeated at appropriate intervals. A permanent breeding bird survey transect is established on this site, and is repeated approximately every five years.

EX19 - Necedah Oak-Pine Forest

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status
Communities					
Northern dry forest	northern dry forest	1998	S3	G3?	NA

EX20. RYNEARSON FLOWAGE BARRENS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Juneau
USGS 7.5' Quadrangle:	Cutler
Town-Range-Section:	T18N-R3E, sections 4-6, 9, and 10
	T19N-R3E, sections 29 and 32
Approximate Size:	751

Description of Site

This site encompasses two mixed pine-oak barrens communities, located, respectively, on the east and near-north sides of the Rynearson Flowage, a large impoundment located in the flat to gently rolling sandy bed of extinct Glacial Lake Wisconsin. The easternmost barrens patch is characterized by scattered Hill's oak (from very large open-grown trees, to grubs) and small of jack pine. The understory consists mostly of prairie grasses and forbs such as big and little bluestems, Indian grass, June grass, Penn sedge, and scattered patches of heath, with blueberries, sweetfern, and bearberry.

The original government land survey notes for the area indicate that pine barrens was the major upland community in the area, but the present aspect is more of an oak barrens. Pole timber was cut from this site in the 1960s after which a regime of prescribed burning began. The result was a semi-open savanna, with scattered large oaks, oak grubs, and small groves of jack pine.

The north-central stand is located on a peninsula within the Flowage. It is smaller, more isolated, and somewhat weedier than the eastern barrens, but supports several rare species such as dwarf milkweed and the Karner blue butterfly. At this time it might best be characterized as an oak barrens with a brush prairie aspect, rather than as a savanna with scattered large trees. Representative plants include little bluestem, June grass, lupine, goat's rue, bastard toadflax, sweet fern, and early blueberry. Oak grubs (northern pin and/or black oaks) to a height of several meters are abundant. Kentucky bluegrass and sheep sorrel, two exotic plant species, are locally common. It's possible that past grazing and/or a long period of fire suppression may have severely reduced or eliminated some of the pine barrens understory species, including some prairie forbs.

Resident birds include Rufous-sided Towhee, Brown Thrasher, Yellow, Chestnut-sided, Nashville, and Golden-winged Warblers, Common Nighthawk, Eastern Bluebird, and Red-headed Woodpecker.

The site is entirely within the boundaries of the Necedah National Wildlife Refuge. Surrounding lands are used for wildlife protection, recreation, and timber production where it is compatible with the other primary uses.

Early in the 20th century much of this area was cleared for short-lived, ill-advised, and ultimately unsuccessful attempts at agriculture. Site hydrology was severely modified by extensive ditching at that time. A system of dikes and water control structures constructed by the US Fish and Wildlife Service has restored some of the functionality of the nearby wetlands.

Significance of Site

Barrens communities are globally rare and continue to decline in acreage and quality due to fire suppression policies, conversion to forest production areas, and colonization by aggressive invasive plants. Central and northwestern Wisconsin offer some of the nation's best opportunities to protect and restore functional stands of pine and oak barrens. This site contains good quality though small remnants, could be substantially

expanded, and supports rare and declining plant and animal species. Significant expansion is now underway south of the easternmost barrens patch.

Management Considerations

The barrens communities have been actively managed by a combination of prescribed burning and mechanical brushing. The feasibility of integrating the individual units of this site into a larger, managed barrens landscape should be investigated.

EX20 - Rynearson Flowage Barrens Element Occurrences

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Lycaeides melissa samuelis	Karner blue butterfly	1996	S2S3	G5T2	SC/FL	LE
Plants						
Asclepias ovalifolia	dwarf milkweed	1997	S3	G5?	THR	
Bartonia virginica	yellow screwstem	1990	S3	G5	SC	
Communities						
Northern Sedge Meadow	Northern Sedge Meadow	1981	S3	G4	NA	
Oak Barrens	Oak Barrens	1997	S2	G2?	NA	
Shrub-Carr	Shrub-Carr	1981	S4	G5	NA	

EX21. YELLOW RIVER BOTTOMS

Location

Subsection:	Central Wisconsin Sand Plain (222Ra)
County:	Wood, Juneau
USGS 7.5' Quadrangle:	Babcock, Finley, Necedah, New Miner, and Quail Point Flowage
Town-Range-Section:	T18N-R3E, sections 1 and 12
	T18N-R4E, sections 6 and 7
	T19N-R3E, sections 1-3, 10-14, 22, 23, 24-26, 35, and 36
	T19N-R4E, sections 6, 7, 19, 30, and 31
	T20N-R3E, sections 3, 4, 9-11, 14-16, 21-27, and 34-36
	T20N-R4E, sections 31
	T21N-R3E, sections 14, 15, 22, 23, 26, 27, 34, and 35
Approximate Size:	14,376

Description of Site

This site delimits a five mile stretch of deciduous floodplain forest along the Yellow River north of Necedah. The river has an extremely low gradient, with many meanders, oxbows, running sloughs, cut-offs, and ponds. The soils are saturated and composed of glacial lake deposits and alluvial sediments. Mature portions of the forest are composed primarily of large silver maple, swamp white oak, river birch, green ash, hackberry, cottonwood, basswood, and red oak. Slightly elevated areas within the floodplain sometimes support white pine, white and black oaks, bigtooth aspen, and rarely, red pine. Reproducing trees include silver maple, green ash, and basswood. The shrub layer varies in density from sparse to dense, with locally common patches of buttonbush, gray dogwood, and prickly-ash. Common understory herbs include wood nettle, green-headed coneflower, dragonhead, and many sedges and grasses.

Noteworthy animals representative of this site include Red-shouldered Hawk, Barred Owl, Prothonotary Warbler, Cerulean Warbler, Acadian Flycatcher, American Redstart, Veery, Wood Thrush, and Blue-gray Gnatcatcher, and eastern Massasauga rattlesnake. The soils are generally sandy, though often covered with a layer of silt.

Disturbances to the floodplain include grazing and logging, but intact stands with large trees, high canopy closure, and some structural attributes of older forests (e.g., snags, coarse woody debris, tip-ups) still remain and it is the larger of these stands that support the greatest number of sensitive forest species. Small inclusions of sedge meadow, emergent marsh, and shrub swamp are present, as are open water areas in the ponds, oxbows, and cut-off sloughs that are common within the floodplain.

The adjacent uplands support oak and oak-pine forests, red pine plantations, old fields, a few active farms, and a large commercial cranberry operation along Cranberry Creek, a tributary of the Yellow. Most, if not all, of these forests have been periodically logged. The site is also used for recreation.

Significance of Site

This is arguably the most extensive and ecologically significant forested floodplain in the central sands ecoregion. The river is free-flowing between the villages of Dexterville and Babcock. The most intact portions of the site are relatively undisturbed, contain mature forest with old-growth attributes, and support a rich flora. The forests and associated wetland communities also support rare resident birds and herptiles.

Management Considerations

Virtually none of this corridor is protected, and commercial logging and hydrologic manipulation continue to impact the site. Protection of one to several substantial core areas of mature forest is needed if the site is to continue to provide viable habitat for rare forest interior species. The Yellow River Bottoms should also be considered as an integral part of a much larger landscape protection project opportunity.

EX21 - Yellow River Bottoms

Scientific Name	Common Name	Date	State Rank	Global Rank	WI Status	US ESA Status
Animals						
Buteo lineatus	Red-Shouldered Hawk	1998	S1N,S3S4B	G5	THR	
Cicindela lepida	little white tiger beetle	1979	S2S3	G4	SC/N	
Cicindela patruela huberi	a tiger beetle	1970	S3	G3T2	SC/N	
Clemmys insculpta	wood turtle	1992	S3	G4	THR	
Dendroica cerulea	cerulean warbler	1991	S2S3B,SZN	G4	THR	
Empidonax virescens	Acadian flycatcher	1991	S2S3B,SZN	G5	THR	
Etheostoma clarum	western sand darter	1973	S3	G3	SC/N	
Hemidactylium scutatum	four-toed salamander	1998	S3	G5	SC/H	
Lycaeides melissa samuelis	Karner blue butterfly	1994	S2S3	G5T2	SC/FL	LE
Lythrurus umbratilis	redfin shiner	1973	S3	G5	THR	
Microtus ochrogaster	prairie vole	1974	S2	G5	SC/N	
Nyctanassa violacea	yellow-crowned night-heron	1984	S1B,SZN	G5	THR	
Ophisaurus attenuatus	western slender glass lizard	1995	S2	G5	END	
Sistrurus catenatus catenatus	eastern massasauga rattlesnake	1994	S2	G3G4T3T4	END	C
Stylurus scudderi	zebra clubtail	1998	S3	G4	SC/N	
Plants						
Bartonia virginica	yellow screwstem	1998	S3	G5	SC	
Platanthera flava var herbiola	pale green orchid	1994	S2	G4T4Q	THR	
Rhexia virginica	virginia meadow-beauty	1998	S2	G5	SC	
Communities						
Floodplain Forest	Floodplain Forest	1992	S3	G3?	NA	

APPENDIX H

Rare Vascular Plants of the Black River/Meadow Valley Landscape

This appendix lists each of the rare plant species known to occur on the Black River State Forest/Meadow Valley Landscape (BRSF/MVL) and provides information on their conservation status. "Rare" plant species are treated here as native species known or suspected to be rare and/or declining in the state. Included are species legally designated as "Endangered" or "Threatened" by the State of Wisconsin, as well as species on the Department's advisory "Special Concern". Rare species information for the BRSF/MVL was compiled from existing records in the BER NHI Biological Conservation Database (BCD, now known as Biotics), field inventories, and other data sources.

The Wisconsin Natural Heritage Database lists 47 rare plant species in the study area. Heritage staff documented many of these rare species during recent field inventory, while others have not been seen for decades. In the last 30 years, biologists have confirmed 2 Wisconsin Endangered plant species and 5 Wisconsin Threatened plant species in the study area. These include Wisconsin Endangered reticulated nutrush (*Scleria reticularis*) and sand violet (*Viola fimbriatula*), and Wisconsin Threatened dwarf milkweed (*Asclepias ovalifolia*), bog bluegrass (*Poa paludigena*), pale green orchid (*Platanthera flava* var. *herbiola*), prairie parsley (*Polytaenia nuttallii*), and algae-like pondweed (*Potamogeton confervoides*). Before 1971, researchers documented four other Threatened or Endangered plant species, including woolly milkweed (*Asclepias lanuginosa*), large water-starwort (*Callitriche heterophylla*), brittle prickly-pear (*Opuntia fragilis*), and spotted pondweed (*Potamogeton pulcher*) that were not relocated during this inventory. Thirty-seven additional rare plant species found on the BRSF/MVL are designated of "special concern," meaning experts suspect they are rare or declining, but have not yet gathered proof of threats to their survival in Wisconsin. There are no federally listed plant species documented in the study area.

SCIENTIFIC NAME (COMMON NAME)	#	State Rank	Global Rank	STATE STATUS	OBSERV DATE
Arethusa bulbosa (Swamp-pink)	4	S3	G4	SC	1998
Artemisia frigida (Prairie sagebrush)	1	S2S3	G5?	SC	1936
Asclepias lanuginosa (Wooly milkweed)	3	S1S2	G4?	THR	1936
Asclepias ovalifolia (Dwarf milkweed)	23	S3	G5?	THR	2000
Aster longifolius (Long-leaved aster)	1	S1	G5	SC	1982
Bartonia paniculata (Twining screwstem)	2	S1	G5	SC	1998
Bartonia virginica (Yellow screwstem)	70	S3	G5	SC	1998
Callitriche heterophylla (Large water-starwort)	2	S2	G5	THR	1958
Carex assiniboinensis (Assiniboine sedge)	3	S3	G4G5	SC	1997
Carex cumulata (Clustered sedge)	14	S2	G4?	SC	1997
Carex folliculata (Long sedge)	51	S3	G4G5	SC	1999
Carex livida var *radicaulis* (Livid sedge)	2	S2	G5T5	SC	1997
Carex straminea (Straw sedge)	3	S1	G5	SC	1999
Ceratophyllum echinatum (Prickly hornwort)	4	S2	G4?	SC	1998
Cypripedium reginae (Showy lady's-slipper)	1	S3	G4	SC	1922
Didiplis diandra (Water-purslane)	4	S2	G5	SC	1997
Eleocharis engelmannii (Engelmann's spike-rush)	1	S2	G4?	SC	1972
Epilobium palustre (Marsh willow-herb)	1	S3	G5	SC	1958
Gnaphalium helleri (Catfoot)	1	S1	G4G5	SC	1998
Juncus marginatus (Grassleaf rush)	8	S2	G5	SC	1997
Lycopodium porophilum (Rock clubmoss)	10	S3	G4	SC	1997
Myriophyllum farwellii (Farwell's water-milfoil)	14	S3	G5	SC	1997
Opuntia fragilis (Brittle prickly-pear)	1	S3	G4G5	THR	1947
Orobanche uniflora (One-flowered broomrape)	1	S3	G5	SC	1994

SCIENTIFIC NAME (COMMON NAME)	#	State Rank	Global Rank	STATE STATUS	OBSERV DATE
Oryzopsis canadensis (Canada mountain-ricegrass)	3	S1	G5	SC	1997
Platanthera flava var *herbiola* (Pale green orchid)	1	S2	G4T4Q	THR	1994
Platanthera hookeri (Hooker orchis)	1	S3	G5	SC	1947
Poa paludigena (Bog bluegrass)	1	S2S3	G3	THR	1997
Polygala cruciata (Crossleaf milkwort)	77	S3	G5	SC	1998
Polytaenia nuttallii (Prairie parsley)	1	S3	G5	THR	1987
Potamogeton confervoides (Algae-like pondweed)	1	S2	G4	THR	1975
Potamogeton diversifolius (Water-thread pondweed)	10	S2	G5	SC	1997
Potamogeton pulcher (Spotted pondweed)	1	S1	G5	END	1938
Potamogeton vaseyi (Vasey's pondweed)	1	S2	G4	SC	1969
Rhexia virginica (Virginia meadow-beauty)	15	S2	G5	SC	1998
Salix sericea (Silky willow)	1	S1	G5	SC	1933
Scirpus georgianus (Georgia bulrush)	1	SH	G5	SC	1968
Scirpus torreyi (Torrey's bulrush)	2	S2S3	G5?	SC	1998
Scleria reticularis (Reticulated nutrush)	1	S1	G4	END	1997
Scleria triglomerata (Whip nutrush)	4	S2S3	G5	SC	1997
Solidago sciaphila (Shadowy goldenrod)	17	S3	G3G4	SC	1997
Strophostyles leiosperma (Small-Flowered woolly bean)	3	S2	G5	SC	1997
Talinum rugospermum (Prairie fame-flower)	5	S3	G3G4	SC	1997
Thelypteris simulata (Bog fern)	60	S3	G4G5	SC	1998
Utricularia geminiscapa (Hidden-fruited bladderwort)	25	S3	G4G5	SC	1998
Utricularia purpurea (Purple bladderwort)	1	S3	G5	SC	1998
Viola fimbriatula (Sand violet)	17	S2	G5	END	1997

Field Survey Methods

A number of activities occur prior to the field season. First, all information on occurrences of state-listed rare vascular plants reported from the BRSF/MVL and surrounding area was obtained from the BCD and referenced to a set of USGS topographic quadrangles covering the area.

Second, staff visited the Wisconsin State Herbarium at the University of Wisconsin-Madison to become acquainted with unfamiliar or difficult to identify species. In some cases, herbarium specimens were photocopied and used as field references. At the herbarium, the draft "Flora of Wisconsin" was consulted to gain information on rare species likely to occur in the State Forest.

Third, staff visited DNR field offices. DNR personnel familiar with plant occurrences and ecological communities were consulted and queried about areas that would benefit from more intensive field surveys. This included sites identified as survey priorities by the NHI ecologist. In addition, forest compartment maps and air photographs maintained at these offices were analyzed.

Finally, staff consulted with local college personnel and amateur naturalists knowledgeable about rare plant populations and unusual plant communities.

During the course of the field season, specific plant communities of interest may be surveyed several times for potential rare species. Initial visits of terrestrial habitat were often made in May in order to detect the spring ephemeral flora, followed by later visits in June and July during the major part of the flowering season. Surveys of aquatic areas were usually conducted in July and August when floating and submerged species were most likely to be in flower/fruit. Later blooming species, including asters and goldenrods, were searched for in August and September.

In some areas, drive-by surveys on every town and forest road in the area have proven valuable, particularly for rare species occurring along roadsides. This involves searching for those natural community sites most likely to contain rare plants. Surveys by bicycle were useful in areas with hard-packed, clay forest lanes, as were others using all-terrain vehicles (ATVs) on sandy roads.

Various methods were used to search for rare plants. The method chosen depended upon the biologists' ability to maneuver through the habitat and the number of individuals conducting a given survey. Some surveys, especially those done in aquatic areas or by more than one individual searching for a fairly nondescript species, were done in a systematic fashion, often searching a habitat intensively along closely-spaced transect lines. Other surveys, where only one biologist was able to search an area and/or the potential habitat was reasonably consistent throughout, relied on the "meander" technique. In either case, the judgment and past field experience of the biologist involved is critical in areas of intensive field surveys that are often typified by subtle habitat differences.

When potential rare species are discovered, data are recorded on standard NHI field forms. If population size permits and if there is a question of identification, a voucher specimen is collected for later identification, verification, and deposition at the Wisconsin State Herbarium. In some cases, where a particularly rare species is found and/or population size is small, a diagnostic photograph may substitute for plant collection.

No survey can be completely comprehensive. For instance, it is impossible to search every square meter of habitat in difficult terrain when several hundred, or even thousand, hectares of similar habitat exist, (e.g. looking for particular sedge or other small species occurring in a vast sedge meadow). Logistical constraints prevent a thorough search of all potential habitat.

In addition, many rare plant species, such as orchids, may exist as short-lived, above ground plants that do not reliably appear every year. These, and other limitations not discussed here, must be into taken account when evaluating rare plant occurrences at any given site.

Typically, new and interesting sites are discovered throughout the course of the field season. Often these sites usually have had no survey coverage for seasons earlier than the initial visit. For example, a fine hardwood forest stand "discovered" in August may have spring ephemerals that have died back and are not evident at the time of the survey. Therefore, follow-up surveys of such sites are recommended for the spring or summer of the coming year. This point is worth stressing as the justification for thorough botanical surveys taking more than one field season since there are always significant plant sites that are missed during the first year of survey.

Rare Vascular Plant Descriptions

The following is a description of each of the rare plants found on the Black River State Forest or the Meadow Valley Landscape Wildlife Areas, including status, conservation concern, and species management. The dates of last observations will vary greatly between species. An older, historic record does not necessarily mean the species no longer exists on the properties, only that it was not encountered during the inventory completed for this report. Each of the plants in this Appendix is accompanied by the Wisconsin protection status and a ranking code denoting its rarity in Wisconsin and throughout its range. These ranks are defined on the first pages of the Wisconsin Natural Heritage Working List (Appendix I).

Those species proceeded by an asterisk (*) are not found in the Black River State Forest (BRSF), but are known from other areas in the bed of old glacial Lake Wisconsin (GLW), known collectively as the Meadow Valley Landscape (MVL). The MVL includes the Meadow Valley State Wildlife Area (Jackson, Monroe, and Juneau Counties); Sandhill State Wildlife Area (Wood County); Jay Creek State Natural Area (Jackson County); county forest lands in Clark, Jackson, and Wood Counties; Wood County Wildlife Area; and Necedah National Wildlife Refuge (Juneau County).

Images, either photographs or line drawings, and additional information about the following species can be found by using the search engine at the Wisconsin State Herbarium website (http://www.botany.wisc.edu/wisflora/) or in the plant section of the NHI Working List on the Bureau of Endangered Resources website at http://www.dnr.state.wi.us/org/land/er/working_list/taxalists/plants.htm.

- **Swamp-pink or dragon's-mouth (*Arethusa bulbosa*) – Special Concern, S3 G4**

  A pink, single-flowered orchid of bogs and fens in the northeastern United States and adjacent Canada, this species is widely distributed in northern Wisconsin but uncommon in the central and south. There are no BRSF records, but there are 1980 and 1997 records from central poor fens in Jackson County Forest lands to the east.

  There are a total of 100 Wisconsin sites; 16 of these were last seen before 1970. There are four swamp-pink populations within the study area, but none of them are on public lands in this survey. A Jackson County population was last observed in 1998.

  Conservation Concerns: Outright habitat destruction, wetland drainage or other alterations of water levels, and invasive plant species.

- **Prairie sagewort (*Artemisia frigida*) – Special Concern, S2S3 G5?**

  A prairie and barrens species of Canada and the central United States, this species is known from scattered localities in western and southern Wisconsin. It is often along railroad right-of-ways, raising questions about its nativity here, although there are undoubted native sites on bluff prairies along the Mississippi River. There are no BRSF records, but there is a 1936 collection from a railroad right-of-way in Wyeville, Monroe County.

  There are a total of 19 Wisconsin sites; 12 of these were last seen before 1970. One population was reported within the study area in 1936. Researchers were unable to relocate prairie sagewort in 1997-8.

  Conservation Concerns: Seeding is erratic with this species. It seems to require periodic disturbance to establish and persist although the type and frequency of disturbance are unknown.

- **Woolly milkweed (*Asclepias lanuginosa*) – Threatened, S1S2 G4?**

  This inconspicuous, narrow-leaved flower of hillside prairies and savannas of the north central United States was known from 40 places around Wisconsin, but 25 of those have either been destroyed or not verified since 1970. A few populations have received careful attention in recent years, and not one of them has produced a pod. There are no BRSF records, but several collections were made from 1936-1940 nearby in the Necedah National Wildlife Refuge.

  Conservation Concerns: This species is sensitive to forest succession, and may also be suffering a loss of effective pollinators.

- **Dwarf or oval-leaved milkweed (*Asclepias ovalifolia*) – Threatened, S3 G5?**

  Another small milkweed, this species resembles a daintier version of common milkweed, with creamy white flowers. It is endemic to the central United States and adjacent Canada, and is known in Wisconsin from prairies and pine and oak barrens. Although it formerly grew throughout the prairie and savanna areas of southern Wisconsin, most of the extant populations lie in the central and northwestern parts of the state. To date, the historic records of dwarf milkweed are not entered in the Natural Heritage database. In 1995, researchers checked on 22 historic populations and found that 16 of them had been lost.

About 10 new populations were discovered in the BRSF in 1997, marking GLW as Wisconsin's best area for protecting dwarf milkweed. The colonies along Palm Road have about 1,000 plants and may be the largest in the state. The species thrives in powerline, railroad, and roadside right-of-ways where competition by woody vegetation is reduced, perhaps mimicking a natural fire regime. The largest population in "native" vegetation was located in Glenn Creek Barrens on Jackson County Forest land just west of BRSF. Five new populations were discovered in 1997-1998 in GLW outside the BRSF: four in Wood County (including Bison Prairie and Sandhill Savanna Restoration) and Juneau County (Rynearson Flowage Barrens).

Conservation Concerns: This milkweed relies on periodic disturbances of the type that keep pine and oak barrens free of shading and encroaching woody vegetation. In the absence of periodic fire, periodic brush removal in roadside, railroad, powerline, and pipeline rights-of-way appears to mimic the natural disturbance regime and aid this species. This clonal species depends on insect pollinators that may be adversely affected by herbicide spraying along rights-of-way.

- **Long-leaved aster (*Aster longifolius*) – Special Concern S1 G5**

  This purple-flowered species has only been found 2 places in Wisconsin, both of them in moist, open sandy habitats within the bounds of Glacial Lake Wisconsin. The heart of long-leaved aster's range is east of Wisconsin, where it ranges from Florida to Quebec and Ontario. In Michigan it grows in a variety of damp open sandy, gravely or rocky habitats. Although both of Wisconsin's documented populations fall within the study area, neither of them is on public land. The Natural Heritage Inventory recently added long-leaved aster as a species of special concern. Researchers did not explicitly search for this species. It is quite possible that it is growing unnoticed on state land.

  Conservation Concerns: The moist open habitats this species requires are attractive to recreational ATV users, who may mechanically destroy the plants. This habitat depends on water level fluctuations or periodic disturbance such as fire to prevent thick woody growth.

- **Panicled screwstem (*Bartonia paniculata*) – Special Concern S1 G5**

  This tiny, hemi-parasitic gentian family member occurs along the East Coast of the United States and adjacent Canada, with scattered stations inland. The species was first discovered in Wisconsin in 1998 east of the BRSF in seasonally wet, sandy-peaty ditches on Jackson County Forest lands north of Hwy. 54. It was also found in Meadow Valley Wildlife Area along Norway Ridge Road in Monroe County. Due to its close resemblance to the next species, it may have been overlooked in GLW. It associates with crossleaf milkwort, Virginia meadow-beauty, and sphagnum and haircap mosses.

  Conservation Concerns: Populations of this species apparently depend on periodic bare mineral soil. In pre-settlement times, this regime may have included catastrophic fires, or perhaps the trails and/or wallows of large animals such as deer, elk, or bison. Currently, periodic maintenance of roadside, railroad, powerline, and pipeline rights-of-way, appears to mimic the natural disturbance regime and maintains this species, and will continue to in many areas (such as along major highways). In other habitats (such as mown trails), there is no assurance that this disturbance regime will continue for the long term. "Natural" populations have very small numbers (often less than 10 individuals) and exist in only a few peatlands and swamp forests. All populations appear to vary greatly from year to year in numbers of individuals, with only a small percentage of seemingly suitable habitat occupied in a given year.

- **Yellow screwstem (*Bartonia virginica*) – Special Concern, S3 G5**

  This species of the eastern United States and Canada is much more common in Wisconsin than the preceding one. Yellow screwstem prefers seasonally wet, periodically disturbed sandy-peaty ditches where it occurs in small colonies in sphagnum or haircap moss beds. It is often associated with crossleaf milkwort and

Virginia meadow-beauty. Less common habitats include acidic sphagnous woods, poor fens, and even moist riverbanks.

There are a total of 93 Wisconsin occurrences; 17 of these were last seen before 1970. The great majority of state sites occur in the Black River/Meadow Valley landscape. In 1997-8, researchers found 57 new occurrences, including 19 in BRSF, 11 in Jackson County outside the forest, 18 in Juneau County, 5 in Wood County, 2 in Monroe County, and one each in Clark and Eau Claire Counties.

Conservation Concerns: See discussion under panicled screwstem.

- **Large water-starwort (*Callitriche heterophylla*) – Threatened, S2 G5**

  This floating aquatic grows in most of the United States in quiet or slowly flowing waters. It occurs as scattered, mostly historic sites in southwest Wisconsin. There are three historic (1938-1958) sites in BRSF that were not relocated in 1997-1998: Perry Creek, Morrison Creek, and Little Bear Flowage. The species appears to have declined and perhaps disappeared from BRSF/MVL, for unknown reasons. There are recent records from Fort McCoy Military Reservation in adjacent Monroe County.

  There are a total of 13 Wisconsin sites; 8 of these were last seen before 1970. Two historical sites fall within the Black River/Meadow Valley landscape.

  Conservation Concerns: Unknown water quality requirements. Large water-starwort is probably also affected by factors that generally threaten aquatic species: the sometimes dramatic water fluctuations associated with dams, erosion and consequent siltation, stream channelization, and changes in water levels, especially lowered.

- **Assiniboine sedge (*Carex assiniboinensis*) – Special Concern, S3 G4G5**

  A sparsely-flowered, clone-forming sedge with long, looping, "walking" stoloniferous stems, this species of the north-central United States and adjacent Canada is known from central and northern Wisconsin. In BRSF, it was discovered in three places in shaded, infrequently flooded, rich, mesic floodplain terrace deciduous forests along the Black River in 1997. In the Black River corridor, it grows in a forest type whose understory has been greatly affected by logging and past grazing (causing a proliferation of thorny shrubs).

  There are a total of 31 Wisconsin sites. Three of these were last seen before 1970. Three sites on Black River State Forest were documented in 1997.

  Conservation Concerns: damming could destroy habitat; watershed development could result in flashier flood cycle that might scour floodplain habitat. Intensive logging resulting in sites that are too sunny and dry could alter the necessary habitat.

- **Clustered sedge (*Carex cumulata*) – Special Concern, S2 G4?**

  A sedge of the northeastern United States and adjacent Canada, this is a member of the difficult Ovales section of the genus Carex. In the BRSF, about 6 new sites were discovered in 1997, mostly in disturbed moist to dry sandy areas such as moss-drying clearings and roadside ditches: Circle Marsh, Battle Point Ridge, and Hatfield Dells. It also occurs in similar habitats in the Meadow Valley landscape. In 1997-1998 it was also discovered in Wood County (Cranberry Road), Juneau County (Kingston Flowage), and Monroe County (Atwood Avenue).

  There are a total of 18 Wisconsin sites; 7 of these were last seen before 1970. Fourteen sites occur in the study area, with 9 of them on Black River State Forest and 2 on Meadow Valley Wildlife Area.

Conservation Concerns: This species appears to prefer very disturbed areas. It is often a pioneer and one of the first species to appear on graded, dry sandy roadsides or on recently used mossing platforms. It is vulnerable to overly frequent disturbance that might result in the loss or deletion of the seed bank, or a cessation or inappropriate timing of disturbance.

- **Long sedge (*Carex folliculata*) – Special Concern, S3 G4G5**

  This is distinctive large wetland sedge with star-like clusters of fruits on long whip-like stems, this species is found in the eastern United States and adjacent Canada. In Wisconsin, other than one recent record in Iron County, long sedge is restricted to Glacial Lake Wisconsin, where it typically grows in White Pine – Red Maple Swamps, but also in poor fens, alder thickets, and tamarack swamps, often becoming locally dominant. Common understory associates are cinnamon fern, skunk cabbage, winterberry holly, and bog fern.

  There are a total of 71 Wisconsin sites; 4 of these were last seen before 1970. In the study area, there are 51 known long sedge populations. These include six on Meadow Valley Wildlife Area and 31 on BRSF.

  Conservation Concerns: This sedge grows in white pine – red maple swamps and adjacent alder thickets. Unlike its frequent associate *Thelypteris simulata*, it appears to tolerate large canopy gaps in swamp forests, and populations can greatly expand in size after logging. Management of this species should be balanced with that of *Thelypteris simulata*. It is recommended that logging operations not take place. Canopy gaps should be permitted to form and close naturally. However, if logging is deemed to be necessary in this habitat, it should be done in a manner that mimics natural canopy gap formation.

- **Livid sedge (*Carex livida* var. *radicaulis*) – Special Concern, S2 G5T5**

  This pale, ghostly (but definitely not "livid") sedge prefers cold alkaline wetlands and occurs circumboreally south to the northern tier of the United States. Wisconsin localities are mostly in the northern part of the state, near the Great Lakes. There are no BRSF localities, but one was discovered in 1997 in a seasonally wet sandy, peaty ditch along Old Highway 54 east of the Forest, with Virginia meadow-beauty and crossleaf milkwort. There is also a 1961 collection from a cranberry bog in southwestern Wood County.

  There are a total of 17 Wisconsin sites. One of these was last seen before 1970. We have reports of 2 populations within the study area, but neither falls on public land in this survey.

- **Greenish-white sedge (*Carex longii*) – Special Concern, S1 G5**

  We currently have no solid proof that greenish-white sedge has ever lived in our study area. Years ago, an esteemed researcher identified his collection from Lee Lake (near Millston) as *Carex longii*. Under recent scrutiny, the specimen turned out to be *C. merritt-fernaldii*, a species that is not listed in WI. There is only one confirmed record of *Carex longii* in Wisconsin, and that is in LaCrosse County.

- **Straw sedge (*Carex straminea*) – Special Concern, S1 G5**

  This is a member of the difficult *Ovales* section of the genus *Carex*. Found in the northeastern United States and adjacent Canada, it is known only from only a few sites in a 5-county area around BRSF. A 1947 collection site from the Clear Creek Fen area along the Black River in BRSF was not relocated in 1997. There is also a 1958 collection from the sandy shores of Lee Lake, an artificial impoundment near Millston. Despite several searchers, biologists did not relocate straw sedge there in 1997. In the intervening 39 years the jack pine forest around the lake has greatly matured. This change may have eliminated potential habitat for this species. A new population was discovered in 1999 in a sandy-peaty ditch adjacent to a central poor fen along Highway 173 near Valley Junction in Monroe County.

There are a total of 5 Wisconsin sites; 3 of these were last seen before 1970. Of the two recently documented sites, one is within the study area, and the other is nearby in Juneau Co.

Conservation Concerns: Succession. See *Bartonia paniculata*.

- **Prickly hornwort (*Ceratophyllum echinatum*) – Special Concern, S2 G4?**

  This submersed aquatic of shallow soft water ponds and lakes is found throughout the Americas. In Wisconsin, it is infrequent, preferring soft substrates and growing in water as deep as 3m. It is known from artificial impoundments in Juneau County (Meadow Valley Flowage), Monroe County (Monroe County Flowage), and Wood County (North Gallagher Flowage), where it was found in 1997-1998.

  There are a total of 21 Wisconsin sites; 8 of these were last seen before 1970. One population was documented on Sandhill Wildlife area in 1998, and 3 other populations fall within the study area.

  Conservation Concerns: Particular about alkalinity, pH, and possibly turbidity.

- **Showy lady's-slipper (*Cypripedium reginae*) – Special Concern, S3 G4**

  There is a 1922 record of this large colorful orchid from Black River Falls. It has not been found since in either Jackson County or GLW. Judging from its habitat preferences elsewhere in Wisconsin, mostly likely it grew in a rich seepage area in a hardwood forest near the Black River, possibly on a back terrace in the floodplain. Suitable habitat is very limited within the study area. Deer herbivory is suspected to have contributed to the decline of this orchid of the eastern United States and Canada.

  There are a total of 105 Wisconsin sites; 50 of these were last seen before 1970. The single BRSF population may still exist, as showy lady's slipper may yet grow in deciduous forests west of Black River Falls that were not searched during the 1997-8 survey.

  Conservation Concerns: Dense concentrations of deer. Flooding of suitable habitat. Overcollecting and poaching.

- **Water-purslane (*Didiplis diandra*) – Special Concern, S2 G5**

  An inconspicuous creeping plant of wet shores and shallow water of the central and eastern United States, water-purslane is rare through a large portion of its range, including central and southern Wisconsin. In 1997 it was collected from the shores of an artificial impoundment (Ball Road Flowage) in Wood County. There are historic records from Juneau County (1973) and Monroe County (1959).

  There are a total of 6 Wisconsin sites. Four of these fall within the study area. The 2 that fall outside this study area have not been verified since 1958 and 1970, respectively.

  Conservation Concerns: Suppression of periodic disturbance, such as water fluctuations that mimic a natural flooding regime.

- **Engelmann spike-rush (*Eleocharis engelmannii*) – Special Concern S2 G4?**

  While it has a widespread range across North America, *E. engelmannii* is very uncommon in the western Great Lakes states. In WI, it seems to grow in shallow water along fluctuating shorelines. Researchers have reported Engelmann spike rush from only 3 places in Wisconsin since 1970, and one of those was Mill Bluff State Park in Monroe County. Eight more Wisconsin sites were last verified before 1970.

Conservation Concerns: The moist open habitats this species uses are attractive to recreational ATV users, who may mechanically destroy the plants. This habitat depends on water level to prevent thick woody growth. Lowering the water table through wells could reduce habitat for this species.

- **Marsh willow-herb (*Epilobium palustre*) – Special Concern, S3 G5**

  A small herb of open wetlands, this species of the central and eastern United States is scattered throughout Wisconsin, mostly in the far north. There is a 1959 collection from the Ketchum-Starlight Peatlands in the BRSF. It was not relocated in 1997-1998, but this is an inconspicuous species and it could have been overlooked here and at other sites.

  There are a total of 33 Wisconsin sites; 5 of these were last seen before 1970, including the one from the BRSF.

  Conservation Concerns: Wetland destruction, including drainage. Other alterations in water level.

- **Catfoot (*Gnaphalium helleri*) – Special Concern S1 G4G5**

  Known from most of the eastern United States, this species grows in dry sandy oak, aspen and jack pine woodlands. We only know of 4 populations of this flower in Wisconsin. All of them are from GLW, and 3 of them were last verified before 1960. The only recently verified population is from Bear Bluff, in Jackson County.

  Conservation Concerns: The woodland habitat is vulnerable to succession or conversion to plantation.

- **Butternut (*Juglans cinerea*) – Not Actively Tracked, S3? G4**

  This eastern North American tree is being extirpated by a blight that has now affected nearly all populations in Wisconsin. It is frequent in the BRSF along the Black River in rich mesic terrace or floodplain forests, mostly as dead trees; only a few living individuals were seen, and these were succumbing to blight.

  Conservation Concerns: disease.

- **Grassleaf rush (*Juncus marginatus*) – Special Concern, SU G5**

  A frail-looking rush that grows in much of the United States and adjacent Canada, this species is scattered and possibly overlooked in wet, young (10-40 years old, probably the result of small clear cuts) jack pine stands with partly open sandy-peaty ground in the understory. It often grows with other rare species such as crossleaf milkwort and yellow screwstem.

  Researchers have documented grassleaf rush in 17 places across Wisconsin, of which 8 haven't been verified since 1970. It was discovered at six sites in the BRSF and 1 on Wood County Forest Crop Land in 1997. Most of Wisconsin's recently verified sites fall within the study area.

  Conservation Concerns: Requires periodic disturbance.

- **Rock or cliff clubmoss (*Lycopodium porophilum*) – Special Concern, S3 G4**

  Also known as *Huperzia porophila*, this regional endemic is nearly restricted to the "driftless area" of southeastern Minnesota, southwestern Wisconsin, northeastern Iowa, and northwestern Illinois. It is known from several new and relocated historic sites in the BRSF, mostly near the Black River and along the lowermost gorges of its tributaries Perry Creek, Halls Creek, and Morrison Creek. A new site was also found on a sandstone road cut on Highway 54 near Saddle Mound on Jackson County Forest land, and

another at Castle Mound in the BRSF. A new county record was also found at Wildcat Mound in Clark County. The preferred habitat is mossy, usually north-facing shelving sandstone cliffs under red maple, yellow birch, white birch, or less commonly jack pine. The more common, more robust shining clubmoss (*L. lucidulum*) is often present at these sites, too. At such places a few intermediate, presumably hybrid individuals may also found.

There are a total of 25 Wisconsin sites; 2 of these were last seen before 1970. It occurs at 6 sites in the BRSF and 4 more within the study area.

Conservation Concerns: This cliff pteridophyte occupies a narrow niche and probably never grew in large numbers. Quarrying or other habitat destruction.

- **Farwell's water-milfoil (*Myriophyllum farwellii*) – Special Concern, S3 G5**

  This submersed aquatic grows primarily in low alkalinity, low pH and low conductivity water in the eastern United States and adjacent Canada. It is scattered throughout Wisconsin but may simply be overlooked. 1997-1998 surveys revealed it to be locally abundant in many of the artificial impoundments of the BRSF (Dry Land, Funmaker, Wildcat, Teal, Railroad, and Oxbow Pond Flowages) as well as lands in GLW to the east, often in flowages and drainage ditches. In Juneau County it is known from Meadow Valley Flowage, and in Wood County from Remington Ditch and Ball Road Flowage.

  There are a total of 36 Wisconsin sites. Nine of these were last seen before 1970. Fourteen sites occur in the study area, making BRSF/MVL an important concentration area for this species.

  Conservation Concerns: This water-milfoil grows in locally large populations within the Black River and Meadow Valley landscapes, all in artificial flowages. Natural ponds and lakes were rare or non-existent in the pre-settlement landscape here. Migrating waterfowl may have introduced *Myriophyllum* to this region after the flowages were built. As long as these flowages are maintained, this species should prosper here. If the maintenance stops, the culverts will eventually plug, dikes will be breached, and the species will be lost from the landscape.

- **Brittle prickly pear (*Opuntia fragilis*) – Threatened, S3 G4G5**

  This little cactus with big flowers is found most often in the Great Plains and Rocky Mountains, but it grows in scattered Wisconsin places as far east as Waupaca County. It tends to grow on sunny, rocky or sandy, non-tillable land. In the past, avid cactus collectors may have significantly depleted populations of brittle prickly pear in Wisconsin. It may be prudent to minimize publicity regarding populations to avoid attracting poachers. Researchers have reported brittle prickly pear from 42 Wisconsin sites, but in the BR/MVL, we have heard no report of brittle prickly pear since 1947, and then it was on private land. Trees seem to have invaded that site in subsequent years.

  Conservation Concerns: succession to forest; disruption of potential habitat by recreationists; poaching.

- **One-flowered broomrape (*Orobanche uniflora*) – Special Concern, S3 G5**

  Like other members of the broomrape genus, this little flower gets its nourishment by tapping the roots of other plants rather than by photosynthesizing. It grows in a wide variety of habitats, from dry prairies to moist woods, and never seems to be abundant in any one place. Researchers have reported one-flowered broomrape from all over North America, but it is considered rare in many states and provinces. We know of 51 Wisconsin populations, of which 23 haven't been confirmed since 1970. The one known population in BRSF/MVL is on Necedah Wildlife Reserve in an oak-pine barren.

Conservation Concerns: Uncertain because the wide variety of habitats for this species makes it hard to judge what people could do to encourage or harm it.

- **Canada mountain-ricegrass (*Oryzopsis canadensis*) – Special Concern, S1 G5**

  As the name implies, this species of northeastern North America is rare south of the Canadian border. Found in pine barrens and woodlands, it is one of Wisconsin's rarest grasses. There are several historic sites and two extant sites in Vilas County. In the BRSF, a 1958 site from Little Bear Flowage was not relocated in 1997; neither was a 1915 site from Trow Mounds in nearby Clark County. A new population was discovered in 1997 growing in an oak woodland in the Rudd Hills in the extreme SE corner of the Forest. In Wisconsin, this species has probably suffered from the suppression of large intense fires.

  Conservation Concerns: fire suppression.

- **American ginseng (*Panax quinquefolius*) – Not being actively tracked, S4 G4**

  This commercially valuable herb of the eastern United States and adjacent Canada has become infrequent in Wisconsin. A few plants were discovered in 1997 in a rich mesic deciduous forest on a terrace of the Black River, within the BRSF.

  Conservation concerns: poaching; overharvesting.

- **Pale green orchid (*Platanthera flava* var. *herbiola*) – Threatened, S2 G4T4Q**

  Found in the eastern United States and adjacent Canada, this orchid is scattered throughout Wisconsin in wet prairies, shrub carrs, and roadside ditches. It is not known from the BRSF, but was collected in 1994 from a floodplain forest along the Yellow River south of Babcock in Wood County.

  There are a total of 36 Wisconsin sites; 15 of these were last seen before 1970. One population was documented in the study area (apparently on private land along the Yellow River) in 1994.

  Conservation Concerns: uncertain

- **Hooker's orchid (*Platanthera hookeri*) – Special Concern, S1 G5**

  A woodland orchid of the eastern and central U.S. and adjacent Canada, Hooker's orchid is scattered throughout WI in a variety of habitats ranging from old growth forests to pine plantations. There is a 1948 collection from the Morrison Creek Gorge area of the BRSF. This site was not relocated in 1997, but the species could still occur somewhere in the area.

  There are a total of 58 Wisconsin sites; 38 of these were last seen before 1970, including the above BRSF site.

  Conservation Concerns: Logging, development.

- **Bog bluegrass (*Poa paludigena*) – Threatened, S2S3 G3**

  This nondescript little grass is endemic to springy areas and forested seeps in the northeastern United States. It is scattered in Wisconsin, where it is most common along the St. Croix River and in the south and east. The only BRSF site was discovered in 1997 in the Clear Creek Fen near the Black River. It may also occur in a skunk cabbage seep, on the east bank of the Black River just north of the confluence of Morrison Creek. This species may be more overlooked than rare; in addition to its small size, its flowering period is short, only a week or two at a given site.

Besides the single BRSF site noted above, there are a total of 31 Wisconsin sites. Three of these were last seen before 1970 and 3 have been extirpated.

Conservation concerns: This species' preferred habitat usually comes in small patches, making it especially vulnerable to mechanical disturbance. It depends on groundwater flow, which could be interrupted by lowering the water table.

- **Crossleaf milkwort (*Polygala cruciata*) – Special Concern, S3 G5**

  A species of the Atlantic coastal plain of the eastern United States, crossleaf milkwort (also known by the equally descriptive name of "drum heads") is more scattered inland. In Wisconsin it occurs in the central and southern parts of the state, especially in GLW. The species prefers acid, seasonally wet, sandy-peaty ditches, young jack pine stands revegetating cleared areas, and ATV trails. Crossleaf milkwort becomes incredibly abundant where periodic mowing eliminates competing plants. About the only native habitat noted (and this was not common) was along deer trails through poor fens and open tamarack swamps. In GLW outside the BRSF, new sites were found in Juneau County (14), Monroe County (8), Wood County (3), and Clark County (1).

  There are a total of 94 Wisconsin sites. Eighteen of these were last seen before 1970, and one is extirpated. Sixty-seven of these sites are in the Black River/Meadow Valley landscape and have been newly found since 1994. In the BRSF proper, about 10 historical sites were relocated and 30 new sites found in 1997-1998.

  Conservation concerns: Like *Bartonia paniculata*, this species is apparently dependent on periodic disturbances that expose mineral soil for population maintenance. In pre-settlement times, this regime may have included catastrophic fires, or perhaps the trails and/or wallows of large animals such as deer, elk, or bison. Currently, periodic maintenance of roadside, railroad, powerline, and pipeline rights-of-way, and mossing of peatlands, provides suitable habitat, and will continue to in many areas (such as along major highways). In other habitats (such as mown trails), there is no assurance that this disturbance regime will continue for the long term. "Natural" populations have small numbers and exist only in scattered peatlands.

- **Prairie parsley (*Polytaenia nuttallii*) – Threatened, S3 G5**

  Prairie parsley ranges from Minnesota and Wisconsin to Nebraska, south to Mississippi, Texas, and New Mexico. It is restricted to roughly the southwest quarter of Wisconsin. Prairie parsley grows in dry to wet-mesic prairies and also in savannas. There are 47 records in Wisconsin, including 24 since 1971 including a record from the study area.

  Conservation concerns: Loss of habitat due to land conversion and degradation. Fire suppression.

- **Algae-like pondweed (*Potamogeton confervoides*) – Threatened, S2 G4**

  Known from Labrador to South Carolina, algae-like pondweed is at the western edge of its range in Wisconsin. It grows submersed in quiet, shallow, acid ponds and lakes of low conductivity and low alkalinity. Known from 12 sites (4 historical) in Wisconsin, nearly all in the north. Although it was collected in 1975 from Meadow Valley Flowage in Juneau County, researchers could not find it there in 1997-1998.

  Conservation concerns: Water quality.

- **Water-thread pondweed (*Potamogeton diversifolius*) – Special Concern, S2 G5**

  This submersed aquatic, also known as *P. capillaceus*, is found in the northeastern United States and adjacent Canada. In Wisconsin it is found throughout the state in a dozen sites in two concentrations -- Vilas-Oneida Counties and GLW. In BRSF, it was found to be locally common in two artificial impoundments: Funmaker and Battle Point Flowages. In GLW outside BRSF, it was discovered in similar habitats in Juneau County (Cutler Pond, Meadow Valley Flowage) and Wood County (Remington Ditch, Cranberry Road, Corner Marsh, and Ball Road Flowage).

  There are a total of 13 Wisconsin sites, and all of them have been verified in recent decades. Ten are from the Black River/Meadow Valley landscape.

  Conservation concerns: This pondweed grows in locally very large but localized populations within the Black River and Meadow Valley landscapes, all in artificial flowages. Natural ponds and lakes were rare or non-existent in the pre-settlement landscape here. Migratory waterfowl may have introduced *Potamogeton capillaceus* after people built flowages. As long as these flowages and water quality are maintained, this pondweed should prosper here. If the maintenance stops, the culverts will eventually plug, dikes will be breached, and the species will be lost from the landscape.

- **Spotted pondweed (*Potamogeton pulcher*) – Endangered, S1 G5**

  Spotted pondweed is a submerged aquatic of the eastern United States, usually in acid water. In Wisconsin it is known from only five scattered sites. In 1938, a researcher collected spotted pondweed from "Potter Reservoir", which is presently known as Eagle Nest Flowage, in Juneau County. It was not relocated in 1997-1998.

  Conservation concerns: water quality, hydrology.

- **Vasey's pondweed (*Potamogeton vaseyi*) – Special Concern, S2 G4**

  Vasey's pondweed is an annual species found primarily in shallow, relatively neutral, low alkalinity, low conductivity water of the northeastern United States and adjacent Canada. It is found scattered throughout Wisconsin (18 sites, 8 historical). Although not known from the BRSF, there is a 1969 site from Sprague Flowage in Juneau County, where it was found with common waterweed in clear, 8" deep water over a sandy bottom. It was not relocated in 1997-1998.

  Conservation concerns: water quality.

- **Virginia meadow-beauty (*Rhexia virginica*), Special Concern, S2 G5**

  A species of the northeastern United States and adjacent Canada that is most common along the Atlantic coastal plain, meadow-beauty is found in central and southern Wisconsin, with a high concentration of sites in GLW. There is one recovered historic site (Cemetery Road and Old Highway 54) and one new record (Battle Point Peatlands) for the BRSF, and several new sites in eastern Jackson County (several Old Highway 54 sites, plus one on a moss-drying area near Potter Flowage). 11 sites are known from Juneau County, mostly in ditches along Highway 80, but also along the Becker-Laske Roads and in the Blueberry Trail Complex. The species typically grows in seasonally wet, sandy-peaty ditches, often with other coastal plain species such as yellow screwstem and crossleaf milkwort. There are no records from Wood or Monroe Counties.

  Similar to *Bartonia paniculata*, this species is apparently dependent on periodic disturbance that reduces shrub density and exposes bare mineral soil. In pre-settlement times, this regime may have included catastrophic fires, or perhaps the trails and/or wallows of large animals such as deer, elk, or bison. It is also

characteristic of the open shores of naturally fluctuating sandy-peaty ponds and lakes, which, however, is a very rare habitat type in the Black River and Meadow Valley landscapes.

There are a total of 31 Wisconsin sites; 9 of these were last seen before 1970. 14 of these sites are in the Black River/Meadow Valley landscape.

Conservation concerns: This species occupies a much smaller percentage of seemingly suitable habitat than its frequent associates *Bartonia virginica* and *Polygala cruciata*, and thus could be characterized as having more "conservative" habitat requirements than those species. Perhaps its seeds are less motile. Currently, periodic maintenance of roadside, railroad, powerline, and pipeline rights-of-way, appears to provide suitable habitat for this species, and will in many areas for the long. In other habitats (such as mown trails), there is no assurance that this disturbance regime will continue for the long term.

- **Silky willow (*Salix sericea*) – Special Concern, SH G5**

  Silky willow is found in the northeastern United States and adjacent Canada, often in rocky ground next to flowing water. It is quite rare in Wisconsin with only 6 historic stations (not found in the state since 1967). However, willows are under-collected and the species may be somewhat overlooked. A 1948 collection from Clear Creek Fen near the Black River in the BRSF was not relocated in 1997. There are also historic collections from Melrose in Jackson County and Neillsville in Clark County. As this species might easily be overlooked, we will not assume that the lack of recent records indicates extirpation.

  Conservation concerns: Uncertain.

- **Georgia bulrush (*Scirpus georgianus*) – Special Concern, SU G5**

  This marsh species is scattered from Nova Scotia to Texas. In Wisconsin, we only know it from 5 historic locations. There is a 1968 collection from near the junctions of Old Highway 54 and Cemetery Road in BRSF. This site was searched several times and the species not relocated in 1997. However, a recent (2000) examination of the specimen on which this record is based revealed that the plant was actually collected along "new" State Hwy. 54, and thus may still be extant.

  Conservation concerns: Uncertain, but probably habitat destruction or degradation.

- **Torrey's bulrush (*Scirpus torreyi*) – Special Concern, S2S3 G5?**

  Torrey's rush is found in shallow water of sandy or peaty shores from Quebec to Missouri, and is rare in many of the states in between. It is scattered throughout Wisconsin, mostly in the northwestern counties in sandy or peaty wetland edges. Two sites are documented in MVWA, and they are very large. There are a total of 24 Wisconsin sites.

  Conservation concerns: changes in water level, physical disturbance of shores.

- **Reticulated nutrush (*Scleria reticularis*) – Endangered, S1 G4**

  This small sedge is found in the eastern United States, south into the tropics. It is rare in the interior United States, and in Wisconsin is found in only three disjunct coastal plain marshes, two in Adams County, the other discovered in1997 at Brockway Lake No. 1 on Jackson County Forest land just south of the BRSF boundary. The tiny population grows at the very wettest part of a small, fluctuating, sandy-muddy pond unlike any other noted in Jackson County.

Conservation concerns: This is a species of the open shores of naturally fluctuating, sandy-peaty ponds and lakes. This is a very rare habitat type in the Black River and Meadow Valley landscapes, apparently well-developed only at Brockway Lake No. 1.

- **Whip nutrush (*Scleria triglomerata*) – Special Concern, S2S3 G5**

  This sedge with long, whiplike stems is found in the eastern United States, south into the tropics. It is scattered in central and southern WI, where its habitat requirements are not well documented. In the BRSF it was found at 4 new sites, 3 of them in ditches along Highway 54, where it formed long, linear colonies at the ecotone between seasonally wet sandy-peaty below, and dry sand prairie on the embankments above.

  There are a total of 32 Wisconsin sites; 18 of these were last seen before 1970. Four sites are in the Black River/Meadow Valley landscape.

  Conservation concerns: This species is apparently dependent on periodic disturbance (to bare mineral soil) for population maintenance. In pre-settlement times, this regime may have included catastrophic fires, or perhaps the trails and/or wallows of large animals such as deer, elk, or bison. Currently, periodic maintenance of roadside rights-of-way, including occasional mowing, appears to mimic the natural disturbance regime. It has a narrower niche than either *Bartonica virginica* or *Polygala cruciata*, and grows in a very specific habitat, on the mid- to lowest- slopes of roadside embankments immediately adjacent to acid, sphagnous ditches. No "natural" populations are known from the Black River and Meadow Valley landscapes. However, "natural" populations from forest or savanna/wetland ecotones are known from Ft. McCoy in Monroe Co., and in various places along the lower Wisconsin River.

- **Shadowy or cliff goldenrod (*Solidago sciaphila*) – Special Concern, S3 G3G4**

  A regional endemic nearly restricted to the "driftless area" of southeastern Minnesota, southwestern Wisconsin, northeastern Iowa, and northwestern Illinois, this goldenrod is now known from almost 100 sites in Wisconsin. The preferred habitats are exposed, partly sunny sandstone cliff edges, usually under an open forest of pines (jack, red, or less commonly white) or oaks, often with few other herbaceous associates. It may also occur on shaded but dry cliffs. Six new sites were discovered on sandstone outcrops in the BRSF in 1997. There are a total of 14 sites in Jackson County, mostly within 15 miles of the Black River, rarely ranging east to Bear Bluff.

  There are a total of 91 Wisconsin sites; 34 of these were last seen before 1970. Seventeen of these sites are in the study area.

  Conservation concerns: Fire suppression. In spite of its specific epithet (*sciaphila* means "shade-loving"), this cliff-loving goldenrod appears to require periodic canopy opening to survive. It is thriving and spreading, for examples, on steep, open, north-facing slopes on Belle Mound that were burned in a large, intense fire in 1977.

- **Small-flowered woolly bean (*Strophostyles leiosperma*) – Special Concern, S2 G5**

  A pink-flowered vine in the pea family, this species grows in dry or moist sandy soil, upland woods, dunes and shores from Connecticut to Arizona. We know of 14 Wisconsin populations, 8 of them last confirmed before 1970. In 1997, researchers noted one population on Meadow Valley, and 2 others in the study area. This means that fully half of the recently confirmed Wisconsin populations of small-flowered woolly bean are within the study area.

Conservation concerns: Fire suppression. Ecologists have found that native vines in the pea family quickly disappear from prairies and savannas when they are not burned. Prescribed fire may be very important in maintaining populations of small-flowered woolly bean.

- **Prairie fame-flower (*Talinum rugospermum*) – Special Concern, S3 G3?**

  This small, rosette-forming succulent is restricted to the central United States, with perhaps the largest number of populations in the world in Wisconsin, especially at Fort McCoy Military Reservation. In Wisconsin it is found scattered throughout the western and southern parts of the state in sand barrens, dry prairies, and dry oak woodlands. One new site, in the Millston Ridge Oak Barrens, was found in 1997 in the BRSF. Two other new sites were found on Jackson County Forest lands west of the Forest in 1996-1997. A population along Lambert Road, in the sandy apron that formed from a road cut through sandstone, has hundreds of plants.

  There are a total of 40 Wisconsin sites, all confirmed recently. 3 of these sites are in the Black River/Meadow Valley landscape, and the single population within the BRSF appears to be marginally viable.

  Conservation concerns: This species may require periodic disturbance (it is often found in very old sandy road ruts), but cannot survive repeated frequent trampling or vehicle traffic. It needs lots of sun, which makes it vulnerable to fire suppression and succession.

- **Bog (Massachusetts) fern (*Thelypteris simulata*) – Special Concern, S3 G4G5**

  Wisconsin populations of this wetland fern are highly disjunct from the bulk of its global distribution. Found in the eastern United States and adjacent Canada, mostly near the Atlantic coast, the nearest populations are in mid-Pennsylvania. In Wisconsin, it typically grows in white pine – red maple swamps, but can also be found in alder thickets, and, rarely, fens and moist cliffs. Common understory associates are cinnamon fern, skunk cabbage, and winterberry holly. Unlike its frequent associate, long fern, this species appears not to tolerate logging and subsequent canopy opening very well.

  There are a total of 68 Wisconsin sites, and all of them have been recently verified. Forty-nine of these were discovered since 1997 in the Black River/Meadow Valley landscape. The following number of new or relocated sites were found in 1997-1998 in various counties: Clark (2), Jackson (33, including 20 in BRSF), Monroe (7), Wood (4), and Juneau (3).

  Conservation concerns: Sensitive to canopy disruption (logging). Wetland habitat sensitive to flooding or water table depression. See *Carex folliculata* above.

- **Hidden-fruited bladderwort (*Utricularia geminiscapa*) – Special Concern, S3 G4G5**

  A tiny, inconspicuous submersed aquatic that rarely produces above-surface yellow flowers, this species is found in the northeastern United States and adjacent Canada. It usually grows in low alkalinity, low conductivity water of close-to-neutral pH. It is scattered throughout Wisconsin in ponds and lakes, with concentrations in Vilas County and GLW. In the BRSF, it has turned out to be locally common in artificial impoundments and ditches, where 15 new sites were found in 1997. Several additional new sites were found in GLW outside of the BRSF, in Wood County (Cranberry Road) and Juneau County (Sprague-Mather Flowage and Second Avenue in Meadow Valley Wildlife Area).

  It is not certain how many, if any of the Black River / Meadow Valley landscape populations represent pre-settlement occurrences that have survived to the present day. Migrating birds might easily disperse this species between water bodies. Some populations in small pools (puddles, really) and game trails in undisturbed peatlands may be native.

There are a total of 56 Wisconsin sites; 9 of these were last seen before 1970. Researchers have documented 25 sites in the study area.

Conservation concerns: water quality, hydrologic disturbances.

- **Purple bladderwort (*Utricularia purpurea*) – Special Concern, S3 G5**

  This aquatic is found in the eastern United States and adjacent Canada. It flowers infrequently, but when it does, the result is a spectacular show, with an entire pond or lake surface becoming a mass of purple blooms. Purple bladderwort is scattered throughout Wisconsin, but is commoner in the north. It grows in low alkalinity, low conductivity, and generally low pH lakes in Wisconsin. It was not found in the BRSF, but has been known since 1968 (relocated 1998) from a huge population in shallow water over mucky peat in the Cranmoor Flowage in Wood County.

  There are a total of 28 Wisconsin sites; 6 of these were last seen before 1970. The Cranmoor population's great size, extent, and evident longevity make it one of the most stable in Wisconsin.

  Conservation concerns: water quality, hydrologic disturbances.

- **Sand violet (*Viola fimbriatula*) – Endangered, S2 G5**

  Now more generally recognized as *Viola sagittata* var. *ovata*, this taxon appears to intergrade with the common arrow-leaved violet *V. sagittata* var. s*agittata* in the BRSF in such habitats as seasonally wet, sandy impoundment dikes at Big Bear Flowage. Sand violet is a species of the northeastern United States and is rare in western and central Wisconsin. Several historic sites were relocated and 10 new sites discovered in 1997 in the BRSF. The commonest habitat was along ski-hiking trails in the Smrekar-Wildcat Ridge areas, and on roadside shoulders in sandy soil with little competition. In either case, plants are most common where trails or roads traverse sandstone cut, and scattered small jack pines are frequent associates.

  There are a total of 20 Wisconsin sites; 3 of these were last confirmed before 1970. Seventeen sites occur in Jackson County in or near the BRSF.

  Conservation concerns: The species was never seen in a truly "natural" habitat and appears to require frequent disturbance to survive.

APPENDIX I

Natural Communities of the Black River State Forest / Meadow Valley Landscape

Abbreviations Used

TNC = The Nature Conservancy

NVC = National Vegetation Classification, developed by The Nature Conservancy's national, regional, and state ecologists. Each type has a unique 4-digit code.

HT = Habitat Type, as developed for Wisconsin by Kotar and Burger (1996)

For interpretation of "G" (global) and "S" (state) ranks, see Appendix M.

Note that there is not necessarily a one-to-one correspondence between Heritage Program types (many of which are still based on Curtis 1959), TNC NVC types, and habitat types. These systems are based on different underlying concepts and were developed for different purposes. Any "crosswalks" between them will be imperfect.

Forest Communities

- **Central Sands Pine-Oak Forest (white pine-red pine-white oak-red oak)**
  Large patch, limited distribution. S3

  This type is associated strongly with subsection 222Ka (and 222Kk), where it occurs on very dry to dry-mesic sites on low nutrient sands. Sandstone bedrock may be very close to the surface. Two types should probably be recognized: a very dry type, with jack pine and northern pin or black oak important canopy species, especially where bedrock is at or near the surface; and a dry to dry-mesic type with red oak, red maple, white pine, and red pine more prevalent. Both types are floristically depauperate, but the moister type supports more mesophytic herbs, shrubs, and trees.

  TNC NVC Type: 2481 White Pine – White Oak Forest G3

  Habitat Types: PVGy, PVCr, PVHa

- **Northern Dry-mesic Forest (white pine-red pine)**
  Large patch, wide distribution. S3

  Dominant trees are typically white and red pines. Canopy associates may include red maple, red oak, bigtooth aspen, paper birch, and, in stands farther north, balsam fir. Understory plants usually include blueberries, wintergreen, bracken fern, pipsissewa, and Canada mayflower. On the BRSF, the best developed stands are associated with sandstone bedrock outcrops.

  TNC NVC Types: 2480 White Pine – Red Oak Forest G3

  2444 White Pine / Blueberry Dry-mesic Forest G3G4

  2378 White Pine (Red Pine) Driftless Bluff Forest G3

  Habitat Type:

- **Northern Dry Forest (jack pine-northern pin oak)**
  Large patch, wide distribution. S3

  In Central Wisconsin this type should perhaps be represented by very dry stands of the Central Sands Pine-Oak Forest. For now, we've typed some of the stands on the excessively drained, level to gently rolling, low nutrient sands that cover much of the Black River State Forest as "Northern Dry Forest". Very few high quality occurrences were documented, as this type was greatly affected in central, west-central, and northwestern Wisconsin by a recent jack pine budworm outbreak. In the past, and in some locales presently, this type has often been converted to plantation monocultures of red pine or sometimes jack pine.

  TNC NVC Type: 2478 Jack Pine – Northern Pin Oak Forest G4G5

2077 Northern Pin Oak Forest G4?

Habitat Types: PVGy

- **Southern Dry-mesic Forest (red oak-white oak-red maple)**
  Large patch, wide distribution.

  Documented at only a few sites on the BRSF, this forest type is more frequent in the ridge and coulee portions of the Driftless Area just to the west. Level to gently sloping sandy terraces within the floodplain of the Black River but above normally flood-prone areas, and saddles or north and east slopes associated with sandstone ridges, contained stands that could be typed here. A trend toward replacement of oaks by red maple, black cherry, or basswood is evident in some stands.

  TNC NVC Type: 2068 Midwestern White Oak – Red Oak Forest G4?

  Habitat Types: ArDeV

- **Southern Mesic Forest (mesic floodplain subtype: sugar maple-basswood)**
  Large patch, wide distribution. S2

  Rare on the State Forest and in subsection 222Ka, with stands documented only on terraces just above the floodplain of the Black River. This community has not been found on other state forests in Wisconsin. The herbaceous flora is exceptionally rich, and on the BRSF this type provides habitat for rare forest interior songbirds and forest raptors, especially where bordered by extensive stands of other forest types.

  TNC NVC Type: 2062 North-central Maple – Basswood Forest G4?

  Habitat Type: ATiCa

- **Hemlock Relict (eastern hemlock)**
  Small patch, limited distribution. S2

  Extremely rare on the Black River State Forest, with a single stand documented. This represents the only Jackson county location for hemlock, and is probably the only occurrence of the type on state forest lands. Important southwestern Wisconsin sites for this community occur are within the Kickapoo, Baraboo, and Pine River drainages, and in the Baraboo Hills. Most of the stands are in Sauk or Vernon counties, though a few are known from southern Monroe, southwestern Juneau, Iowa, and southern Richland counties. Hemlock is absent from similar sites in the Driftless portions of southeastern Minnesota, northeastern Iowa, and northwestern Illinois.

  TNC NVC Type: 2597 Hemlock – Sugar Maple Relict Forest G2

  Habitat Types:

- **White Pine – Red Maple Swamp (white pine-red maple)**
  Large patch, limited distribution. S2

  This wetland community is virtually restricted to subsection 222Ka, which encompasses Glacial Lake Wisconsin and associated geological features. The State Forest contains some of the most significant stands of this geographically restricted type. Rare plants, including several species markedly disjunct from their more eastern ranges, and springs or seepages are almost invariably associated with this community. Mature stands with high canopy cover may support rare animals, and are frequently rich in northern species at their southern range limits.

  TNC NVC Type: 2482 White Pine – Red Maple Swamp G3G4

  Habitat Types: PVRh

- **Floodplain Forest (silver maple-green ash)**
  Large patch or linear, wide distribution. S3

  Associated with the floodplains of major rivers in southern Wisconsin but with outliers in the north, this community is represented by several occurrences along the Black River. This type supports a number of habitat specialists, including some that are rare such as the Prothonotary Warbler and Red-shouldered Hawk. The Floodplain Forest community is rare on state forest lands.

  TNC NVC Type: 2586 Silver Maple – Elm (Cottonwood) Forest G4?

  Habitat Types: NA

- **Southern Hardwood Swamp (ash spp.-red maple-American elm)**
  Large patch, widespread distribution. S2

  Wet deciduous forests not associated with major river floodplains are not well represented on the BRSF. This is a minor type in 222Ka, and is much better represented on glaciated terrain farther north.

  TNC NVC Type: 2071 Red Maple – Ash – Birch Swamp Forest G4

  Habitat Types: NA

- **Tamarack Swamp/Central Tamarack Poor Swamp**
  Large patch, limited distribution. S3

  In Wisconsin, most occurrences of this "southern" conifer swamp community are in section 222K. Several important stands were documented on the State Forest. This type provides important habitat for many northern birds at or near their southern range limits in central Wisconsin.

  TNC NVC Type: 2472 Central Tamarack Poor Swamp G4?

  Habitat Types: NA

- **Black Spruce Swamp**
  Large patch, wide distribution. S3?

  Widespread in northern Wisconsin, this acidic wet forest community is relatively restricted in the southern part of the state to Glacial Lake Wisconsin and a few other locations. The larger stands often support northern species at their southern range limits.

  TNC NVC Type: 2454 Black Spruce/Labrador Tea Poor Swamp G5

  Habitat Type: NA

- **Jack Pine Swamp**
  Small patch, limited distribution. S2

  Acidic, forested peatlands with jack pine as an important canopy component are uncommon in Wisconsin. Stands have been documented in Bayfield and Vilas counties, as well as on the BRSF in Jackson county. Sphagnum mosses, sedges, and ericaceous shrubs are important groundlayer components.

  TNC NVC Type: 166 Jack Pine Swamp G?Q

  Habitat Type: NA

- **Forested Seep**
  Small patch, wide distribution.

  On the Black River SF this type is typically associated with exposures of Cambrian sandstone bedrock that form cliffs along steep-walled river gorges. The best documented examples occur on the flanks of the Black River's main channel, and along the lower reaches of Morrison and Halls Creeks. Groundwater seepage keeps the cliffs and the narrow benches below them constantly moist. A mixed canopy of coniferous and deciduous trees shades the sites. Important tree species include red maple, black ash, yellow birch and white pine. Understory diversity can be very high. Several rare plants and invertebrates have been documented primarily in this community.

  TNC NVC Type: 2071 Red Maple – Ash – Birch Swamp Forest G4 (seepage swamp subtype is not yet ranked)

  Habitat Type: NA

Savanna Communities

- **Pine Barrens (jack pine-northern pin oak-prairie grasses and forbs-sweet fern)**
  Large patch, limited distribution. S2

  The fire-dependent "barrens" community is not currently well represented on the State Forest. Fire suppression and conversion to plantations have left few intact remnants. Numerous sensitive plant and animal species are associated with or dependent on this rare community, which is an appropriate target for restoration and maintenance at small to very extensive scales in subsection 222Ka. Sharp-tailed grouse, dwarf milkweed, Karner blue butterfly, frosted elfin, phlox moth, blue racer, and bull snake are just a few of the numerous sensitive species that can benefit from barrens maintenance.

TNC NVC Type: 2490 Jack Pine / Prairie Forbs Barrens G2

Habitat Type: NA

Shrub Communities

- **Alder Thicket**
  Linear, widespread distribution. S4

  Found along stream margins and wetland edges. Common in the north, more localized in the central sands, and generally rare in southern Wisconsin.

  TNC NVC Type: 2381 Alder Swamp G5?

  Habitat Type: NA

Herbaceous Communities

- **Emergent Aquatic (cattail-bulrush-burreed)**
  Large patch or linear, widespread distribution. S4

  Emergent marshes are not well developed on the BRSF, at least partly because of the acidic, low nutrient surface waters characteristic of ecoregion 222Ka, and the absence of lakes. Documented stands are associated with artificial impoundments or sluggish backwaters of streams.

  TNC NVC Type: 2026 Bulrush – Cattail – Burreed Shallow Marsh G4G5

  2229 Midwest Mixed Emergent Deep Marsh G5

  Habitat Type: NA

- **Submergent Aquatic (pondweed-coontail-water milfoil)**
  Large patch or linear, wide distribution. S4

  As with the emergent marsh, this aquatic macrophyte community is also poorly developed in the Central Sands. The major exceptions are stands associated with artificial impoundments. Among the aquatic plants adapted to the acidic, nutrient-poor waters typical of subsection 222Ka are several rare species.

  TNC NVC Type:

  Habitat Type:

- **Coastal Plain Marsh**
  Small patch, limited distribution. S1

  No natural stands of this rare wetland type were documented on the State Forest, but a significant occurrence was found on adjoining Jackson County Forest land. The key attributes associated with this feature, a small pond with a sandy littoral zone that experiences marked natural water level fluctuations, can be partially mimicked by human disturbance. These include an exposed substrate of almost bare sand kept moist by slow groundwater seepage. A number of rare or otherwise restricted plants can colonize such habitats, which are sometimes created on the margins of borrow pits, in roadside ditches, and on the edges of moss drying beds. Many of these rare plants have ranges centered on the Atlantic Coastal Plain of the eastern U.S. (hence the community name). The conservation value of the artificial sites is currently undetermined.

  TNC NVC Type: 5108 Inland Coastal Plain Marsh G2?

  Habitat Type: NA

- **Northern Sedge Meadow (sedges-Canada bluejoint grass)**
  Large patch, widespread distribution. S3

  The classification of wet open meadows in central Wisconsin remains problematic. For the time being, “Northern Sedge Meadow” will be used to classify those herbaceous wetlands dominated by tussock sedge, the broad-leaved sedge Carex utriculata, and Canada bluejoint grass. Sphagnum mosses are absent or present in a thin, discontinuous layer.

  TNC NVC Type: 2257 Northern Sedge Wet Meadow G4G5Q

  Habitat Type: NA

- **Central Poor Fen**
  Large patch, limited distribution. S3

  These acid, floristically depauperate meadows are common features of the central Wisconsin landscape, particularly in subsection 222Ka. A layer of sphagnum mosses is typically present, with Canada bluejoint grass and the sedges *Carex oligosperma* and *C. utriculata* the dominant graminoids. Hardhack (Spiraea tomemtosa) is frequently common. Ericaceous shrubs are conspicuous by their absence, though leatherleaf and cranberries are usually present with low cover. More work on floristics, water chemistry, and hydrology is needed to better classify these communities.

  The State Forest has extensive acreages of this type, but many of the larger stands have been affected by hydrologic modification and/or the harvest of sphagnum moss.

  TNC NVC Type: 2265 Northern Poor Fen G3G4

  Habitat Type: NA

- **Sand Barrens**
  Small patch, wide distribution.

  This type references pine or oak barrens formerly affected by disturbances other than fire, such as grading, furrowing/scarification, or even cultivation. Significant exposures of bare sand are characteristic, and the re-vegetation of these droughty, low-nutrient sites is typically very slow. The conservation significance of the sand barrens community lies in its ability to provide habitat for specialized plants and animals, some of them now rare.

  TNC NVC Type: 2318 Midwest Dry Sand Prairie G2G3

  5099 Sand Barrens

  Habitat Type: NA

Primary Communities

- **Dry Cliff**
  Linear patch, widespread but very localized distribution. S4

  Dry Cambrian sandstone cliffs are characteristic features of 222Ka, where they most often occur on the sides of the many bedrock mesas, mounds, and pinnacles that emerge abruptly from the central sands landscape. Several rare plants are associated with dry acid cliff habitats in and around the State Forest. Sandstone cliffs also occur along the Black River and some of its tributaries, such as Halls, Morrison and Perry Creeks. It's likely that future versions of this classification will split communities along bedrock type. If that happens, this type would be restricted to the Driftless Area of southwestern and central Wisconsin, and a few locations along Lake Superior in Bayfield and Ashland counties.

  TNC NVC Type: 2045 Midwest Sandstone Dry Cliff G?Q

  Habitat Type: NA

- **Moist Cliff**
  Linear, widespread. Less common than the dry cliff community. S4

  Rare on the BRSF, but highly significant occurrences were documented on Cambrian sandstone along the Black River and its tributaries, Morrison, Halls, and Perry Creeks.

  TNC NVC Type: 2287 Sandstone Moist Cliff G4G5

  Habitat Type: NA

Aquatic Types

Definitions and descriptions of aquatic types will be forthcoming over the next several years.

APPENDIX J

Rare Animals of the Black River/Meadow Valley Landscape

This appendix lists each of the rare animal species known to occur on the Black River State Forest/Meadow Valley Landscape (BRSF/MVL) and provides information on their conservation status. "Rare" species are treated here as native species known or suspected to be rare and/or declining in the state. Included are species legally designated as "Endangered" or "Threatened" by the State of Wisconsin, as well as species on the Department's advisory "Special Concern". Rare species information for the BRSF/MVL was compiled from existing records in the Bureau of Endangered Resources' NHI Biological Conservation Database (BCD, now known as Biotics), field inventories, and other data sources.

Mammals

- **Timber Wolf (*Canis lupus*) - Threatened, S2**

  Brief Description: They have silvery gray-brown backs, light tan underparts, and bushy tails. In winter, their fur becomes darker on the neck, shoulders, and rump. They are approximately twice as large as a

  Distribution: Currently distributed throughout Canada and Alaska, extends south into Minnesota, Michigan, Wisconsin, Montana, Idaho, and Washington.

  Habitat: Remote, contiguous, mixed forest blocks. Large conifer swamps often serve as rendezvous sites probably because of availability of dense cover and nearness to water sources.

  State Records: As of 2002 there were 81 packs known to inhabit 20 northwest, north-central, and central Wisconsin counties.

  Black River/Meadow Valley Records: As of 2002 there were 13 packs in and adjacent to the Study Area

  Conservation Concerns: Poaching, mistaken identification by hunters, disease, and collision with motor vehicles.

- **Prairie Vole (*Microtus ochrogaster*) - Special Concern, S2**

  Brief Description: A vole with grayish to dark brown with a good mixture of tawny-tipped hairs. Head and body 3 ½ - 5 inches (89-127 mm), tail 1 – 1 2/5 inches (25-36 mm), weight 1 – 1 ½ ounces (28-42 g).

  Distribution: Southwestern Canada south through Oklahoma, east to Ohio.

  Habitat: Dry grassy areas along fence lines and in open fields; sandy prairies and slopes, especially if weed or grass grown; abandoned farm fields; seldom in sparsely wooded areas. Preferable habitat seems to be native prairie sod, of which there is little left in the State. It avoids marshes and wet places.

  State Records: Southern and southwestern parts of the state, all known populations south of the tension zone.

  Black River/Meadow Valley Records: 1 record from 1974.

  Conservation Concerns: Uncertain.

- **Arctic Shrew (*Sorex arcticus*) - Special Concern, S2**

  Brief Description: One of the most brilliantly colored and attractive shrews. The back, sides, and belly all contrast. In winter, tricolored, with back nearly black; in summer dull brown. Head and body 2 ¾ -3 inches (70-76mm), tail 1 ¼ - 1 2/3 inches (31-42 mm). Weight ¼ - 1/3 ounce (7-9 g).

  Distribution: Canada and Alaska south into the northern Midwest states.

  Habitat: Tamarack and spruce swamps. Sometimes in alder or willow marshes, rarely in leatherleaf-sphagnum bogs.

  State Records: Mostly in the northern half of the state. Scattered records from the southern half of the state.

  Black River/Meadow Valley Records: 6 records from the late 1990s.

  Conservation Concerns: Uncertain.

- **Pigmy Shrew (*Sorex hoyi*) - Special Concern, S2**

  Brief Description: A shrew with upperparts between sepia and brown, undersides smoke gray, tinged with light buff. Tail darkening toward the tip. By weight, probably the smallest living mammal, about the weight of a dime. Eyes: tiny black beads. Nose: pointed and long. Head and body 2 - 2 ½ inches, tail 1 – 1 2/5 inches (35-36 mm), weight 1/10 – 1/7 ounces.

  Distribution: Canada and Alaska south through northeastern U.S. and the Great Lakes Region, extending south along the Appalachian range.

  Habitat: Among debris and heavy vegetation in woods, clearings, and meadows, particularly those grown to high grass. Avoiding swampy or excessively wet areas, though can be found in cold sphagnum or tamarack bogs.

  State Records: 41 records scattered across the state.

  Black River/Meadow Valley Records: 4 records.

  Conservation Concerns: Uncertain.

- **Water Shrew (*Sorex palustris*) - Special Concern, S2**

  Brief Description: A large (3-3.5") blackish-grey shrew, with underside paler, sometimes silvery. Stiff hairs along the sides of the feet distinguish from other Midwest shrews. Head and body 3 1/5 – 3 ½ inches (81-89 mm), tail 2 ½ - 3 inches (64-76 mm), weight 1/3 – ½ ounces (9-14 g).

  Distribution: Northern U.S. and Canada. Extends south in the U.S. along the Rockies and the Appalachian Mountains.

  Habitat: Marshes, bogs, and cold, small streams with cover along the banks.

  State Records: Not common anywhere within range. Collected infrequently in the northern third tier of counties.

  Black River/Meadow Valley Records: 1 record from 1997.

  Conservation Concerns: Sensitive to water quality changes.

Birds

- **Northern Goshawk (*Accipiter gentilis*) - Special Concern, S2N, S2B**

  Brief Description: Large gray to brown hawk with pale stripe over eye.

  Distribution: Circumboreal

  Habitat: Locally remote tracts of forest. These are typically hardwood, hardwood/conifer, or upland conifer stands and have not been recently managed. Nests in young stands are rare. Good numbers of prey animals such as medium-sized birds and mammals near nesting areas are required as well. Doesn't do well in areas dominated by red-tailed hawks or great-horned owls.

  State Records: Wisconsin status uncertain. Reportedly declining in the NE. Nests typically reported from northern third of the state. Several nests are known from central WI. A few locations have been recently reported from east central WI as well. A study by WDNR is currently underway to determine nesting density in WI.

  Black River/Meadow Valley Records: 4 records, 2 from the late 1990s.

  Conservation Concerns: Logging, including clear cutting, thinning, and selective harvesting; increased accessibility to humans due to road building; trails, etc.

- **Henslow's Sparrow (*Ammodramus henslowii*) – WI Threatened, S2S3B, SZN**

  Brief Description: A small bird (sparrow) characterized by large flat head, large gray bill, and short tail. The head, nape, and most of the central crown stripe is olive-colored, with the wings extensively dark chestnut. The breast is finely streaked.

  Distribution: Central and eastern U.S.

  Habitat: Open fields and meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas.

  State Records: 33 records scattered throughout the state, except for the northern third.

  Black River/Meadow Valley Records: 1 record from the mid 1980s.

  Conservation Concerns: Decline apparently is related to loss of habitat due to encroaching urbanization, successional change to shrubland or forest, and use for row-crop agriculture.

- **Le Conte's Sparrow (*Ammodramus leconteii*) - Special Concern, S2B, SZN**

  Brief Description: A smaller sparrow with a bright eyebrow stripe, and with breast stripes confined to the sides.

  Distribution: Breeding habitat extends from the northern part of the upper Midwest through a large part of Canada.

  Habitat: Weedy prairie marshes, sedge meadows, tall grasses, and weedy hayfields.

  State Records: Large majorities of records are confined to the northern third of the state. Verified records are few, but the species is not detected efficiently during surveys as its singing periods are short and song does not carry well.

  Black River/Meadow Valley Records: 2 records from the late 1990s, both in marshy areas.

  Conservation Concerns: Water level fluctuations, wetland draining, mowing, and burning.

- **American Bittern (*Botaurus lentiginosus*) - Special Concern, S3B, SZN**

  Brief Description: A stocky medium sized heron with a black neck stripe and outer wing blackish in flight.

Distribution: Eastern and central U.S.

Habitat: Marshy reedy lakes, wet meadows, and sedge meadows.

State Records: Occurs statewide, but local in the southwest, and declining in the southeast. Declining steadily overall in past 15 years. Most recent records are from inventories conducted for state forest master plans in the NW, NE and WC parts of the state.

Black River/Meadow Valley Records: 7 records from the late 1990s.

Conservation Concerns: Shoreline development, wetland alteration, disturbance, recreational boating, or alteration of water quality.

- **Red-shouldered Hawk (*Buteo lineatus*) - WI Threatened, S1N, S3S4B**

Brief Description: A large broad-winged hawk with rufous shoulders and black tail with narrow white stripes.

Distribution: Eastern and central U.S. and southeastern Canada.

Habitat: Extensive woodlands with frequent ponds, wooded river bottoms, and timbered swamps.

State Records: Range is statewide. 299 records total.

Black River/Meadow Valley Records: 19 records, post 1972.

Conservation Concerns: Fragmentation of large forest blocks, stand thinning.

- **Black Tern (*Chlidonias niger*) - Special Concern, S3B, SZN**

Brief Description: A small tern with a dark, sooty gray body.

Distribution: Breeds from the northern U.S. up through middle Canada.

Habitat: Freshwater marshes and lakes.

State Records: Range is statewide. 44 records total.

Black River/Meadow Valley Records: 8 records, all from 1999.

Conservation Concerns: Water level manipulations, nest depredation.

- **Northern Harrier (*Circus cyaneus*) - Special Concern, S2N, S3B**

Brief Description: A medium sized thin bird of prey, pale-gray to brown to cinnamon in color, always with a white patch on rump.

Distribution: Holarctic

Habitat: Forages in open habitats. Nests on ground on hummocks in large treeless areas such as meadows, shrub carr, grasslands, sedge meadows, tall marsh, etc.

State Records: In WI statewide, but rare in heavily forested or plowed landscapes. Rare in the south.

Black River/Meadow Valley Records: 3 records post 1997 found near marshes and peatlands.

Conservation Concerns: Succession of grasslands, activities that disturb the ground during the nesting season, activities that concentrate ground predators, wetland alteration, or direct disturbance.

- **Trumpeter Swan (*Cygnus buccinator*) - WI Endangered, S1B, SZN**

Brief Description: A large swan native to North America.

Distribution: Formerly throughout North America. Alaska now contains over 85% of the world's breeding population. Breeding areas outside of Alaska are very localized.

Habitat: Primarily breeds in freshwater, on edges of large inland waters; typically in emergent marsh vegetation, or on a muskrat house, beaver lodge, or island.

State Records: 21 records found in central and western parts of the state. Absent in the south and the east. Reintroduced species.

Black River/Meadow Valley Records: 8 records from the late 1990s.

Conservation Concerns: Sensitive to human disturbance (boating, floatplane use, photography, etc.), and to pollution. Unusually sensitive to lead poisoning due to habitat and foraging behavior.

- **Cerulean Warbler (*Dendroica cerulea*) - WI Threatened, S2S3B, SZN**

  Brief Description: A small songbird with breeding males recognized by blue back, white undersides and a narrow dark neck stripe.

  Distribution: Eastern and central U.S..

  Habitat: Large stands of mesic hardwoods and floodplain forest.

  State Records: Uncommon and largely restricted to the southern two thirds of the state with occasional breeding season records in the northern third. Has been expanding its range northward. 77 records.

  Black River/Meadow Valley Records: 4 records from the 1990s.

  Conservation Concerns: Canopy opening, fragmentation, logging of nest sites. Management practices that result in seasonal disturbance of nesting habitat. Rangewide, this species has undergone a 70% decline since 1966, mostly occurring between 1966 and 1979.

- **Kirtland's Warbler (*Dendroica kirtlandii*) – U. S. Endangered, Special Concern, SAN**

  Brief Description: A 6-inch songbird. Upper parts are blue-gray (browner in fall and winter), streaked with black; under parts are yellow with black streaks on the sides; white eye ring is broken by black lores and eye line; whitish wing bars are indistinct.

  Distribution: Breeding is limited mainly to a small area in Michigan.
  Habitat: Shrublands and pine-woodlands.

  State Records: There are 10 records of males in the breeding season with no documented nesting. The records are in two pockets, one in the central sands and one in the northwest corner (Douglas County).

  Black River/Meadow Valley Records: 6 of the state's 10 records occur in the study area, all but one occur in the late 1980s.

  Conservation Concerns: Threats include habitat loss and degradation due to a reduction in fires and forestry practices (replacement of jack pines with red pines or hardwoods) and parasitism by brown-headed cowbird.

- **Acadian Flycatcher (*Empidonax virescens*) - WI Threatened, S2S3B, SZN**

  Brief Description: A small bird (flycatcher). Olive above, with yellow eye ring, two buffy or whitish wing bars; very long primaries.

  Distribution: Middle and eastern U. S..

  Habitat: Key habitat requirements are moist deciduous forests with a moderate understory, generally near a stream.

  State Records: 34 records occur in the southern half of the state.

  Black River/Meadow Valley Records: 2 records from the 1990s.

  Conservation Concerns: The primary threat to this species, as with other neotropical migrants, is habitat degradation and fragmentation (and therefore indirectly, cowbird parasitism and nest depredation).

- **Common Loon (*Gavia immer*) - Special Concern, S3S4, SZN**

  Brief Description: A large aquatic bird (loon). Upper parts are black with a greenish gloss, heavily spotted with white. The under parts are mainly white, the sides of the breast are streaked black and white, and the flanks are black with small white spots. The bill is black, and the iris is brownish ruby.

  Distribution: Breeds across Canada and the northern U.S..

  Habitat: Lakes containing both shallow and deep-water areas. Water clarity is an important component of breeding habitat selection.

  State Records: 7 records in the northern half of the state.

  Black River/Meadow Valley Records: 4 records from 1999.

  Conservation Concerns: Susceptible to human disturbance at breeding lakes (via development of shoreline areas and aquatic recreational activities), acid rain alterations of lake ecosystems, and mercury poisoning. Also may be jeopardized in some areas by fluctuating water levels at the nest site and by increasing numbers of predators such as raccoons.

- **Bald Eagle (*Haliaeetus leucocephalus*) - U. S. Threatened PD, Special Concern, S2N, S3B**

  Brief Description: A very large bird of prey with dark back and undersides. Head white or dark in immature. Adults

unmistakable with snowy white heads and tails.

Distribution: North American in distribution. In eastern U.S. generally northern or coastal.

Habitat: Sites with large area of clear surface water. Typically in forested lake complexes or along larger streams in WI.

State Records: Around 700 nesting records concentrated in northern third of the state with scattered outliers in the western, southern and central portions.

Black River/Meadow Valley Records: 3 records from the 1990s, and 1 from 1981.

Conservation Concerns: Logging, shoreline development, wetland alteration, disturbance, recreational, boating, or alteration of water quality, toxic compounds.

- **Least Bittern (*Ixobrychus exilis*) - Special Concern, S3B, SZN**

Brief Description: The smallest member of the heron family, the least bittern ranges between 28-36 cm in length. Bitterns also have a laterally compressed trunk and short legs. The head is slightly crested. Whitish, highly visible lines border the scapular feathers. The crown and back of the female is purple-chestnut, whereas those of the male are black.

Distribution: Very large range (southern Canada to South America) and common in many areas.

Habitat: Nest in freshwater wetlands with dense, tall growths of emergent vegetation interspersed with open water.

State Records: 16 recent records in the central and northern portions of the state

Black River/Meadow Valley Records: 4 records last updated in 1999.

Conservation Concerns: Jeopardized by draining, filling, and degradation of marshes and probably by environmental contaminants and unnaturally high densities of predators such as raccoons (Evers 1992). May be negatively impacted by high water levels in the Great Lakes (Sandilands and Campbell 1988).

- **Yellow-crowned Night-heron (*Nyctanassa violacea*) - WI Threatened, S1B, SZN**

Brief Description: A stocky heron with a straight, stout, all dark bill; breeding adult has buffy-white crown, black face with white cheek patch, gray under parts, and long white head plumes; juvenile has dusky upper parts with fine white streaks and spots, and dark-streaked under parts.

Distribution: Found in central U.S. and Canada.

Habitat: Swamps and river bottomlands.

State Records: 7 records in the 1980s from the Southwestern corner of the state.

Black River/Meadow Valley Records: 1 record from 1984.

Conservation Concerns: Threats include disturbance and loss/degradation of nesting and foraging habitat. Probably susceptible to reduced reproductive success caused by pesticide contamination.

- **Connecticut Warbler (*Oporornis agilis*) - Special Concern, S3B, SZN**

Brief Description: A small songbird with breeding males recognized by gray hood, yellow and olive body and a white eye

Distribution: South central Canada and north central U.S..

Habitat: Medium aged to older Jack pine forests with some understory and also reported from conifer bogs.

State Records: Uncommon and largely restricted to the northern tiers of counties with an outlier in central Wisconsin. 13 records are known so far.

Black River/Meadow Valley Records: 2 records in the 1990s.

Conservation Concerns: Harvesting/salvaging jack pine has reduced the area of suitable habitat available for this bird. Management practices that result in seasonal disturbance of nesting habitat for habitat fragmentation.

- **Kentucky Warbler (*Oporornis formosus*) - WI Threatened, S2B, SZN**

Brief Description: A 13-cm bird (warbler). Bold yellow spectacles separate black crown from black on face and sides of neck; under parts are entirely yellow, upper parts bright olive.

Distribution: Large breeding range in the eastern (mainly southeastern) U.S..

Habitat: Forest - hardwood and forested wetland.

State Records: 29 breeding records from the southwestern portion of the state.

Black River/Meadow Valley Records: 1 record from 1997.

Conservation Concerns: Probably adversely affected by forest fragmentation.

- **Osprey (*Pandion haliaetus*) - WI Threatened, S3S4B, SZN**

Brief Description: A nearly eagle-sized bird of prey with dark back and white undersides. Head white with dark line through eye.

Distribution: Nearly cosmopolitan. In eastern U.S. generally northern or coastal.

Habitat: Sites with large area of clear surface water. Typically in forested lake complexes or along larger streams in WI.

State Records: Nesting population restricted to northern third of the state with scattered outliers in the west and central portions.

Black River/Meadow Valley Records: 8 records from the late 1980s and 1990s.

Conservation Concerns: Logging, shoreline development, wetland alteration, disturbance, recreational, boating, or alteration of water quality, toxic compounds.

- **Red-necked Grebe (*Podiceps grisegena*) - WI Endangered, S1B, SZN**

Brief Description: A small aquatic bird. Plumage includes gray upper body with white below. Top of head is black, cheeks are nearly white, neck is dark red, bill is straight and mainly black with yellow at the base, and eyes are dark brown. Diagnostic field characteristic is angular tuft of feathers toward rear of crown. Legs and feet are black. This bird is short-bodied, long-necked, and long billed.

Distribution: Alaska, western and south central Canada, south to Washington, Montana, northeastern South Dakota, Minnesota, rarely elsewhere in northern U.S.; Europe and northern Asia.

Habitat: Nesting habitat includes wetlands with patches of open water and stands of bulrush (Scirpus validus, S. acutus) or similar emergents. Fresh water lakes, lagoons, floodwaters, and calm rivers with some emergent vegetative cover are commonly used.

State Records: Uncommon spring migrant; rare fall migrant. Rare summer resident. The largest population exists in Rush Lake, Winnebago County. Recently, between 35-65 pairs have nested there annually. In the Grassy Lake Wildlife Area in Columbia County, one to three pairs have nested annually since 1975. Range in Wisconsin is generally the west central and south-central parts of the state. 12 records scattered in the state, but void in the northern third and south-eastern and -western corners.

Black River/Meadow Valley Records: 1 record from 1999.

Conservation Concerns: Wetland habitat loss is the major factor contributing to population declines in the state. The alteration or destruction of wetlands eliminates nesting habitat. Conservation of large inland wetland complexes is critical to the stability of red-necked grebe populations.

- **Prothonotary Warbler (*Protonotaria citrea*) - Special Concern, S3B, SZN**

Brief Description: A small bird with entire head and breast deep yellow, almost orange. Wings blue-gray; no bars. Females duller than males.

Distribution: Great Lakes area to the Gulf States in the U.S..

Habitat: River bottomlands, and swamps.

State Records: Mainly distributed in southwest and south central Wisconsin, north along the Mississippi River. Numerous scattered records from the mid part of the state along the Wolf River. Most of the 26 records occurred in 2000.

Black River/Meadow Valley Records: 1 record in 2000 near the Black River.

Conservation Concerns: Logging, shoreline modification.

- **Louisiana Waterthrush (*Seiurus motacilla*) - Special Concern, S3B, SZN**

Brief Description: Small, ground-dwelling bird frequently found near water. The throat is mostly white and the underparts are white with dark dense streaks.

Distribution: Central and eastern U.S..

Habitat: Moist forest, woodland, and ravines along streams; mature deciduous and mixed floodplain and swamp forests.

Prefers areas with moderate to sparse undergrowth.

State Records: 21 records, mostly from the west central part of the state, with others in Polk, Rusk, and Waukesha counties.

Black River/Meadow Valley Records: 2 records from 1999 and 2000.

Conservation Concerns: Potential threats include forest fragmentation and activities that cause reductions in forest canopy cover or negatively impact aquatic insect communities.

- **Sharp-tailed Grouse (*Tympanuchus phasianellus*) - Special Concern, S2B, S2N**

  Brief Description: A medium-sized, stocky, round-winged, chicken-like bird with a narrow, pointed tail that has white outer tail feathers.

  Distribution: Found throughout U.S..

  Habitat: Requires a mosaic of dense grass and shrubs with rich forb and insect foods during nesting and brood-rearing and a bare open area for lekking. During winter often relies on riparian areas and other sites that support deciduous trees and shrub for feeding, roosting, and escape cover; also utilizes non-native cultivated grains and hedgerow species.

  State Records: 4 records from the 1990s in the central sands and northwestern portions of the state.

  Black River/Meadow Valley Records: 2 records from 1999.

  Conservation Concerns: Historic conversion of native habitat to private cultivation is cited as a major contributor to declines. Natural succession of grasslands and shrublands to forests, accelerated or expanded geographically by artificial fire regimes, have influenced habitat quality and populations in several regions.

- **Barn Owl (*Tyto alba*) - WI Endangered, S1B, S1N**

  Brief Description: A medium-sized owl with white heart-shaped face, dark eyes, no ear tufts, and long-legs.

  Distribution: Nearly worldwide in tropical and temperate regions, near the northern limits of its range in the U.S. halfway up the state of Wisconsin.

  Habitat: Woodlands, groves, farms, barns, towns, and cliffs.

  State Records: Uncommon, 29 scattered records, but majority from far southern WI.

  Black River/Meadow Valley Records: 1 record from 1979.

  Conservation Concerns: Uncertain.

Reptiles & Amphibians

- **Blanchard's Cricket Frog (*Acris crepitans blanchardi*) - WI Endangered, S1**

  Brief Description: A small tree frog (ca 1”) with moist skin, warts on the dorsal surface, and the ventral surface in granular. Hind limbs are long in comparison to body size. Toes are extensively webbed, and the terminal discs are scarcely larger than the digits.

  Distribution: Northern Mexico/southern northeast through central Ohio, north to central Wisconsin, west to southeastern New Mexico.

  Habitat: Marshes along rivers and river floodplains, fens and low prairies usually near permanent water bodies or flowing water in open country. They prefer open mud flats and banks of streams where there is abundant emergent vegetation.

  State Records: Historically it was widely distributed across the southern half for the state.

  Black River/Meadow Valley Records: 5 records from the early 1980s.

  Conservation Concerns: Population declines were noted in the late 1950's and continued through the mid -1980's. Reason for decline is unclear, but there is evidence that this species cannot survive under polluted conditions. The range now seems somewhat stable although sites wink in and out, primarily associated with major storm events during the breeding season.

- **Midland Smooth Softshell Turtle (*Apalone mutica*) - Special Concern, S3**

  Brief Description: A medium-sized smooth soft-shelled turtle. Carapace length ranges from 17-34 cm for females and

11-18 cm for males. The smooth, leathery carapace is nearly round and is void of spines or tubercles. Color is light brown or tan with numerous dark dots or dashes.

Distribution: Gulf Coast from western Florida to eastern Texas, north to eastern New Mexico, southern South Dakota, Wisconsin, and northwestern Pennsylvania.

Habitat: Large rivers and streams; in some areas also found in lakes, impoundments, and shallow bogs (Ernst and Barbour 1972). Usually in water with sandy or mud bottom and few aquatic plants. Often basks on sandbars and mudflats at edge of water. Eggs are laid in nests dug in high open sandbars and banks close to water.

State Records: In WI, there have only been only 3 records, each from a major river system: Mississippi (1946), Wisconsin (1967), and the Black (1997) Rivers. This species is nowhere abundant in Wisconsin.

Black River/Meadow Valley Records: 1 record in the Black River in 1997.

Conservation Concerns: Historically harvested for turtle soup.

- **Wood Turtle (*Clemmys insculpta*) - WI Threatened, S3**

Brief Description: A medium sized semi-terrestrial turtle with the upper shell sculptured into concentric ridges and grooves similar in appearance to wood grain.

Distribution: Canada, north central and northeastern U.S.

Habitat: Restricted to forested areas along fast moving streams. Nests in nearby open sand or gravel.

State Records: Essentially statewide. Rare in the southwest and east-central portions, absent in the southeast.

Black River/Meadow Valley Records: 6 records from the west half of the study area.

Conservation Concerns: Lack of secure nesting habitat. Road kills. Harvesting for pet trade and or human consumption. Water quality degradation. Disturbance of nesting areas during incubation period. High densities of mammalian nest predators. Management opportunities might include protection of traditionally used nest sites.

- **Yellow-bellied Racer (*Coluber constrictor*) - Special Concern, S2S3**

Brief Description: A 30-50 inch long snake. Dorsum is highly variable in color: plain brown, gray, olive or dull to dark blue. Underside is typically yellow or cream.

Distribution: North Dakota and Iowa to Texas and Louisiana.

Habitat: Inhabits various open habitats, ranging from agricultural areas to open woodland and streamsides. When inactive, hides underground, in crevices, or under surface cover. Adults often hibernate communally, sometimes partly submerged in water. Commonly climbs shrubs and small trees. Eggs are laid in an underground tunnel or burrow, rotting stump, sawdust pile, or under a rock.

State Records: 3 current records in the southwestern quarter of the state.

Black River/Meadow Valley Records: 1 record from 2000, near the South Morrison Creek Marsh.

Conservation Concerns: Uncertain.

- **Northern Ringneck Snake (*Diadophis punctatus edwardsii*) - Special Concern, S3?**

Brief Description: A slender snake with a yellow, cream, or orange neck ring and bright yellow, orange, or occasionally red belly. The underside is free of markings or may be marked with an irregular row of black spots. Spots are more common where this subspecies intergrades with the prairie ringneck snake (Diadophis punctatus arnyi). The neck ring may be interrupted, obscure, or occasionally absent. Adults are 12-15” long.

Distribution: This subspecies ranges from far southeastern Canada and northeastern U.S. west to northeastern Minnesota and south to northern Alabama.

Habitat: Northern Ringneck Snakes prefer to live in moist areas in forests, grasslands, cut over areas, rocky wooded hillsides, or ledges along streams. They are most often seen under flat rocks, logs, or the loose bark of dead trees. They are believed to be highly fossorial.

State Records: Specimens verified from twenty-six counties, distributed mainly north of the tension zone. Populations from the southern central and southeastern counties are believed to be extirpated. This subspecies apparently does not extend into the driftless area.

Black River/Meadow Valley Records: 2 records from the 1990s.

Conservation Concerns: Uncertain.

- **Blanding's Turtle (*Emydoidea blandingii*) - WI Threatened, S3**

  Brief Description: Medium size turtle with a bright yellow underside of its neck. Its head, tail, and limbs are blue-black, while the underside of its shell (or plastron) is yellow, with brown or black splotches, and is hinged. Its upper shell (or carapace) is usually black speckled with yellow, or horn colored and mottled with brown.

  Distribution: Great Lakes Region extending west through Iowa. Disjunct population in Massachusetts, and southeastern New Hampshire and Maine.

  Habitat: A semi-aquatic turtle that prefers open, grassy marshes containing shallow water, but will move to ground adjacent to water to forage or bask.

  State Records: Ranges across most of the state in appropriate habitat, except for far northern tier of counties. 177 records.

  Black River/Meadow Valley Records: 15 records, mostly from the late 1990s.

  Conservation Concerns: Uncertain.

- **Four-toed Salamander (*Hemidactylium scutatum*) - Special Concern, S3**

  Brief Description: A small brown to rich red-brown terrestrial salamander with the underside porcelain white with irregular black flecks. Four rather than five toes on the hind feet distinguish this from all other terrestrial WI salamanders.

  Distribution: Found in the eastern U.S. and southeastern Canada.

  Habitat: Requires moist, mature, usually deciduous forest with high quality leaf litter and an abundance of downed wood in advanced stages of decomposition. These forests must also contain appropriate breeding sites, which are typically woodland ponds or seeps with abundant mosses. Nesting habitat is usually in sphagnum moss mounds directly adjacent to shallow fresh cool water.

  State Records: There are about 40 records for the state from twenty-two counties, but most of those from southern WI are old and need to be verified. As a result, this species was recently added to the NHI Working List as status undetermined. Most recent records are from inventories conducted for state forest master plans in the NW, NE and WC parts of the state. The recent discovery of their breeding habitat has resulted in many of these new records.

  Black River/Meadow Valley Records: 4 records in moist areas from 1998.

  Conservation Concerns: Timber harvesting practices resulting in increased light and decreased humidity, canopy openings or reduced downed wood, wetland modification (draining, impoundment, dredging), or alteration of water quality.

- **Western Slender Glass Lizard (*Ophisaurus attenuatus*) - WI Endangered, S2**

  Brief Description: A lizard with a snake-like appearance with a long tan, brown, or bronze cylindrical body with no limbs, pointed snout, and narrow head. A dark brown to black stripe runs along the middle of the back from head to tail. Two additional stripes run immediately above the lateral groove and four narrow stripes run below the groove. Unlike a true snake it has eyelids and external ear openings, plus the ability to shed part of its tail. Average total length 18-24 inches, although they may reach 36 inches, two-thirds may be tail.

  Distribution: South central U.S. from southern Texas north through most of Indiana. Disjunct population in west-central Wisconsin.

  Habitat: Oak savannas, sand prairies, old fields, and pine barrens in central Wisconsin.

  State Records: There are 45 records from a band of central Wisconsin counties extending from LaCrosse County in the west to Waushara County in the east.

  Black River/Meadow Valley Records: 2 records from 1980 and 1994.

  Conservation Concerns: Urban and agricultural development, especially increased road density and monotypic pine plantations are factors contributing to their Endangered status.

- **Bullsnake (Pituphis catenifer) - Special Concern, S3S4**

  Brief Description: Large, stout-bodied snake, 127-200 cm in total length. The dorsal ground color is yellow or cream with 38-53 dark blotches patterned posteriorly.

  Distribution: Found from central Wisconsin south to Texas and northeastern Mexico, and from western Indiana west to southern Alberta, Canada. In Wisconsin, they occur mostly in the southwestern corner.

Habitat: Dry and dry-mesic prairies, oak savannas, pine barrens, and oak openings.

State Records: There are 19 occurrences in the state. The majority in the southwestern corner.

Black River/Meadow Valley Records: 3 record from 1933.

Conservation Concerns: Uncertain.

- **Bullfrog (*Rana catesbeiana*) - Special Concern, S3**

Brief Description: Largest North American frog. Plain or nearly plain green above, or with a netlike pattern of gray or brown on a green background. No dorsolateral ridges on trunk.

Distribution: Eastern and central North America. Introduced widely outside their range.

Habitat: A wide variety of wetlands and vegetated edges of open water bodies.

State Records: Widely distributed and scattered throughout the state in appropriate habitat. Widely introduced, and it is difficult to distinguish natural populations from introduced ones.

Black River/Meadow Valley Records: 3 records from the late 1990s.

Conservation Concerns: Uncertain.

- **Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*) - WI Endangered, S2**

Brief Description: A medium-sized rattlesnake, ranging from 30 to 36 inches.

Distribution: Occurs in the southern Great Lakes region and Midwest.

Habitat: Sphagnum bogs, fens, swamps, marshes, shrub-dominated peatlands, wet meadows, and floodplains to dry woodland; prefers seasonal wetlands with mixture of open grass-sedge areas and short closed canopy (edge situations).

State Records: 55 state records limited to the southwestern and west-central portions of the state.

Black River/Meadow Valley Records: 15 records.

Conservation Concerns: Decline has been due to habitat loss and fragmentation caused by agricultural development, urbanization, damming, and drainage of wetlands. Natural vegetation succession (encroachment of dense woody vegetation) is a significant cause of habitat loss in many areas. In some areas deliberate killing by humans is a problem, as is mortality from automobiles, late season burning, summer mowing, and pasturing of pigs in massasauga habitat.

- **Western Ribbon Snake (Thamnophis proximus) - WI Endangered, S1**

Brief Description: A small-medium sized snake, ranging from 20-30 inches. Ground color may be olive, brown, or black. Middorsal stripe may be yellow, orange, red, or brown.

Distribution: Southern Wisconsin to Costa Rica; west to New Mexico, east to Indiana and Mississippi.

Habitat: Found in vicinity of streams, lakes, ponds, sloughs, and marshes. Often in water-edge vegetation. Sometimes found in terrestrial habitats. Underground when inactive.

State Records: 4 records from the central portion of the state.

Black River/Meadow Valley Records: 1 record from 1928.

Conservation Concerns: Uncertain.

Fish

- **American Eel (*Anguilla rostrata*) - Special Concern, S1S2**

Brief Description: An elongate, almost snakelike fish with a protruding lower jaw.

Distribution: Breeds in the Atlantic Ocean. Females migrate up tributary systems as far west as western Lake Superior and tributaries, and the Upper Mississippi River.

Habitat: Large streams and lakes, preferring muddy bottoms and still waters.

State Records: Uncommon to rare in the Mississippi River and tributaries. Considered an oddity in the Great Lakes tributaries of WI.

Black River/Meadow Valley Records: 1 record from the Black River in 1975.

Conservation Concerns: Fish toxicants, migration barriers such as dams.

- **Pirate Perch (*Aphredoderus sayanus*) - Special Concern, S2S3**

  Brief Description: A small fish with a stout body, slightly compressed laterally, elevated at base of dorsal fin; caudal peduncle thick. Mouth large, oblique, with lower jaw projecting. Back dark olive to black; side lighter; belly yellowish. Two narrow, vertical bars separated by a pale interspace at base of caudal fin. Dorsal and caudal fins slate colored, other fins more lightly pigmented.

  Distribution: Great Lakes Region, Mississippi River basin, southeastern U.S., and Mid-Atlantic States.

  Habitat: Oxbows, overflow ponds, sloughs, marshes, ditches, and the pools of low gradient streams. It is found over sand, or over soft, muck bottoms covered with organic debris. Frequently it is associated with brush piles or dense aquatic vegetation. Prefers quite water, seldom in sluggish or stronger current.

  State Records: Occurs in Mississippi River and Lake Michigan drainage basins, where it reaches the northern limit of its distribution. The principal population centers are the lower Wisconsin River and its tributaries, and the Des Plaines River watershed.

  Black River/Meadow Valley Records: 1 record from the Lemonweir River in 1994.

  Conservation Concerns: Shoreline modifications.

- **Redside Dace (Clinostomus elongatus) - Special Concern, S3**

  Brief Description: A small, slender fish with a narrow head and a sharp snout.

  Distribution: Widespread in eastern U.S. and adjacent Ontario.

  Habitat: Small to medium, cool, clear, rubble and gravel-bottomed streams.

  State Records: 98 records throughout the state mostly in smaller rivers.

  Black River/Meadow Valley Records: 1 record from 1977.

  Conservation Concerns: Habitat degradation.

- **Western Sand Darter (*Etheostoma clarum*) - Special Concern, S3?**

  Brief Description: A small, slender, almost cylindrical, pallid fish with a distinct opercular spine.

  Distribution: Spotty distribution in streams from Wisconsin and Kentucky to Texas and Mississippi.

  Habitat: Usually in medium and large rivers; most common in slight to moderate current over sandy bottom, though also known from areas of gravel or silt. Also recorded from quiet margins of drainage canals and shallow backwaters. Buries in sand.

  State Records: 12 state records, all in medium/large rivers in the western half of the state.

  Black River/Meadow Valley Records: 1 record from the Yellow River in 1973.

  Conservation Concerns: Habitat degradation is considered to be the primary cause of decline (siltation, impoundments, channelization, etc.).

- **Redfin Shiner (*Lythrurus umbratilis*) - WI Threatened, S3**

  Brief Description: A small, deep-bodied, thick-skinned, whitish shiner (fish) with small, closely crowded predorsal scales. Snout bluntly pointed. Black bluish gray dorsally, sides and belly silvery.

  Distribution: Great Lakes Region extending south almost to the Gulf of Mexico, and west to central Oklahoma.

  Habitat: Found occasionally in clear water, but more often in turbid areas at depths of 4-60 inches (0.1-1.5m) over silt, gravel, and rubble. Occur in pool areas of low-gradient, medium size streams.

  State Records: Of the state's 73 records, none are in the last 20 years. At the northern limit of its range in the Mississippi River and Lake Michigan drainage basins. Disjunctly distributed in the southern half of Wisconsin.

  Black River/Meadow Valley Records: 2 records, 1 from the Black River in 1908 and 1 from Hemlock Creek in 1973.

  Conservation Concerns: During most of the year they are tolerant of siltation, but they require clear water during spawning, which may factor into their scant occurrence.

- **River Redhorse (Moxostoma carinatum) - WI Threatened, S2S3**

  Brief Description: Body moderately stout, usually round, often quite compressed in adult males; ventral line curved. Mouth ventral and horizontal; lips deeply plicate, folds almost always smooth, papillae absent; lower lip much broader

than upper lip. Back bronze olive; sides and belly yellowish, brassy or browned.

Distribution: Great Lakes Region extending south to the northern border of Texas, and west to central Kansas.

Habitat: Prefers large rivers and the lower portions of their main tributaries. It inhabits reservoirs, pools, and moderate to swift water over clear gravel and rubble. Seldom encountered in deeper waters with mud, silt, or sand bottoms.

State Records: Most collections are from the late 1970s/early 1980s from the major Wisconsin rivers. Collected from the Mississippi, St Croix, Yellow, Chippewa, Wisconsin, Sugar, Rock, Fox, Black, Wolf, and Apple Rivers.

Black River/Meadow Valley Records: 1 record from 1978.

Conservation Concerns: Uncertain.

- **Weed Shiner (*Notropis texanus*) - Special Concern, S2S3**

  Brief Description: A small, moderately robust, slightly compressed shiner (fish). Mouth terminal, oblique, tip of upper lip extending to level of midpupil. Eye large. Back olive green with brassy tinge; silvery on sides, belly whitish. Lateral stripe extends through eye.

  Distribution: Great Lakes Region, Mississippi River Basin, and Gulf of Mexico states.

  Habitat: Sloughs, lakes, and the quiet or sluggish sections of medium-sized streams and larger rivers.

  State Records: Mississippi River and Lake Michigan drainage basins. Uncommon in lower Wisconsin River, in the Mississippi River, and in the lower portion of their tributaries. Populations are widely disjunct. At northern limits of its range in WI.

  Black River/Meadow Valley Records: 1 record from 1973 in the Lemonweir River.

  Conservation Concerns: Apparently extremely sensitive to environmental deterioration or changes, although the factors causing this are not known.

- **Gilt Darter (Percina evides) – WI Threatened, S2**

  Brief Description: A small fish (darter).

  Distribution: Wide but discontinuous and shrinking range in eastern U.S.

  Habitat: Generally found on the open bottom of fast, stony riffles.

  State Records: 27 records mostly in the west-central portion of the state in larger rivers.

  Black River/Meadow Valley Records: 1 record from 1979.

  Conservation Concerns: Threatened by pollution and habitat alteration.

Aquatic Invertebrates

- **Black-tipped Darner (*Aeshna tuberculifera*) - Special Concern, S3**

  Brief Description: A large deep blue dragonfly with abdominal segment 10 black on the upper surface.

  Distribution: Canada, north-central and northeastern U.S.

  Habitat: Larvae are in shallow densely vegetated ponds, including acid bog ponds, peaty acidic lakes, possibly streams. Adults range widely in adjacent areas.

  State Records: Adults have been collected rarely but widely in northern and central to south central WI. Factors limiting distribution in WI are not known.

  Black River/Meadow Valley Records: 1 record from the late 1990s in peatlands.

  Conservation Concerns: Fish stocking, shoreline modifications water quality degradation, water level alterations.

- **Green-striped Darner (*Aeshna verticalis*) - Special Concern, S3**

  Brief Description: A large clear winged dragonfly with bright blue and gray markings.

  Distribution: Northeastern to Midwestern U.S. and southern Canada.

  Habitat: Larvae in wetlands with shallow or very limited water and occasionally in cattail marshes. Adults range widely in surrounding areas.

  State Records: Widely scattered from northwest to southeast part of the state with no records in the southwest.

Black River/Meadow Valley Records: 10 records, 8 from the late 1990s. All records near peatlands or marshy area.
Conservation Concerns: Wetland alterations.

- **Elktoe (Alasmidonta marginata) - Special Concern, S4**

  Brief Description: A mussel with an elongate, triangular, inflated, and relatively thin shell. Anterior end rounded, posterior end sharply angled, ending in a blunt, squared point. Posterior ridge sharply angled and prominent, posterior slope broad, flat, and covered with fine ridges. Periostracum yellowish green or bright green with numerous rays and dark green spots present. Posterior slope often lighter than rest of shell. Length to 4 inches (10.2cm).
  Distribution: In the U.S. it is distributed in the Ohio-Mississippi River and Susquehanna River systems. In Canada it is in the Great Lakes – St. Lawrence system from Lake Huron to the Ottawa River.
  Habitat: Medium-sized streams in gravel or mixed sand and gravel.
  State Records: Known from 25 waterbodies in Wisconsin. Only common in St. Croix County.
  Black River/Meadow Valley Records: 3 records from 1997.
  Conservation Concerns: Increased sedimentation, impoundment.

- **Aurora Damselfly (*Chromagrion conditum*) - Special Concern, S3**

  Brief Description: A 31-39 mm damselfly with a pale blue face and blackbody.
  Distribution: Eastern and central U.S.
  Habitat: Pools and slow backwaters of clean, often spring-fed streams.
  State Records: 15 records throughout the state. Most in the northern and central areas.
  Black River/Meadow Valley Records: 6 records occurring post 1989.
  Conservation Concerns: Uncertain.

- **Purple Wartyback (Cyclonaias tuberculata) – WI Endangered, S1**

  Brief Description: The circular and compressed shape, nodules on the surface, and purple inner lining of shell distinguish it from other mussel species.
  Distribution: Widespread throughout eastern U.S.
  Habitat: Found on gravel or mud bottoms of rivers.
  State Records: 14 records from the 1990s in the west-central and northern rivers.
  Black River/Meadow Valley Records: 1 empty shell found in 1997. Probably no longer living in study area.
  Conservation Concerns: Uncertain.

- **A Water Scavenger Beetle (*Cymbiodyta acuminata*) - Special Concern, S3**

  Brief Description: An aquatic beetle typically brown to black.
  Distribution: Bayfield, Door, Douglas, Jackson and Outagamie Co's.
  Habitat: Shallow ponds and lakes.
  State Records: 9 widely scattered records in the north and central parts of the state.
  Black River/Meadow Valley Records: One site known from Black River State Forest (East Fork Pines).
  Conservation Concerns: Water level modifications, shoreline modifications.

- **A Water Scavenger Beetle (*Cymbiodyta blanchardi*) - Special Concern, SU**

  Brief Description: A water beetle.
  Distribution: Rangewide distribution unknown.
  Habitat: Larvae burrows in substrate of spring fed seeps and streams.
  State Records: Only 6 specimens known from 3 WI counties.
  Black River/Meadow Valley Records: 2 sites from Black River State Forest including Gullickson's Glen State Natural Area.
  Conservation Concerns: Shoreline modifications.

- **Splendid Clubtail (*Gomphurus lineatifrons*) - Special Concern, S3**

  Brief Description: A large blackish and yellow dragonfly, males with a prominent club that is narrower than the thorax. No yellow spot on top of club.

  Distribution: Centered in the Midwest, extending to some of the northern Southern states, western northeastern states, and Mid-Atlantic States.

  Habitat: Larvae in medium to large fast-flowing streams with good water quality. Adults usually found within a mile of larval sites.

  State Records: 22 records, mostly in the northern counties, except for the 2 records in the central sands region.

  Black River/Meadow Valley Records: 2 records from 1997 in the Black River and Halls Creek.

  Conservation Concerns: Increased sedimentation, impoundments.

- **Skillet Clubtail (*Gomphurus ventricosus*) - Special Concern, S3**

  Brief Description: A large black and yellow dragonfly, males with the tip of the abdomen broadly flared (clubtail).

  Distribution: Distributed widely across the northern half of the state. Generally upstream of the fall line.

  Habitat: Larvae in moderate sized fast clean rivers. Adults usually within a mile of breeding sites.

  State Records: 34 records are known in the northern half of the state.

  Black River/Meadow Valley Records: 4 records from the late 1990s in the Black River and Halls Creek.

  Conservation Concerns: Flow modifications; shoreline alterations. Moderately sensitive to siltation.

- **Green-faced Clubtail (*Gomphus viridifrons*) - Special Concern, S3**

  Brief Description: A medium sized black and yellow dragonfly, males with the tip of the abdomen moderately flared for a clubtail.

  Distribution: Distributed widely across the northern half of the state. Generally upstream of the fall line.

  Habitat: Larvae in moderate sized fast clean rivers. Adults usually within a mile of larval sites.

  State Records: 40 records are known in the northern half of the state.

  Black River/Meadow Valley Records: 4 records from the late 1990s in the Black River and Halls Creek.

  Conservation Concerns: Flow modifications; shoreline alterations. This species is moderately sensitive to siltation.

- **A Crawling Water Beetle (*Haliplus pantherinus*) - Special Concern, S2S3**

  Brief Description: An aquatic beetle

  Distribution: Uncommon throughout the state.

  Habitat: Ponds, lakes and stream margins.

  State Records: 8 records from NW, West-central and East-central WI.

  Black River/Meadow Valley Records: One record from Brandy Creek.

  Conservation Concerns: Shoreline modifications, flow modifications.

- **A Water Scavenger Beetle (*Hydrobius melaenum*) - Special Concern, SU**

  Brief Description: An aquatic beetle.

  Distribution: Uncommon in Ashland, Door, Iron, and Jackson Co's.

  Habitat: Spring-fed streams.

  State Records: 8 records from the late 1990s.

  Black River/Meadow Valley Records: 3 of the 8 state records are within the study area boundaries.

  Conservation Concerns: Shoreline alterations.

- **A Water Scavenger Beetle (*Hydroporus badiellus*) - Special Concern, S3**

  Brief Description: An aquatic beetle.

  Distribution: Common in northern third of WI, but rare elsewhere in the state.

Habitat: Sites containing Sphagnum moss.
State Records: Common in Polk to Marinette Counties; only 10 collection records for the remainder of the state scattered from Jefferson and Shawano counties in the east to Douglas and Jackson counties in the west.
Black River/Meadow Valley Records: All 3 of the state's records occur in the study area from 1997.
Conservation Concerns: Wetland alterations, mossing.

- **A Water Scavenger Beetle (*Hydroporus vittatus*) - Special Concern, S3**

Brief Description: An aquatic beetle.
Distribution: Uncommon statewide.
Habitat: Most collections are from small to medium sized streams, also adjacent pond and spring ponds.
State Records: 5 records in the central sands region.
Black River/Meadow Valley Records: All 5 of the state's records occur in the study area from the late 1990s.
Conservation Concerns: Wetland alterations, stream bank modification, flow modifications.

- **A Predaceous Diving Beetle (*Ilybius discedens*) - Special Concern, S3**

Brief Description: An aquatic beetle.
Distribution: Unknown.
Habitat: Sites containing Sphagnum.
State Records: 1 state record.
Black River/Meadow Valley Records: First and only record in the state in 1997.
Conservation Concerns: Wetland alterations, mossing.

- **A Predaceous Diving Beetle (*Ilybius ignarus*) - Special Concern, S3**

Brief Description: An aquatic beetle.
Distribution: Door, Jackson,Outagamie, and Shawano Counties.
Habitat: Ephemeral ponds and intermittant creeks, possibly associated with small forest streams.
State Records: 6 records from 4 counties.
Black River/Meadow Valley Records: Two recent records from Black River State Forest.
Conservation Concerns: Wetland alterations. Logging?

- **A Perlid Stonefly (*Isoperla bilineata*) - Special Concern, S2S3**

Brief Description: An aquatic insect (stonefly).
Distribution: Unknown.
Habitat: Medium to large rivers.
State Records: Twenty-two records from 15 widely scattered counties. Fairly common in west and South-west parts of the state, rare elsewhere.
Black River/Meadow Valley Records: There are two records from Robinson Creek just west of Black River State Forest.
Conservation Concerns: This species is moderately intolerant of organic pollution. Water level modifications and shoreline alterations are also a concern.

- **A Perlid Stonefly (*Isoperla marlynia*) - Special Concern, S3**

Brief Description: An aquatic insect (stonefly).
Distribution: Unknown.
Habitat: Large rivers.
State Records: 1 record in the state.
Black River/Meadow Valley Records: 1 record from 1994.
Conservation Concerns: This species is moderately intolerant of organic pollution. Water level modifications and

shoreline alterations are also a concern.

- **A Water Scavenger Beetle (*Laccobius reflexipennis*) - Special Concern, S1S2**

  Brief Description: An aquatic beetle.

  Distribution: Very rare statewide.

  Habitat: Margins of streams and ponds.

  State Records: Previously only 2 collections known. One recent record from eastern WI.

  Black River/Meadow Valley Records: 1 record from 1997.

  Conservation Concerns: Water level modifications; dredging, riparian alterations.

- **Amber-winged Spreadwing (*Lestes eurinus*) - Special Concern, S3**

  Brief Description: A large damselfly, metallic green in color with strongly flavescent wings, which are spread open while perched.

  Distribution: Global Range - Central and Eastern Canada, Eastern and Central U.S..

  Habitat: Larvae in Sphagnum bordered lakes and pools, and temporary ponds with little vegetation. Adults usually in adjacent emergent vegetation.

  State Records: Now known from nine WI counties scattered in all but the SW portion of the state. Factors limiting distribution in WI are not known.

  Black River/Meadow Valley Records: 1 record from 1997.

  Conservation Concerns: Shoreline modifications, water quality degradation, water level alterations, mossing. Possibly requires fishless waterbodies.

- **An Elmid Beetle (*Microcylloepus pusillus*) - Special Concern, SU**

  Brief Description: A dark, aquatic beetle.

  Distribution: Widespread.

  Habitat: Larvae and adults live in streams.

  State Records: 3 records in the central sands region, all from the 1990s.

  Black River/Meadow Valley Records: 2 of the 3 state records are within the study area boundaries, the third is 2 miles north of the boundary.

  Conservation Concerns: Uncertain.

- **A Water Scorpion (*Nepa apiculata*) - Special Concern, SU**

  Brief Description: A dark brown, strongly flattened aquatic insect that looks like a dead leaf. Adults range from 0.6 to 0.8 inches long with a 0.3 to 0.4 inch 'tail' (breathing tube).

  Distribution: Eastern distribution in North America and is quite scarce in the Great Plains region.

  Habitat: Lentic - Dense aquatic vegetation.

  State Records: 2 state records from the late 1990s.

  Black River/Meadow Valley Records: Both state records occur in the study area.

  Conservation Concerns: Uncertain.

- **Smoky Shadowfly (Neurocordulia molesta) - Special Concern, S2S3**

  Brief Description: A dull brownish olive dragonfly, with little pattern. Face wholly pale, except for a narrow blackish band that runs along front margin of eye.

  Distribution: Found throughout central and eastern U.S.

  Habitat: Larvae live under large rocks and on submerged cliff faces in large warm streams. Adults roost in tree foliage and are active for a brief period at dusk and dawn.

  State Records: 10 records most in the 1990s from large rivers in the western half of the state.

  Black River/Meadow Valley Records: 1 record from 1997.

Conservation Concerns: Unknown, but possibly sensitive to sedimentation.

- **Stygian Shadowfly (*Neurocordulia yamaskanensis*) - Special Concern, S3**

  Brief Description: A pale golden yellow and brown medium sized dragonfly.

  Distribution: Widely distributed in northern half of the state; local elsewhere.

  Habitat: Larvae in rapid, moderate to large, warm-water streams with abundant submerged boulders or cliff face. Adults fly only at dusk.

  State Records: Known from 25 waterbodies statewide except SE WI.

  Black River/Meadow Valley Records: 4 records from the late 1990s.

  Conservation Concerns: Unknown, but possibly sensitive to sedimentation.

- **A Purse Casemaker Caddisfly (*Ochrotrichia riesi*) - Special Concern**

  Brief Description: A caddisfly.

  Distribution: Alabama, Illinois, Kentucky, and Wisconsin.

  Habitat: Madicolus, living in very shallow water where there is a continuous coat of diatoms, other algae, and a cushion of moss or liverworts through which the water trickles

  State Records: 1 record from 1998.

  Black River/Meadow Valley Records: First and only state record, 1998

  Conservation Concerns: Road on upland behind top of cliff is a potential source of erosion

- **Sand Snaketail (*Ophiogomphus smithi*) - Special Concern, S2**

  Brief Description: A medium-sized dragonfly with a green thorax, and yellow and black markings.

  Distribution: Apparently endemic to the Midwest: Western Wisconsin and northeastern Iowa.

  Habitat: Larvae burrow in gravel and sand substrate of moderately fast, small to medium sized, warm water streams. Adults frequent stream edges.

  State Records: Found in at least 34 streams in Wisconsin, but only a few populations are large including Robinson Creek in the Study Area. Most records are from the west-central and west-northern portions of the state.

  Black River/Meadow Valley Records: 4 records across the entire study area, all from the mid to late 1990s.

  Conservation Concerns: Impoundments, sedimentation, and other alterations of water quality.

- **Ski-tailed Emerald (*Somatochlora elongata*) - Special Concern, S2S3**

  Brief Description: A medium-sized blackish dragonfly with emerald green eyes and light yellowish markings on the thorax.

  Distribution: Global Range - Eastern Canada and U.S..

  Habitat: Forest streams with intermittent rapids, outlets of lakes and ponds.

  State Records: Known from nine WI counties, mostly the northern forested counties with a pocket in Jackson Co. and a historical record from Milwaukee Co. Factors limiting distribution in WI are not known.

  Black River/Meadow Valley Records: 2 records from 1997.

  Conservation Concerns: Shoreline modifications, water quality degradation, water level alterations.

- **Delicate Emerald (*Somatochlora franklini*) - Special Concern, S2S3**

  Brief Description: A medium-sized dragonfly, mostly metallic brown.

  Distribution: Northern and Eastern U.S. into Canada.

  Habitat: Prefers spring-fed sphagnum bogs, and central poor fens. The flight period extends from June through July.

  State Records: 16 records from the northern and central portions of the state. 15 of the records occur in the 1990s.

  Black River/Meadow Valley Records: All 5 records occur in the late 1990s in central poor fens.

  Conservation Concerns: Water level modifications, mossing.

- **Warpaint Emerald (*Somatochlora incurvata*) - WI Endangered, S2**

  Brief Description: A medium sized slender and elongate metallic brown dragonfly.

  Distribution: A modest total known range from Cape Breton Island, west to northern Michigan, south to Massachusetts.

  Habitat: Habitat is bogs, fens, and heaths. Wisconsin larval habitat is Central Poor Fen with sphagnum moss. Larvae unknown to science till this study where they were discovered in Komensky Peatlands. Description is in preparation for publication.

  State Records: 17 records, all but one in the west-central portion of the state. The other record from Langlade county.

  Black River/Meadow Valley Records: 13 of the state's 17 records are in the study area and are from the late 1990s.

  Conservation Concerns: Potential threats of habitat degradation from harvesting of peatmoss and fuel peat, cranberry farming, broadcast toxic pollution, and water level alteration leading to inundation or desiccation of the habitat.

- **Kennedy's Emerald (*Somatochlora kennedyi*) - Special Concern, S3**

  Brief Description: A medium-sized dark dragonfly with emerald green eyes in adult males. Pale stripes on sides ill defined and wide. Legs black, paler basally. Abdomen long and stout. Front of thorax metallic green, with bluish reflections, at either side of which are areas of dull yellow.

  Distribution: Canada, New England, and some northern Midwest states.

  Habitat: Slow streams through open bogs or marshes. Sedge meadows and central poor fens

  State Records: Collected from 17 sites in nine counties. Mostly the northern edge of the state, with other pockets in the central sands and one in Ozaukee county.

  Black River/Meadow Valley Records: 2 records from the 1990s found in or near central poor fens.

  Conservation Concerns: Water level fluctuations.

- **Clamp-tipped Emerald (*Somatochlora tenebrosa*) - Special Concern, S2**

  Brief Description: A medium-sized dragonfly, mostly metallic brown.

  Distribution: Northern and Eastern U.S. into Canada.

  Habitat: Prefers small forest streams with intermittent riffles and pools. The flight period is early July thorough mid-August.

  State Records: 7 records post 1988. All from the central portion of the state.

  Black River/Meadow Valley Records: 3 of the 4 study area records occur in 1997 all near small streams.

  Conservation Concerns: Uncertain, but likely that maintanence of forest canopy over breeding sites is important.

- **a stonefly (*Soyedina vallicularia*) - Special Concern, S1**

  Brief Description: A stonefly with a light brown body and a yellowish brown head.

  Distribution: Nearctic.

  Habitat: Seeps associated with streams.

  State Records: 1 record in the state in 1997.

  Black River/Meadow Valley Records: First and only state record made in 1997 in a seep near Morrison Creek.

  Conservation Concerns: Uncertain.

- **a water scavenger beetle (*Sperchopsis tessellatus*) - Special Concern, S2S3**

  Brief Description: An aquatic beetle.

  Distribution: Rare in the western 3/4th of the state (Florence to Dane counties); not known from the eastern quarter.

  Habitat: Small, cool streams, usually with sand.

  State Records: Twenty to 25 populations are estimated to be in the state. A few recent records from eastern WI.

  Black River/Meadow Valley Records: 2 records from the late 1990s.

  Conservation Concerns: Water level modifications; dredging, bank alterations.

- **Elusive Clubtail (*Stylurus notatus*) - Special Concern, S2S3**

  Brief Description: A medium sized blackish dragonfly with yellow markings and an elongate body.

  Distribution: Widely distributed in the western half of the state.

  Habitat: Larvae live in depositional sand in lower sections of larger warm-water streams. Adults are seldom seen or collected because of their habit of patrolling open river channels away from the shore and perching well up in trees.

  State Records: 20 records known from 14 waterbodies in the state.

  Black River/Meadow Valley Records: 1 record from 1993 in the Black River.

  Conservation Concerns: Sensitive to sedimentation and possibly to streamside openings in the forest canopy.

- **Zebra Clubtail (*Stylurus scudderi*) - Special Concern, S3**

  Brief Description: A large black and yellow dragonfly with end of abdomen widely expanded in males. Yellow rings on black abdomen distinguish it from other large Clubtails.

  Distribution: Global Range - Eastern Canada and U.S..

  Habitat: Larvae in cool sandy streams (trout streams) in forested habitats.

  State Records: Known from 13 WI counties in the heavily forested northern part of the state with a pocket in Jackson County. Factors limiting distribution in WI are not known.

  Black River/Meadow Valley Records: 10 records from the late 1990s.

  Conservation Concerns: Shoreline modifications, water quality degradation, water level alterations.

- **Black Meadowhawk (*Sympetrum danae*) - Special Concern, S3**

  Brief Description: A dragonfly with brightly colored bodies, 3/4-2 1/2" (18-64 mm) long, that are shorter than the wingspan, which is usually 1-4" (25-102 mm). The wings often have bands or spots.

  Distribution: Widespread.

  Habitat: Larvae inhabit bogs.

  State Records: 8 records in the state. Mostly Northern in WI. One as early as 1913.

  Black River/Meadow Valley Records: 1 record from 1997.

  Conservation Concerns: Uncertain.

- **Buckhorn (Tritogonia verucosa) - WI Threatened, S2**

  Brief Description: Brown or black elongate shell, moderately large, heavy, and has many pustules. Beak sculpture consisting of a series of ridges continuing down the side. The female shell has larger wing-like extensions, which the males lack. Length to 8 inches.

  Distribution: Mississippi River drainage; southeast in streams draining into the Gulf of Mexico from the Alabama River systems, west to central Texas.

  Habitat: Inhabits fairly deep water on a sand or mud bottom. Also found in riffles and in shallow water (1-3m) of smaller streams.

  State Records: Known from the Mississippi, Black, upper and lower Wisconsin, White, St. Croix, Baraboo, Chippewa, Eau Claire, Pecatonica, and Wolf Rivers.

  Black River/Meadow Valley Records: 1 record from 1997.

  Conservation Concerns: Habitat destruction and river pollution have resulted in declines. Restriction of dredging, impoundments sand and gravel mining, and navigational improvements would benefit this species.

- **Ebony Bog Haunter (*Williamsonia fletcheri*) - Special Concern, S3S4**

  Brief Description: A tiny black dragonfly with emerald green eyes and whitish rings on the first few abdominal segments.

  Distribution: Global Range - Central and Eastern Canada, Northeastern and North-central U.S..

  Habitat: Shallow, Sphagnum filled pools including bog moats. Bog lakes deep enough for fish are probably not utilized.

  State Records: Now known from 6 WI counties, mostly the central sands region with a pocket in northern-forested counties. This species is very difficult to detect with standard surveys. All of the known breeding sites (19) are the result

of recent state forest inventories. These factors make it possible that more sites are present. Factors limiting distribution in WI are not known.

Black River/Meadow Valley Records: 14 of the state's 19 records are in the study area from the late 1990s. All known sites are in the Central Poor Fen natural community.

Conservation Concerns: Shoreline modifications, water quality degradation, water level alterations, road maintenance, mossing.

- **Ringed Boghaunter (*Williamsonia lintneri*) - Special Concern, S2S3**

Brief Description: A small brown dragonfly with a yellow face and orange bands on the posterior ends of abdominal segments 2-9.

Distribution: Largely confined to eastern Massachusetts, Rhode Island, Michigan and Wisconsin.

Habitat: Found in sedge meadows with Sphagnum pools. Adults usually in forested wetland or drier adjacent forest. Immatures found in shallow water pools including moats.

State Records: Restricted in WI to Central Poor Fen natural community in the study area. All 11 state records from the central-sands region in the late 1990s.

Black River/Meadow Valley Records: 9 of the state's 11 records are from the study area in the late 1990s.

Conservation Concerns: Destruction of forested upland and filling of sites a great threat, as well as ditching and mossing. Pesticides, water level manipulations, pollution, and collection are apparent threats.

Terrestrial Invertebrates

- **Dusted Skipper (*Atrytonopsis hianna*) - Special Concern, S2?**

Brief Description: This fairly large, medium brown to gray black skipper butterfly has pointed elongate forewing with three white subapical spots.

Distribution: Widespread range, but apparently local, colonial distribution.

Habitat: This skipper is found in bluestem grasslands, and often on acid pine or pine-oak barrens or prairies. Old fields, woodland clearings, and power-line swaths are also utilized. Hostplant grasses: *Andropogon gerardii*, *Scoparius* spp.

State Records: The majority of the states 29 records are in the west-central region with a small handfull in the northwest corner.

Black River/Meadow Valley Records: 14 records in the 1990s, primarily in the west of the study area.

Conservation Concerns: Habitat (bluestem grasslands, often on acid pine or pine-oak barrens or prairies) may be threatened in much of range.

- **Henry's Elfin (*Callophrys henrici*) - Special Concern, S2**

Brief Description: Small and brown butterflies, with a straight white line at the top of the ventral forewing.

Distribution: Has a wide range, but is rare throughout. Found in Quebec and south to Florida and Texas, and west to Michigan, Wisconsin, Nebraska, Kansas, and Missouri.

Habitat: Pine barrens. Host plants possibly are *Vacciniums* and or maple-leaved viburnum in Wisconsin.

State Records: 12 records in the state, half in the 1990s, all in the northern half of the state.

Black River/Meadow Valley Records: 5 of the state's 12 records occur in the study area.

Conservation Concerns: Uncertain.

- **Frosted Elfin (*Callophrys irus*) - WI Threatened, S1**

Brief Description: Small and brown butterflies, with an irregular white line at the top of the ventral forewing.

Distribution: Central and eastern U.S.. Central sands region in Wisconsin.

Habitat: Formerly more often in natural settings, such as grassy openings in barrens and savannas, especially the lupine feeding version. In Wisconsin, most populations occur in powerline and railroad right of ways, along sand or gravel roads through dry woods or pine barrens, and around old gravel pits. Hostplants: *Baptisia*, *Lupinus*, and *Crotalaria* spp. In Wisconsin, an obligate lupine feeder.

State Records: 18 records in the state, all in the central sands region.

Black River/Meadow Valley Records: 17 of the 18 state records are in the study area in three clusters.

Conservation Concerns: Threats include habitat loss, succession, inappropriate prescribed burning, suppression of wildfires, excessive deer damage to food plants, conversion of barrens to pine plantations. Standard rotational fire practices in the Midwest appear to be a substantial threat to this butterfly there (A. Swengel) even though pupae are underground and not directly harmed (Schweitzer) and probably explain its current absence from most suitable habitat there.

- **Gorgone Checker Spot (*Chlosyne gorgone*) - Special Concern, S3**

Brief Description: Underside hindwing of butterfly with zigzag pattern of alternation brown and white bars and scallops.

Distribution: Midwest and southern U.S. and south central Canada. Basically a broad area of the continental interior of the U.S. west of the Appalachians and east of the Rockies.

Habitat: Prairies, open ridges, glades in deciduous woods, waste areas. Hostplants: *Helianthus*, *Ambrosia*, *Iva*, and *Viguiera* spp.

State Records: There are 38 known records from the state, most in the southern half of the state.

Black River/Meadow Valley Records: 11 records, all from the mid to late 1990s.

Conservation Concerns: Uncertain.

- **Little White Tiger Beetle (*Cicindela lepida*) - Special Concern, S2S3**

Brief Description: A small tiger beetle, 10-11mm in length, brown background with greatly expanded white markings so beetle often appears mostly white.

Distribution: Central Plains, SW to Arizona, NE to New York and Eastern Coast.

Habitat: In WI sandy areas, blowouts and dunes. Also reported from beaches and streamsides.

State Records: 13 state records, all post 1970 and in the central to south-central part of the state.

Black River/Meadow Valley Records: 4 records all within the 1990s.

Conservation Concerns: Uncertain.

- **A Tiger Beetle (*Cicindela macra*) - Special Concern, S2**

Brief Description: A thin, brownish tiger beetle, 11.5-13mm in length, dull olive green with white markings.

Distribution: Midwestern species.

Habitat: Sandbars in larger rivers.

State Records: 6 records in the central part of the state.

Black River/Meadow Valley Records: 1 record attributed to somewhere in Wood County (mapped in study area).

Conservation Concerns: Uncertain.

- **A Tiger Beetle (*Cicindela patruela huberi*) - Special Concern, S3**

Brief Description: A large tiger beetle with muddy green to brown to black coloration as opposed to the bright green of C. patruela patruela.

Distribution: Endemic subspecies to central WI.

Habitat: Semi open pine barrens or dry oak woodlands where open ground exists, such as along trails.

State Records: 79 records in the state, mostly from the central portion.

Black River/Meadow Valley Records: 32 records.

Conservation Concerns: The main threat to this species is habitat destruction due to deforestation and fire suppression (ecological succession eliminates some habitats).

- **Short-winged Grasshopper (*Dichromorpha viridis*) - Special Concern, S2**

Brief Description: A grasshopper exhibiting two color phases, green and brown, and two wing length morphs, long-winged and short-winged. A specialist required for verifying identification.

Distribution: Eastern half of U.S. as well as central and eastern Mexico.

Habitat: Preferred habitat includes, grasses less than knee high, pastures, fields, roadsides, marginal wooded areas, lake sides, and pond sides.

State Records: One record in the state from the central sands region.

Black River/Meadow Valley Records: The first and only record of the species in the state in 1996.

Conservation Concerns: Uncertain.

- **Mottled Dusky Wing (*Erynnis martialis*) - Special Concern, S2**

Brief Description: A light brown with lavender cast butterfly. Very strong contrasting dark patches on all wings so it appears almost banded; tiny glossy spots on fore wing; brown fringes.

Distribution: Central and eastern U.S..

Habitat: Usually confined to hilly country, often near woods or in open brushy fields. Hostplant: *Ceanothus* spp.

State Records: The 11 state records occur in 4 pockets: Brown, Burnett, Jackson, and Sauk counties.

Black River/Meadow Valley Records: 3 records in the 1990s in or near barrens.

Conservation Concerns: Deer and gypsy moth spraying have accounted for most recent extirpations in Northeast.

- **Persius Dusky Wing (*Erynnis persius*) - Special Concern, S2**

Brief Description: A dusky wing butterfly. Forewing with patch at end of cell more gray than brown. Male forewing with numerous raised white hairs.

Distribution: The Great Lakes region and northeastern U.S., along the West Coast from southern U.S. border north to Alaska. Absent from a large part of the central U.S..

Habitat: Open areas, marshes, seeps, and sand plains. Hostplant: *Lupinus*, *Salix*, and *Populus* spp.

State Records: There are 23 known records, from nine counties, the majority from the central sand region of the state.

Black River/Meadow Valley Records: Over half, 13 of the 23 state's records occur.

Conservation Concerns: Uncertain.

- **Two-spotted Skipper (*Euphyes bimacula*) - Special Concern, S2S3**

Brief Description: A skipper butterfly. Forewings pointed. Fringe white. Upperside of male forewing with limited tawny patch; female dark, forewing with two pale spots. Underside of hindwing orange-brown. Veins paler.

Distribution: Northeast, upper Midwest, and east coast of U.S..

Habitat: Wet sedge meadows, marshes, and bogs. Hostplant sedges: *Carex trichocarpa*, assoc. with *C. stricta*.

State Records: There are 10 known records, from 8 counties, mostly from the eastern third and southern half of the state.

Black River/Meadow Valley Records: 3 records all from 1989 in three different marshes.

Conservation Concerns: Uncertain.

- **Phyllira Tiger Moth (*Grammia phyllira*) - Special Concern, S2**

Brief Description: A moth.

Distribution: Several disjunct ranges: Atlantic coastal region Maine to Florida; Great Lakes region; Colorado to Texas.

Habitat: Extensive areas of sandy soil, generally supporting barrens or disturbed old field type vegetation. This species feeds on corn, lupines, and other low plants.

State Records: 9 state records in the east-central portion of the state.

Black River/Meadow Valley Records: 1 record from 1993 in barrens.

Conservation Concerns: Threats unknown; may benefit from barrens restoration.

- **Midwestern Fen Buckmoth (*Hemileuca sp 3*) - Special Concern, S3S4**

Brief Description: A large, day-flying moth with light gray to black wings with yellow to white markings.

Distribution: Known from NE Indiana to Michigan and Wisconsin, and NE Ohio, and NW Pennsylvania.

Habitat: In WI, found in bogs and fens and oak barrens. Reported feeding on willow, oak, bog bean, and purple loosestrife.

State Records: 6 records occur throughout the state.

Black River/Meadow Valley Records: Half the state's records occur in the study area. 1 from 1971, and 2 from the 1990s.

Conservation Concerns: Uncertain

- **Leonard's Skipper (*Hesperia leonardus leonardus*) - Special Concern, S3**

Brief Description: A rich, tawny orange butterfly with thick black margins.

Distribution: Scattered in small colonies from New England and Ontario, west to Kansas, and south as far as Florida.

Habitat: Localized populations in damp meadows, open fields, and roadsides. Hostplants are a wide variety of grasses.

State Records: 8 records in the south and central portions of the state.

Black River/Meadow Valley Records: 1 record from 1992.

Conservation Concerns: Uncertain.

- **Cobweb Skipper (*Hesperia metea*) - Special Concern, S2**

Brief Description: A brown and tawny orange skipper butterfly. The wing span is about an inch.

Distribution: Found from Maine and Florida, west to Wisconsin and Texas.

Habitat: Old grassy fields or forest clearings overrun with wild strawberry and cinquefoil. Hostplant grass: *Andropogon* spp.

State Records: 12 records in the state, all but 1 in the western half. All post 1989.

Black River/Meadow Valley Records: 4 records all in the mid 1990s from Jackson County Forest Land.

Conservation Concerns: Uncertain.

- **Karner Blue Butterfly (*Lycaeides melissa samuelis*) - U. S. Endangered, Special Concern, S2S3**

Brief Description: A bluish, sexually dimorphic butterfly. Underside of both wings with continuous black subterminal line. Red-orange submarginal row broken into separate spots.

Distribution: Isolated populations from Wisconsin east to central New York and southern New Hampshire.

Habitat: Pine/oak barrens. Lupine is a required larval food plant.

State Records: There are approximately 300 records of this species from WI. The vast majority from the central sands region of the state, ranging NW through Burnett County.

Black River/Meadow Valley Records: The study area contains over a third of the state's 300 records and the state's first recorded sighting.

Conservation Concerns: Barrens and dry forest management, ATV use, utility and road maintenance.

- **Bog Copper (*Lycaena epixanthe*) - Special Concern, S2S3**

Brief Description: A small butterfly with upper side purple iridescent in males, mouse gray brown in females, underside pale tan or white and hindwing with tiny black spots and a zigzag red-orange border.

Distribution: Great Lake area of U.S. and Canada and northeastern U.S..

Habitat: Open bogs with cranberry and other ericaceous components. Hostplant: *Vaccinium* spp.

State Records: Known from 46 sites in WI, mostly in the northern third of the state.

Black River/Meadow Valley Records: 5 recent records in marshy areas.

Conservation Concerns: Activities that alter natural hydrological or biological properties of the known site.

- **Newman's Brocade (*Meropleon ambifusca*) - Special Concern, S3**

Brief Description: A nocturnal moth.

Distribution: Midwest to Connecticut.

Habitat: Virtually nothing known about this apparently rare species. Congeners bore in grasses or sedges and knowing

which species this uses might improve inventory success.

State Records: 15 of the 16 state records occur in the southern half of the state.

Black River/Meadow Valley Records: 1 record from 1994.

Conservation Concerns: Uncertain.

- **American Burying Beetle (*Nicrophorus americanus*) - U. S. Endangered, WI Endangered, SH**

Brief Description: A large shiny black beetle with a bright orange markings on the face, pronotum and the elytra.

Distribution: Historically widespread in Eastern US and Ontario and Nova Scotia, Canada. Surveys in at least eight states included in its historic range have failed to discover remnant populations. Only known now from the extreme east and west edges of its historic range.

Habitat: Species exhibits broad vegetational tolerances, though natural habitat may be mature forests. Species is recorded from grassland, old field shrubland, and hardwood forests. Most sites have sandy soils.

State Records: All of the state's records are historic.

Black River/Meadow Valley Records: 1 record from 1940.

Conservation Concerns: Threats include habitat fragmentation, insecticide and bug-zapper use, disturbance of soils, and competition from vertebrate scavengers.

- **Jutta Arctic (*Oeneis jutta*) - Special Concern, S3**

Brief Description: A butterfly variable in coloration. Above, gray-brown. Both wings with yellow-orange submarginal band (usually interrupted). Variable number of small eyespots, more on forewing than hindwing.

Distribution: Holarctic. In North America the northern Great Lakes region, and south along the western montane region.

Habitat: Black spruce and sphagnum bogs and central poor fens. Seems to like small wooded islands in setting of open bog or fen. Hostplant sedges: *Eriophorum*, *Carex*, and *Juncus* spp.

State Records: Known from 43 sites in the 1990s, all from eleven far northern Wisconsin counties.

Black River/Meadow Valley Records: 3 records in the 1999.

Conservation Concerns: Increased sedimentation, water quality degradation, mossing, and water level alterations.

- **Spotted-winged Grasshopper (*Orphulella pelidna*) - Special Concern, S1?**

Brief Description: A grasshopper highly variable in coloration. Some females are mostly green, others mostly brown.

Distribution: Widespread over North America south to northern Mexico.

Habitat: Variable across its range. From grasslands and old fields to beach dunes.

State Records: 4 records all occurring in the south central section of the state. All occurring in the late 1990s.

Black River/Meadow Valley Records: 3 of the 4 state records occur in the study area.

Conservation Concerns: Uncertain.

- **Mulberry Wing (*Poanes massasoit*) - Special Concern, S3**

Brief Description: A butterfly with rounded wings. Black with tiny (male) or slightly larger (female) spots. Underside hindwing with large irregular yellow central patch.

Distribution: Coastal southern New England and upper mid-Atlantic states. Great Lakes region extending west into southern Minnesota, northern Iowa, and the eastern edge of the Dakotas.

Habitat: Freshwater marshes or bogs. Hostplant sedge: *Carex stricta*.

State Records: There are 45 records, widely scattered, but absent from northern and far western WI.

Black River/Meadow Valley Records: 1 record from 1988.

Conservation Concerns: Wetland loss, alteration.

- **Net-veined Leafhopper (*Polyamia dilata*) - WI Threatened, S1**

Brief Description: A small, wedge-shaped, globally rare jumping insect.

Distribution: Only about 20 known sites rangewide which is western Iowa, Driftless Area of WI and Indiana. Possible

Arkansaw as well.

Habitat: Has been associated with cool season *Panicum* grasses.

State Records: 12 records in 1997 and 1998 in the southwestern portion of the state.

Black River/Meadow Valley Records: 1 record from 1997.

Conservation Concerns: Uncertain.

- **Sand Locust (*Psinidia fenestralis*) - Special Concern, S1S2**

  Brief Description: A locust with a narrow yellow stripe on the head. Hind-wing orange, red, or yellow with broad black band.

  Distribution: Minnesota to Maine, south to Texas and Florida.

  Habitat: Sandy areas.

  State Records: 4 state records from the late 1990s occur in the west-central region.

  Black River/Meadow Valley Records: 3 of the 4 state records occur within the study area.

  Conservation Concerns: Uncertain.

- **Phlox Moth (*Schinia indiana*) - WI Endangered, S2?**

  Brief Description: A striking, purple, medium-sized moth.

  Distribution: Reported from Indiana, Illinois, North Carolina, Arkansas, Texas, Nebraska, Wisconsin, Minnesota, and Michigan. Only Wisconsin, Minnesota, and Michigan currently report having populations.

  Habitat: Roadsides, scrub-oak pine barrens and prairies with *Phlox philosa*, the larva's' food plant.

  State Records: There are 22 records from 5 counties, most from the central sands region of the state.

  Black River/Meadow Valley Records: 10 records from the mid 1990s.

  Conservation Concerns: Roadside maintenance.

- **Northern Marbled Locust (*Spharagemon marmorata*) - Special Concern, S2S3**

  Brief Description: A locust with basal area of hind-wings yellow, with broad outer dark band. Overall body color variable. Pale bands on forewing do not cross the wing.

  Distribution: Wisconsin's subspecies ranges from Minnesota east into southern Canada and New England, and south along the Atlantic Coast through New Jersey.

  Habitat: Variable within range. Often on bare sand or open scrub, in Michigan it was found among bracken fern and blueberry in an open forest. Often associated with lichens in open habitats.

  State Records: There are 10 records from five counties. Mostly in the west-central portion of the state with one outlier in Shawano county.

  Black River/Meadow Valley Records: 5 records from the late 1990s.

  Conservation Concerns: Barrens and sand blow management.

- **Ash-brown Grasshopper (*Trachyrhachys kiowa*) - Special Concern, S2**

  Brief Description: A grasshopper with hind-wings variable in color. A technical key is needed to distinguish this species.

  Distribution: Southwestern Canada south to central Mexico, and in the U.S. from California east to Virginia.

  Habitat: Bare gravely ground.

  State Records: There are only 4 known records from the state. Three from the central sands and one from Waupaca county.

  Black River/Meadow Valley Records: 3 of the state's 4 records are from the study area and are from the late 1990s.

  Conservation Concerns: Barrens, sand blow alterations.

Miscellaneous Elements

- **Bat Hibernaculum (bat hibernaculum) - Special Concern, S3**

  Brief Description: A building/cave where bats overwinter. Hibernaculums may be composed of several different species of bats or just one.

  Distribution: Widespread.

  Habitat: Typically caves, old mines, and abandoned buildings.

  State Records: The majority of the 46 records in the state lie within its western half.

  Black River/Meadow Valley Records: 1 bat hibernaculum record from 1969.

  Conservation Concerns: Disturbance by humans, mines being boarded up.

- **Bird Rookery (bird rookery) - Special Concern, SU**

  Brief Description: Nesting colonies of large wading (fish eating) birds, typically herons and egrets.

  Distribution: Widespread.

  Habitat: Snag or large trees, typically near wet areas. Occasionally on bare ground.

  State Records: 42 records occur throughout the state.

  Black River/Meadow Valley Records: 3 records post 1985, all occurring in large wetland complexes.

  Conservation Concerns: Disturbance, removal of nesting trees.

Appendix K

Wisconsin Natural Heritage Working List Explanation

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

Key

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

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

Global Rank: Global element rank. Refer to the Rank Definition Sheet.

State Rank: State element rank. Refer to the Rank Definition Sheet.

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

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

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

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

Global & State Element Rank Definitions

Global Element Ranks:

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

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

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

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

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

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

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

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

G? = Not ranked.

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

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

State Element Ranks

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

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

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

S4 = Apparently secure in Wisconsin, with many occurrences.

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

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

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

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

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

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

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

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

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

SX = Apparently extirpated from the state.

State Ranking of Long-Distance Migrant Animals:

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

APPENDIX L

Ecoregions of the Study Area

Ecoregions are geographic areas of similar physical, chemical, and biological characteristics organized within a hierarchical framework. Each level of the hierarchy shares important ecological attributes such as climate, geology, landform, hydrology, soils, and vegetation. Terminology for the ecoregions presented here follows that developed for the USDA Forest Service by Bailey (1995), the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et al., 1994), and others. Related information using somewhat different methods of classifying broad landscapes of Wisconsin and the western Great Lakes can be found in Albert (1995) and Hole and Germain (1994).

The NHFEU comprises the following eight different scales of mapping (from largest to smallest): Domain, Division, Province, Section, Subsection, Landtype Association, Landtype, and Landtype Phase. These scales range from millions of square miles to less than 100 acres. Figure L.1 illustrates the ecoregions of the study area at four different scales of the NHFEU.

The Black River / Meadow Valley landscape is located within **Province** 222 – Eastern Broadleaf Forest (Continental). The study area is also within **Sections** 222R - Central Wisconsin Sands and 222L North Central U.S. Driftless and Escarpment. These broad ecoregional classifications are characterized by differences in climate, geomorphic process, geologic origin, drainage, and stratigraphy.

NHFEU Subsections

The next subdivision of these ecoregions shows the study area encompassing three distinct **Subsections**: the Central Wisconsin Sand Plain (222Ra), the Melrose Oak Forest and Savannah (222Lb), and the Neilsville Sandstone Plateau (222Rb). These subsections are characterized by basic differences in geomorphic process, surface geology, lithology, subregional climate, and some soil and vegetation characteristics. The subsections within the study area demonstrate unifying attributes that were useful in planning and structuring our fieldwork; these subsections are described below.

Central Wisconsin Sand Plain – Subsection 222Ra

This subsection is an extensive sand lake plain formed by Glacial Lake Wisconsin that is characterized by thick deposits of glacial outwash and lake sediments, extensive wetlands, sandstone buttes, and streams but contains no natural lakes. Soils are generally sandy, with muck, peat and small amounts of clay. Topography varies from extensive level areas to abrupt bedrock outcroppings and ridges. The Central Sands marks an area of transition between northern and southern vegetation types. Wetlands, oak forests and pine-oak barrens are common throughout the landscape and interspersed with smaller concentrations of more mesic hardwood forests and scattered hemlock relics. Dominant cover types at present include mixed pine-oak forest, tamarack swamp, sedge meadow/open bog, and plantation-grown pine.

Current land uses include forestry, agriculture on drained soils, wildlife conservation, and cranberry production. There is also a significant acreage of marginal, idle agricultural land and a high percentage of publicly owned land.

Wetlands are numerous and extensive in this subsection. Most of the wetlands here are acidic, having accumulated layers of sphagnum peat over several millennia. Open bog, muskeg, poor fen, tamarack swamp, and northern sedge meadow are common peatland communities. Other wetland types are also present, including hardwood swamp, emergent and submergent marsh, fen, alder thicket, black spruce swamp, shrub-carr, and floodplain forest. This subsection comprises the majority of the study area.

Melrose Oak Forest and Savanna – Subsection 222Lb

The Melrose Oak Forest and Savanna subsection marks the eastern edge of the unglaciated driftless area of Wisconsin. This ecoregion is characterized by highly eroded, driftless topography, relatively extensive forested landscape, with big rivers and wide river valleys. The Black River is the primary river running through the western portion of the study area. Soils are sandy and silt loams over Cambrian siltstone and sandstone. Vegetation consists of oak-forest, oak savanna, prairie, and floodplain forest. Agriculture and forestry are primary land uses. This subsection comprises a very small portion of the study area.

Neilsville Sandstone Plateau – Subsection 222Rb

The Neilsville Sandstone Plateau subsection encompasses a very limited acreage along the northern edge of the study area. The ecoregion is closely associated with the Central Sand Plains. It is characterized by a shallow irregular till surface with soils of loam, peat, and outwash sand above Cambrian sandstone. Vegetation includes more mesic hardwood forests of sugar maple-basswood and northern communities consisting of white and red pines. Oak forests and pine barrens are common. Forestry and agriculture are the dominant land uses. This subsection comprises a small portion of the study area.

More detailed information on the ecoregions of northern Wisconsin is included in the WDNR's "Northern State Forest Assessments" (1999), particularly in the reports dealing with "Regional Ecology" and "Community Restoration and Old Growth." Information is broken down by ecoregion and includes vegetative cover, wildlife, ownership, and aquatic features. Ecoregion descriptions relevant to the upper Great Lakes area can also be found in Albert (1995) and Bailey (1995).

NHFEU Landtype Associations

The study area contains 17 **Landtype Associations**, or LTAs, the next level of the hierarchy. Below are brief descriptions for the LTA's that occur within the study area. These descriptions should be considered draft, as they were still being developed at the time of the writing.

LTA 222Lb05 - Boone Valleys and Hills

The characteristic landform pattern is undulating alluvial valley fills within an eroded, dissected, bedrock-controlled landscape. Some lower-relief bedrock ridges are included. Soils are predominantly well-drained sandy loams over sandy or loamy alluvium or colluvium, over sandstone bedrock.

LTA 222Lb06 Northfield Low Hills

The characteristic landform pattern is hilly eroded, dissected, bedrock-controlled ridges with relatively wide valleys containing stream terraces and floodplains. Soils are predominantly well-drained silt loams over silty loess or loamy colluvium or residuum, over sandstone bedrock. Soils in valleys are formed in silty alluvium.

LTA 222Lb07 Trempealeau Sandstone Hills

The characteristic landform pattern is steeply dissected, with narrow valleys between bedrock-controlled sandstone ridges. Soils are predominantly well-drained silt loam over silty loess or loamy colluvium or residuum, over sandstone or dolostone bedrock. Soils in valleys are formed in silty alluvium.

LTA 222Ra04 Northwest Outlet Cranberry Bogs

The characteristic landscape pattern is broad, nearly level stream terraces formed over a glacial lake plain. Soils are predominantly very poorly drained and poorly drained mucky peats, mucks, and mucky sands over sandy alluvium or glaciolacustrine residuum. A few bedrock-controlled ridges rise above the glacial lake plain; these have excessively drained sandy soils.

LTA 222Ra07 Wisconsin River Outwash Terraces
The characteristic landscape pattern is a nearly level glacial lake plain. Soils are predominantly excessively drained sands over sandy glaciolacustrine residuum.

LTA 222Ra09 Tomah-Mauston Terraces
The characteristic landscape pattern is undulating stream terraces formed at the margin of the glacial lake plain, with protruding bedrock-controlled knolls and ridges common. Soils are predominantly somewhat poorly drained silt loams over silty alluvium or clayey glaciolacustrine materials.

LTA 222Ra11 Yellow River Floodplain and Terraces
The characteristic landscape pattern is broad, nearly level stream terraces formed over a glacial lake plain, containing a braided low-gradient river. Soils are predominantly very poorly to somewhat poorly drained mucky loamy sands or sands over sandy alluvium.

LTA 222Ra13 Yellow River Siliceous Terrace
The characteristic landscape pattern is nearly level glacial lake plain. Soils are predominantly moderately well drained sands over sandy glaciolacustrine material.

LTA 222Ra14 Glacial Lake Wisconsin Siliceous Sand Plain
The characteristic landscape pattern is nearly level glacial lake plain. Soils are predominantly very poorly and poorly drained mucky sands or sands over sandy glaciolacustrine material.

LTA 222Ra15 Lemonweir Floodplain and Terraces
The characteristic landscape pattern is nearly level stream terraces and floodplains formed over a glacial lake plain, containing a braided low-gradient river. Soils are predominantly somewhat poorly drained loamy sands over sandy to clayey stream terraces and glaciolacustrine materials.

LTA 222Ra16 Jackson-Juneau Sandstone Knolls and Terraces
The characteristic landscape pattern is rolling, eroded, bedrock-controlled knolls and ridges, surrounded by nearly level glacial lake plain and stream terraces. Soils are predominantly excessively drained sands over sandy colluvium, residuum, or alluvium; some are over sandstone bedrock.

LTA 222Ra19 Jackson Siliceous Sand Plain
The characteristic landscape pattern is broad, nearly level stream terraces formed over a glacial lake plain. A few bedrock-controlled knolls and ridges protrude. Soils are predominantly somewhat poorly and poorly drained mucky sands over sandy alluvium.

LTA 222Ra20 Black-Robinson-Harrison Terraces and Floodplains
The characteristic landscape pattern is gently sloping stream terraces and floodplains containing the area's larger rivers. A few bedrock-controlled knolls and ridges protrude. Soils are predominantly excessively drained sands over sandy alluvium; floodplain soils contain loamy sand strata and range from moderately well to poorly drained.

LTA 222Rb01 Fairchild Uplands
The characteristic landscape pattern is a rolling bedrock-controlled surface with a thin mantle of eroded glacial till. Outwash stream terraces are common in valleys. Soils on slopes and hilltops are predominantly moderately well drained loamy sands over loamy colluvium or residuum, over sandstone-shale bedrock. Soils in the valleys are predominantly sandy outwash over bedrock.

LTA 222Rb02 Spaulding Uplands
The characteristic landscape pattern is undulating erosional moraine and bedrock-controlled hills and ridges. Soils

are predominantly somewhat poorly drained loams over loamy or clayey colluvium or residuum, over sandstone-shale bedrock.

LTA 222Rb03 Pittsville Uplands

The characteristic landscape pattern is undulating erosional moraine; bedrock-controlled hills and ridges occur in places. Soils are predominantly moderately well drained drained loamy sands over loamy colluvium or residuum, over sandstone-shale bedrock.

LTA 222Rb04 Arbutus Uplands

The characteristic landscape pattern is undulating erosional moraines. Outwash stream terraces are common in valleys. Soils are predominantly somewhat poorly drained drained loamy sands over loamy colluvium or residuum, over sandstone-shale bedrock. Soils in the valleys are predominantly sandy outwash over bedrock.