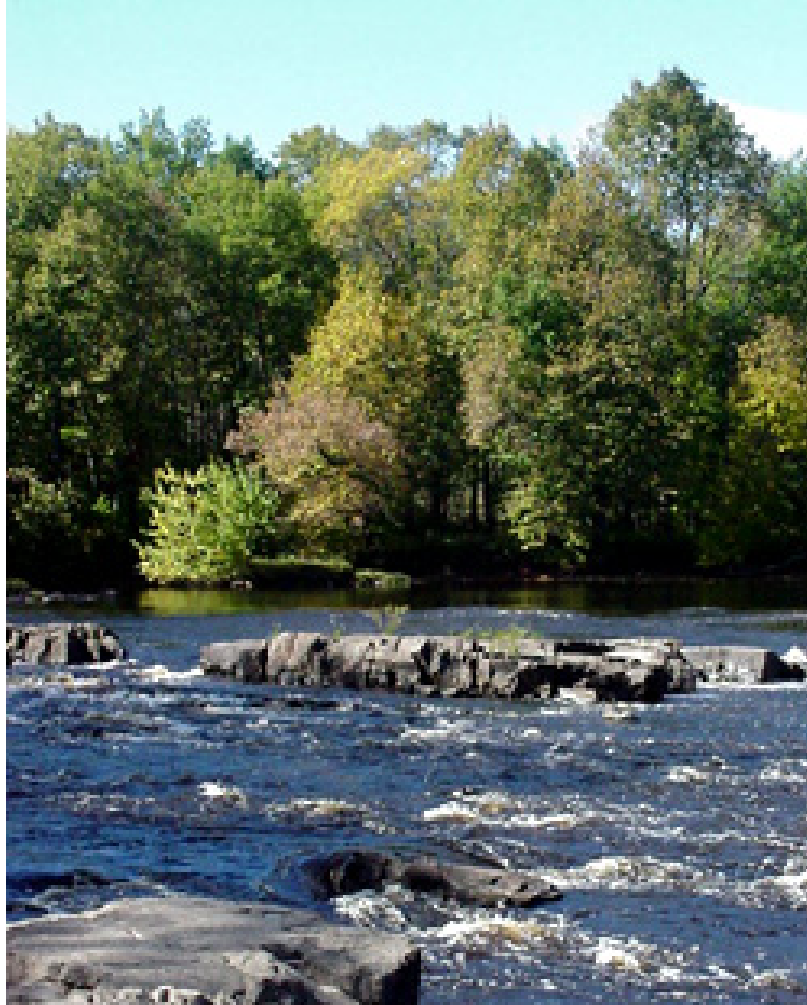


# PROPERTY AND REGIONAL ANALYSIS

## BLACK RIVER STATE FOREST



Wisconsin Department of Natural Resources

Division of Forestry

January 2007

DRAFT

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## **Introduction**

The purpose of the Regional and Property Analysis is to provide background information for the Black River State Forest (BRSF) and the surrounding region. The assessment was initiated to collect ecological, economic and social data to support informed decisions for the Black River State Forest master plan. It describes significant resources, identifies potential management opportunities and notes limitations which exist for the region or the property. The analysis helps define a niche for the state forest and is used to develop management alternatives that are consistent with and beneficial to the overall region. The Regional and Property Analysis also is utilized to create the environment assessment for the master planning process. During planning, emphasis is placed on managing for sustainability of the forest resources and promoting the benefits of natural communities while remaining sensitive to local and regional economies.

## **Regional and Property Scale**

To assess the ecological, social, recreational and economic significance of the Black River State Forest, this analysis utilized information from the best available research and reports. These complex documents, however, cover different geographical areas, time periods, scale or focus which then creates challenges for consistently comparing data. For this reason, there is no uniform defined “region” in this report. Rather the “region” shifts depending on the particular focus being described. For example, some of the “regions” described relate to the Upper Great Lakes states while others address Ecological Landscapes, the National Hierarchical Framework of Ecological Units (NHFEU), a statewide perspective, the local and surrounding counties, or a property based perspective.

## **Existing Assessment Reports**

The Statewide Comprehensive Outdoor Recreation Plan ((SCORP) (DNR 2006)) and the Black River State Forest Recreation Focus Groups (WDNR 2001) were used to assess the recreational resources. For the ecological analysis, the Biotic Inventory and Analysis of the Black River State Forest/Meadow Valley Landscape (WDNR 2005), the Strategy for Wildlife Species of Greatest Conservation Need: Wisconsin (WDNR 2005), the Ecological Landscapes of Wisconsin (WDNR 2004), Wisconsin Land Legacy Report (WDNR, 2006) Wisconsin’s Biodiversity as a Management Issue (WDNR 1995), forest reconnaissance and many other sources listed in the references were utilized. The 2000 United States Census was used to assess regional population, social, and economic factors. As new information becomes available, it will be incorporated into the planning process as part of a dynamic and responsive tool used by planners and property managers.

## **Property Overview**

The Black River State Forest is located in central Wisconsin in the Eastern Broadleaf Forest Province which occupies the southern half of the state. The Black River State Forest was established in 1957 after the federal government conveyed 59,000 acres of forest land to the Wisconsin Conservation Department in 1955. Through further land purchases, the forest has grown to its present size of 67,869 acres. The original area within the Black River State Forest, which consisted primarily of white pine and red pine, was heavily logged between 1880 and

1895 and was later settled by homesteaders seeking farmland. Today the forest consists of a mix of jack pine, oak, and aspen with an increasing component of white pine in the understory and canopy.

During the late 1930's the Resettlement Administration, using Works Project Administration labor, began a project to develop a series of earthen dikes within the forest. This included setting up a small sawmill in the area where they produced and assembled oak sheet piling for the core of every earthen dike in the state forest area. Three layers of overlapping oak boards are present beneath each of these dikes. This project changed the hydrology of the area by creating large shallow impoundments within the wetland complex of the state forest. Over 90% of the impoundments created during this time are still present on the state forest today.

A log shelter and home were built in 1938 by the Civilian Conservation Corps at the Castle Mound Roadside Park. A service building was added in 1958 and soon after a loop campground with toilets and an observation tower were built. By 1966, annual attendance at the Black River State Forest was 100,000. Today, over 300,000 visitors use the forest annually (WDNR 2004).

The arrival of snowmobiles brought a new type of recreation to the forest and in 1967 a 14-mile loop trail was constructed. Today there are more than 50 miles of snowmobile trails that link with an extensive county trail network. With the advent of the ATV in the 1970s, this new recreational use was permitted on 30 miles of the existing snowmobile trail system. Today, ATVs have become one of the fastest growing recreation activities in Wisconsin and on the state forest.

The construction of Interstate 94 contributed to the development of Robinson Beach on the state forest. The need for sand resulted in the digging of an 11 acre clear water pond in 1968. Today, the clear water pond includes a beach which is over 600 feet long.

When cross-country skiing became popular in the early 1970's, a 14-mile trail was developed. Another 12 miles were added in 1981. The trails are also used for backpacking, hiking and mountain biking. The Black River State Forest also contains three nature trails with one located at each campground.

The state forest provides hunting for whitetail deer, ruffed grouse, wild turkey, waterfowl, bear, and a variety of small game. Fishing is also popular on the Black River, East Fork of the Black River and on various flowages found throughout the state forest.

## **ANALYSIS OF THE REGION AND PROPERTY**

### **Regional Context**

The Black River State Forest is located in Jackson County. Housing and population density in the region are low compared to other parts of the state. Between 2000 and 2005 the population in Jackson County increased by 3.4 % (US Census 2000). In 2005, the county population was 19,828 with Black River Falls, the largest community in the county, having a population of 3,601 (State of Wisconsin 2005). The overall road density in the region is much lower than in most parts of the state even though Interstate 90/94 runs through the region and links the state forest

and surrounding area with large metropolitan communities such as Minneapolis/St. Paul, Madison, Milwaukee, and Chicago. Other access routes for the forest include State Highways 12 and 54 and County Roads O and K.

The Biotic Inventory and Analysis of the Black River State Forest and Meadow Valley Landscape Study Area encompasses 710,180 acres in portions of Clark, Jackson, Juneau, Monroe, and Wood Counties (NHI 2005). There is a blend of land ownership types in this area with almost half of the study area (342,000 acres) being publicly owned. The largest tract of public land is the Clark County Forest at 132,852 acres. The Black River State Forest is Wisconsin's third largest state property. There are 10 state natural areas in the region; four are located within the state forest. The large tracts of private land in the region are primarily committed to cranberry production; 55% of the state's cranberry beds occur in this region. The Ho-Chunk Nation and individual tribal members also own property in the region.

Land cover is primarily forested and non-forested wetland. Commercial forestry is a major activity with fragmentation being less pronounced here than in the southern part of the state. Historic wetland alteration, primarily for agricultural use was unsuccessful except for cranberry production. Agricultural land use in the region is low.

The forest is close to Fort McCoy Military Training Center which is situated on approximately 60,000 acres and provides support and training facilities for over 100,000 military personnel annually. Fort McCoy recently expressed interest in renegotiating an expired land use agreement for military training purposes with the Black River State Forest.

## Biological resources and ecological capability

### Natural Resources

The U.S. Department of Agriculture Forest Service Forest Inventory and Analysis<sup>1</sup> (FIA 2006) for Clark, Eau Claire, Jackson, Juneau, Monroe, Trempealeau, and Wood counties indicate the total forest cover in the region remains the same today as it did in 1983 while the age of the forests is increasing (Miles 2006). The total forest cover and age of the forests for the seven county region is shown in Table 1 below.

**Table 1. Percent Forest Cover and Total Acres by Stand Age in the Region from 1983-2004**

Year	% Forested	Stand Age				
		0-20 years	21-40 years	41-60 years	61-80 years	81+ years
1983	44	470,200	280,800	502,400	230,100	209,100
1996	46	267,110	458,110	568,685	327,295	156,204
2004	45	264,757	383,257	608,947	375,568	122,907

Source: Miles 2006

<sup>1</sup> FIA is an annual census of the nation's forests. It reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership.

Wisconsin's Natural Heritage Inventory (NHI) Program<sup>2</sup> indicates the presence of many unique, rare, and underrepresented species in the study area. As of 2006 the NHI documented 47 rare plants and 119 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, the most well-known being the Karner Blue Butterfly. Other rare animal species found in the study area include the bald eagle, osprey, bobcat, goshawk, and timber wolf. The area also contains many natural communities. The NHI documented 196 occurrences of 26 natural community types in the study area. Peatlands are more extensive in the region than anywhere else in southern Wisconsin. Similarly, the study area contains a greater acreage of contiguous forest than any other landscape of comparable size in the Eastern Broadleaf Forest Province. In addition to rare or unique species, the region contains several problematic invasive species such as common or glossy buckthorn, spotted knapweed, and leafy spurge.

### **Exceptional Characteristics of the Region**

The Western Sands region identified in the Biotic Inventory (NHI, 2005) 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

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<sup>2</sup> The Wisconsin Natural Heritage Inventory (NHI) program is part of an international network of NHI programs. It is managed in Wisconsin by a section of the Wisconsin Department of Natural Resources' Bureau of Endangered Resources.

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 Black River State Forest / Meadow Valley Landscape 7 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.

## Threatened, Endangered, and Special Concern Species

### Rare Vascular Plants in the Region

The Wisconsin NHI database tracks 47 rare plant species in the Black River State Forest and surrounding Meadow Valley landscape. In the last 30 years three Wisconsin endangered plant species (reticulated nutrush (*Scleria reticularis*), sand violet (*Viola fimbriatula*), and beak grass (*Diarrhena obovata*) and five Wisconsin threatened plant species dwarf milkweed (*Asclepias ovalifolia*), bog bluegrass (*Poa paludigena*), pale green orchid (*Plantanthera flava* var. *herbiola*), prairie parsley (*Polytaenia nuttallii*) and algae-like pondweed (*Potamogeton confervoides*)) have been confirmed in the region. Table 2 lists plants that have their largest state populations in the Natural Heritage Inventory (2005) survey area.

**Table 2. Plants with Their Largest State Populations in the Region**

Scientific Name	Common Name	Status in Wisconsin
<i>Viola fimbriatula</i>	Sand Violet	endangered
<i>Asclepias ovalifolia</i>	Dwarf Milkweed	threatened
<i>Bartonia paniculata</i>	Twining Screwstem	special concern
<i>Bartonia virginica</i>	Yellow Screwstem	special concern
<i>Carex cumulata</i>	Clustered Sedge	special concern
<i>Carex folliculate</i>	Long Sedge	special concern
<i>Carex straminea</i>	Straw Sedge	special concern
<i>Juncus marginatus</i>	Grassleaf Rush	special concern
<i>Polygala cruciata</i>	Crossleaf Milkwort	special concern
<i>Potamogeton diversifolius</i>	Water-thread Pondweed	special concern
<i>Thelypteris simulate</i>	Bog Fern	special concern

Source: NHI 2005

### Rare Animals in the Region

The Wisconsin NHI database tracks 119 species of rare animals and two miscellaneous elements that the Biotic Inventory and Analysis of the Black River State Forest/Meadow Valley Landscape recorded in the area (2005). The rare animals include 5 mammals, 25 birds, 13 reptiles and amphibians, 7 fish, 31 terrestrial invertebrates, and 38 aquatic invertebrates.

### State Endangered or Threatened Animals

There are 27 animals listed as endangered or threatened in the region. Species that have experienced the greatest reduction in numbers over the last twenty years are the wood turtle and massasauga rattlesnake. Wood turtle population declines have been noted in the past ten years in the Black River below Black River Falls. One cause may be illegal harvest (NHI 2005). The eastern massasauga rattlesnake population drastically declined in the 1980's and is now rare in the study area and throughout its entire range.

Table 3 lists the 27 state endangered or threatened animals and their current status as documented in the Natural Heritage Inventory (2005) survey area.

**Table 3. Wisconsin Endangered or Threatened Animals Found in the Black River Region**

Scientific Name	Common Name	State Status
<i>Acris crepitans blanchardi</i>	Blanchard's Cricket Frog	endangered

<i>Cyclonaias tuberculata</i>	Purple Wartyback	endangered
<i>Cygnus buccinator</i>	Trumpeter Swan	endangered
<i>Lanius ludovicianus</i>	Loggerhead Shrike	endangered
<i>Nicrophorus americanus</i>	American Burying Beetle	endangered
<i>Ophisaurus attenuatus</i>	Western Slender Glass Lizard	endangered
<i>Podiceps grisegena</i>	Red-necked Grebe	endangered
<i>Schinia Indiana</i>	Phlox Moth	endangered
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga Rattlesnake	endangered
<i>Somatochlora incurvata</i>	Warpaint Emerald	endangered
<i>Thamnophis proximus</i>	Western Ribbon Snake	endangered
<i>Tyto alba</i>	Barn Owl	endangered
<i>Ammodramus henslowii</i>	Henslow's Sparrow	threatened
<i>Buteo lineatus</i>	Red-shouldered Hawk	threatened
<i>Callophrys irus</i>	Frosted Elfin	threatened
<i>Clemmys insculpta</i>	Wood Turtle	threatened
<i>Dendroica cerulea</i>	Cerulean Warbler	threatened
<i>Empidonax vireescens</i>	Acadian Flycatcher	threatened
<i>Emydoidea blandingii</i>	Blanding's Turtle	threatened
<i>Lythrurus umbratilis</i>	Redfin Shiner	threatened
<i>Moxostoma Carinatum</i>	River Redhorse	threatened
<i>Nyctanassa violacea</i>	Yellow-crowned Night-heron	threatened
<i>Oporornis formosus</i>	Kentucky Warbler	threatened
<i>Pandion haliaetus</i>	Osprey	threatened
<i>Percina evides</i>	Gilt Darter	threatened
<i>Polyamia dilata</i>	Net-veined Leafhopper	threatened
<i>Tritogonia verrucosa</i>	Buckthorn	threatened

Source: NHI 2005

### Federal Endangered or Threatened Animals

Federally threatened and endangered species in the region are listed in Table 4. Kirtland's Warbler is one of the rarest birds in North America and has been reported a number of times in the study area, however, despite extensive searches, breeding Kirtland's Warblers have yet to be found in Wisconsin. The Kirtland's Warbler on the federal threatened and endangered resources list is noted as accidentals. Bald eagles are proposed for delisting because of population recovery in Wisconsin. Karner Blue Butterflies have their largest global population in the study area and are managed under a formal Habitat Conservation Plan (WDNR 2000). The eastern massasauga rattlesnake is a candidate for federal listing and there are attempts to protect existing sites in order to prevent federal listing. The timber wolf is also relatively new to the study area. The region provides a unique niche in that it is the only suitable wolf habitat in central Wisconsin and is separate from habitat in northern Wisconsin. The state forest falls into Wisconsin Wolf Management Zone 2 which is thought to be capable of sustaining 20-40 wolves. There were between 35-38 wolves reported in Management Zone 2 in 2002. The current population of wolves meets the recovery goals and the species has been delisted from a state threatened to a protected species (NHI 2005). The current list of federal threatened and endangered animals found in or near the state forest according to the Natural Heritage Inventory survey area is shown in Table 4.

**Table 4. Federal Endangered or Threatened Animals in Black River Region**

Scientific Name	Common Name	Federal Status in Wisconsin
<i>Dendroica kirtlandii</i>	Kirtland's warbler	Listed endangered, accidental
<i>Haliaeetus leucocephalus</i>	Bald eagle	Listed threatened, under review for delisting
<i>Lycaeides melissa samuelis</i>	Karner blue butterfly	Listed endangered
<i>Nicrophorus americanus</i>	American burying beetle	Listed endangered, extirpated
<i>Sistrurus catenatus catenatus</i>	Eastern massasauga rattlesnake	Candidate for future listing

Source: NHI, 2005

### Wildlife Species of Greatest Conservation Need

The Central Sand Plains Ecological Landscape and associated natural communities provide regionally significant habitats for many important native species with low or declining populations. These species are also known as Species of Greatest Conservation Need. These are wildlife species identified in Wisconsin's Wildlife Action Plan (WDNR 2005) that are most at risk of no longer being a viable part of Wisconsin's fauna and are in need of management to prevent them from being endangered or threatened at the federal level. While some of these species are currently state listed, many of them are not and some are game species. Appendix J lists priority Vertebrate Species of Greatest Conservation Need (SGCN) and their natural community associations that could benefit from management within the Central Sand Plains Ecological Landscape. That is, those high priority situations where all of the following are true: a) there is a high or moderate probability that the SGCN occurs in manageable numbers in the ecological landscape, b) the SGCN is significantly or moderately associated with the natural community, and c) the ecological landscape represents a major opportunity to manage or sustain that natural community. Wisconsin's Wildlife Action Plan provides the details on management for species and its habitats.

### Eco-regions

The National Hierarchical Framework of Ecological Units (NHFEU) defines eco-regions as geographic areas of similar physical, chemical, and biological characteristics in a hierarchical framework (Avers et al, 1994). The Black River State Forest is located within Province 222, Eastern Broadleaf Forest. The region is also within Section 222R, the Central Wisconsin Sands. The region is further divided into two subsections, the Central Wisconsin Sand Plain (222Ra) and the Neillsville Sandstone Plateau (222Rb). See map in Appendix H. This ecoregion is associated with a shallow irregular till surface with soils of loam, peat, and outwash sand. Wetlands, oak forests and pine-oak barrens are common and interspersed with smaller concentrations of more mesic hardwood forest and scattered hemlock relics. Current major land uses include forest management and agriculture (mostly in cranberry production).

### Recreational resources and use

The activities people participate in depend on the region of the state and specific opportunities available. The 2005 SCORP report listed walking for pleasure as the most popular outdoor activity in Wisconsin with 86% of adults participating. Other popular activities with over half of

Wisconsin residents participating are family gatherings (81%), driving for pleasure (62%), and picnicking (57%). Bicycling, boating, visiting a beach, swimming, snow/ice activities of any kind and freshwater fishing round out the remaining top recreational activities in the West Central/ Lake Winnebago Region, which includes the Black River State Forest.

Public outdoor recreation in the region is provided by federal, state, county, municipal, and private landowners with the type and amount of opportunities varying depending on the size, management objectives, and owner. Recreational trail use, canoeing, fishing, hunting, and camping are all available in the region (Appendix E).

Canoeing and kayaking are popular in the state and the region provides opportunities for short half-day trips to multi day trips. Paddling difficulty ranges from flat water to class IV rapids. Portions of the East Fork and Black River run through the forest offering paddlers a mixture of whitewater and flat water canoeing along with rustic campgrounds. Several local businesses support and encourage visitation to these rivers by providing shuttles, guides, and private campgrounds.

Since 1992 the number of people in Wisconsin who fish and hunt has remained steady. Jackson County has the most miles of Class I streams and the third highest mileage of Class II streams within the west central region of Wisconsin. Most of these streams are located in the western portion of the county and not in the state forest. The BRSF contains 20 lakes, about 15% of the total number found in the county. The lakes in the state forest total 572 acres which is approximately 11% of the total acreage for the county. Only one lake on the state forest has barrier-free boat ramp, three have a public boat ramp, and the rest do not have a defined access point or have trail access. One issue in the region is access to streams and lakes. Access to streams in the county is often via easement or at public road crossings.

The Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) noted that as Wisconsin's countryside becomes increasingly divided, recreation planners should anticipate increased pressure for large, open public spaces where hunting is allowed (WDNR, 2006). The Black River State Forest and the Jackson County Forest are two of the largest contiguous tracts of open hunting land in the southern part of the state. The trends show that the number of deer and turkeys harvested in the county is higher than the number of county residents who identify themselves as hunters or purchase licenses in the county. This suggests that the area is a destination for hunters. Private land open to hunting contributes to the overall acreage available in the area. Most private land that is open to hunting is suitable for big game (black bear and white-tailed deer) and upland (turkey, grouse, rabbit, squirrel, etc.) hunting. There is some private land available and suitable for waterfowl hunting (ducks and geese). Table 5 summarizes the hunting land available in Jackson County.

**Table 5. Acres Available for Hunting in Jackson County**

<b>Land Ownership</b>	<b>Big Game</b>	<b>Waterfowl</b>	<b>Upland Game</b>
County	117,204	117,204	117,204
Federal	1,682	1,682	1,682
Private	15,670	651	15,670
State	73,659	21,003	73,362

Total	208,215	23,336	207,918
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Source: WDNR, 2003

There are over 100 campsites available on the Black River State Forest, 285 on the Jackson County Forest and over 700 available throughout the county. Private campgrounds account for almost half the camping opportunities in the county. The public and private campgrounds serve different niches. Private campgrounds provide most of the developed camping opportunities and camping opportunities combined with guide services. The public campgrounds provide most of the rustic and backcountry opportunities. If you include the surrounding counties of Adams, Chippewa, Clark, Eau Claire, Juneau, Marathon, Monroe, Portage and Wood, then the number of campsites in the region increases to 2,352 electrical sites and 2,097 non-electrical sites.

There are a variety of trails in the region available for ATV riding, biking, cross-country skiing, hiking, horseback riding, snowmobiling, and snowshoeing. The fastest growing sports in the region are ATV riding and off-road mountain biking. There are over 100 miles of ATV trails running through the state forest and county forest in Jackson County and over 300 miles of snowmobile trails. The neighboring counties of Chippewa, Eau Claire, Clark, Wood, Portage, Juneau, Adams, Monroe, and Marathon provide an additional 227 miles of summer ATV use trails and 944 miles of winter ATV use trails, and 2,852 miles of snowmobile trails. Snowmobile trails make up the highest percentage of trails in the region, followed by ATV trails, bike trails, hiking, and cross-country ski trails. Poor winter snow conditions in recent years have significantly reduced the number of snowmobile users in the area. This has been off-set by increased ATV users and pressure to open trails for a longer period of the year.

The popularity of more passive forms of recreation such as watching birds and wildlife, nature study, and nature photography are expected to increase in the future due to an aging population and the desire for people to participate in activities deemed more environmentally friendly according to the Wisconsin Northern State Forest Assessment of Recreational Supply and Demand. (WDNR, 2001). State lands account for nearly 90% of the acreage in the region available for wild resource recreation and many areas of the BRSF offer passive recreation attributes. These users, who are an important source of revenue for local communities, prefer lands that are “wild” meaning a small number of support facilities and a feeling of solitude. They like areas where motorized sports are not allowed and where few signs of management activities exist. These preferences may cause conflict with the increasing presence of ATV use in the area. (WDNR, 2001)

### **Socio-economics**

Human population density is one of the most notable differences between the county and state. In 2000, Jackson County had only 19.3 people per square mile while the rest of the state averaged 98.8 people per square mile. (MRRPC, 2005). The low population density may contribute to more urban dwellers visiting the area for forest-based recreation. The easy access to the forest via Interstate Highway 90/94 positions the county in a prime location for visitors from Chicago, Milwaukee, Madison, Minneapolis, and other metro areas.

In 2003, the largest employment sectors in the Jackson County were government and government enterprises (29.0%), farm employment (10.2%), retail trade (9.0%), construction

(8.8%), transportation and warehousing, and manufacturing (7.3%). Sectors comprising the largest percentage of total earnings total were government and government enterprises (32.7%), construction (14.1%), transportation and warehousing (12.8%), manufacturing (9.4%), and farm earnings (6.4%). (MRRPC, 2005). In 1999 the median household income for Jackson County was \$37,015 and \$43,791 for the state. The top ten employers in Jackson County in 2004 are shown in Table 6.

**Table 6. Top 10 Employers in Jackson County in 2004**

Establishment	Product or Service	Size
Ho Chunk Nation	Tribal government	1000+ employees
Millis Transfer Inc	Gen. freight trucking	500-999 employees
County of Jackson	Executive and legislative offices	250-499 employees
Black River Falls Public School	Elementary and secondary schools	250-499 employees
Lunda Construction Co	Highway, street, and bridge construction	250-499 employees
Department of Corrections	Correctional institutions	250-499 employees
Leeson Electric Corp	Motor and generator mfg.	100-249 employees
Black River Memorial Hospital	Gen. medical and surgical hospital	100-249 employees
Fleet Guard Inc	Misc. general purpose machinery mfg.	100-249 employees
Flying J Inc	Gasoline stations with convenience stores	100-249 employees

Source: MRRPC, 2005

Tourism-related travel expenditures in the region were \$587 million in 2004. This was about 5% of the \$11.8 billion in state travel revenues. The travel revenues in the region generated over 15,000 jobs and employed 9% of the labor force. Most travel dollars were spent on lodging, recreation, food, and shopping. Table 7 provides information on visitor tourism expenditures, employment impacts, and resident income impacts for the region and state. Jackson County ranks third highest for visitor expenditures and employment impact in the nine county area. (MRRPC, 2005)

**Table 7. Tourism Impact, Visitor, Employment and Income Impact in 2004**

Jurisdiction	Total Visitor Expenditure	Total Employment Impact
Buffalo	\$19,621,827	519
Crawford	\$49,866,224	1,316
Jackson	\$76,260,278	1,674
LaCrosse	\$212,464,287	5,829
Monroe	\$108,354,273	2,859
Pepin	\$8,135,868	213
Pierce	\$32,393,430	855
Trempealeau	\$38,247,980	1,010
Vernon	\$41,591,257	1,097
Region	\$586,935,424	15,372
State	\$11,781,228,510	309,207

Source: MRRPC, 2005

Wood-based industries are an important part of the state and regional economies. Wisconsin is the number one paper making state in the nation. Approximately 18% of the jobs in Wisconsin are tied to either wood-based industries or tourism sensitive sectors. In Wisconsin over 1,800 companies in the timber industry employ over 99,000 people with a total payroll of \$3.6 billion. (WDNR, 2000). The value of annual timber removals in Wisconsin was almost \$210 million and almost 82% of that was from private lands. Public forest lands in Wisconsin account for the remaining harvest value. On public lands, 50% of the harvest value came from federal property, 36% from county forests, and 14% on state lands. A 2000 report indicated the highest stumpage values were in the central and southwestern parts of the state. Central Wisconsin, which includes the Black River State Forest, valued annual timber removals at \$62.8 million dollars (WDNR 2000).

Recreation in the forest also impacts the local economy. In a span of 10 years Jackson County saw an increase of over 200 percent in traveler spending from \$22 million in 1994 to \$72 million in 2005 according to Jackson County's 2005 Economic Impact, provided by the Wisconsin Department of Tourism. Eighteen percent of all expenditures were made in the winter, 22% were made in the spring, 36% in the summer, and 23% in the fall. (WDOT, 2006). Some local businesses in the vicinity of the state forest report that ATV customers now account for a significant portion of their sales and revenues (Wynenberg, 2006).

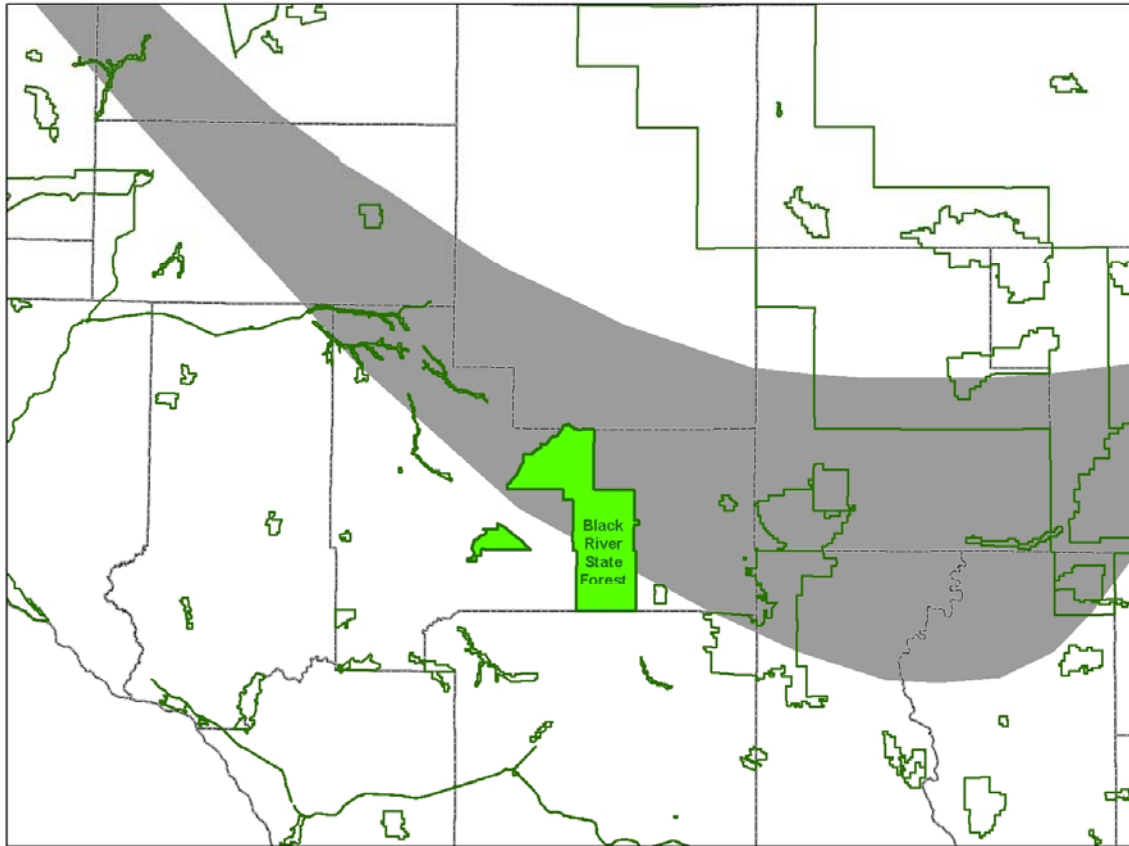
Non-motorized forms of recreation also have a positive economic impact on local economies. The Wisconsin Department of Tourism found that the average expenditure for western Wisconsin trails, including the Elroy-Sparta Trail, for trail visitors who were not local was \$26.43 per person per day. (WDOT, 2000).

## PROPERTY DESCRIPTION FOR THE BLACK RIVER STATE FOREST

### **Physical Environment**

#### **Climate**

The Black River State Forest lies in the "tension zone" which 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 forest of the south (Curtis 1959). Most of the forest lies within the tension zone (Figure 1) and therefore features a mix of northern and southern vegetation types. The area is especially noteworthy for supporting southern outliers of many "northern" species.

**Figure 1. Tension Zone in Wisconsin****Geology**

The Black River State Forest (BRSF) landscape lies within an area that was strongly influenced by glaciations during the Ice Age. The Ice Age began about 2.5 million years ago, and was a time when glaciers repeatedly formed, expanded, and retreated. The most recent ice advance into this area occurred during the latter part of the Wisconsin Glaciation. At 26,000 years ago, a large ice sheet expanded through Canada and moved into the Lake Superior and Lake Michigan basins. The ice reached its maximum southerly extent in Wisconsin at about 18,000 years ago, and then gradually retreated back out of the Lake Superior basin by about 9,500 years ago. The Wisconsin Glaciation was responsible for creating many of the surface formations found in the vicinity of the BRSF, although the area was not in direct contact with the ice sheets, and prior glaciations are also thought to have influenced the surficial geology of the area.

Glacial Lake Wisconsin occupied a large area just to the east of the state forest between 14,000 and 19,000 years ago. During most of the time the lake existed, glacial meltwater drained through the lowland now occupied by the East Fork of the Black River, and thence through the Black River valley to the Mississippi River. Drainage channels of Glacial Lake Wisconsin are found in southwestern Wood County in the Wood County State Wildlife Area. Most of the

former drainage channels have been obscured by deposits of post-glacial sediments, so their exact location is uncertain. Drainage through these channels built outwash terraces and fans, shaping topography along the Black River and the East Fork.

Earlier glacial lakes, formed by glaciers that preceded the Wisconsin Glaciation, are believed to have built lake plains and other drainage features in the BRSF area. The large sand plain that makes up most of the BRSF, known as the Jackson Plain, may have been covered by one or more large glacial lakes prior to 130,000 years ago. Possible drainage outlets for these lakes are located in eastern Jackson Co. near Eleva Station.

After the Wisconsin Glaciation, and before vegetation covered the land, there was little to impede strong winds throughout the region. The sandy surfaces of the lake plains and outwash terraces were easily moved about, and many aeolian dune features were built by wind action. Also protruding above the sand plain are remnants of eroded Cambrian sandstone, forming buttes, hills, knolls, ridges, and pediments. Castle Mound and Wildcat Mound are examples of landscape features formed by Upper Cambrian sandstone.

Upper Cambrian sandstone is also exposed along the banks of the Black River and the East Fork of the Black River, outcropping as low ledges or cliffs. Precambrian-age igneous and metamorphic rock is exposed at rapids along these rivers upstream from Black River Falls; these are some of the southernmost exposures of Precambrian rocks in Wisconsin.

### **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 Black River include localized areas of silts and other fine-textured soils, but these make up a small part of the forest. Where the water table is close to the surface, small changes in elevation can result in a wide range of local soil moisture conditions.

The majority of soils found within the Black River State Forest belong to one of three soil associations that group soil series with similar properties (Appendix I). These associations are the Tarr-Boone-Rockdam Association, the Elm Lake-Fairchild Association, and the Iron Run-Ponycreek-Dawsil Association. All of these associations present unique suitability limitations for various uses based on slope, water holding capacity and texture as well as chemistry and engineering indices.

The Tarr-Boone-Rockdam Association is made up of moderately well to excessively drained sandy soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. They are found on nearly level to very steep sites and have an available water holding capacity that is low to very low. These soils are generally better suited for pine tree growth as hardwood trees generally grow slowly and are of poor shape. Restrictive soil features for recreational development are ranked as "severe" (on a scale of slight, moderate, or severe) for all soils within this association primarily due to the sandy and acidic nature of these soils. The nearly level to

gently sloping areas are generally well suited for dwellings however, are poorly suited to septic tank absorption fields because they do not adequately filter the effluent.

The Elm Lake-Fairchild Association is made up of poorly drained and somewhat poorly drained sandy and mucky soils formed in siliceous sandy alluvium and loamy residuum derived from the underlining interbedded sandstone and shale. They are found on nearly level and gently sloping sites and have an available water holding capacity that is low. The Elm Lake soils in this association are suited to conifers but are poorly suited to most other trees because of the wetness. The Fairchild soils of this association are suited to trees. Restrictive soil features for recreational development are ranked as “severe” (on a scale of slight, moderate, or severe) for all soils within this association primarily due to wetness and the sandy acidic nature of these soils. This association is generally poorly suited to unsuited for septic tank absorption fields and dwellings mainly because of the wetness and the thin soil layer over bedrock.

The Iron Run-Ponycreek-Dawsil Association is made up of somewhat poorly drained to very poorly drained sandy, mucky, and peaty soils. The Iron Run and Pony Creek soils are formed in siliceous sandy alluvium and the Dawsil soils are formed in organic material overlaying siliceous sandy alluvium. They are found on nearly level and gently sloping sites with Iron Run and Pony Creek soils having available water holding capacity that is low and the Dawsil soils having an available water holding capacity that is very high. The Iron Run soils are suited to trees, the Dawsil soils are generally unsuited to trees, and the Pony Creek soils are suited to conifers but are poorly suited for most other trees. Restrictive soil features for recreational development are ranked as “severe” (on a scale of slight, moderate, or severe) for all soils within this association primarily due to humus, wetness and the sandy acidic nature of these soils. All soils in this association are unsuited to poorly suited for septic tank absorption fields and dwellings mainly because of wetness. (Soil Survey of Jackson County, 2001)

## Water Resources and Aquatic Habitats

### 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. The most standing water in the Black River State Forest is man-made impoundments and flowages constructed by the damming of small streams. Like the streams they impound, they are generally shallow, acidic, and infertile. (WDNR, 1968) Table 8 is a summary of these impoundments.

**Table 8. Impoundments Located within the Black River State Forest**

Name	Description	Maximum Depth	Access
Battle Point Flowage	A very soft water drainage impoundment. The water has a medium brown color, is acid, and has a low transparency.	7 feet	There is public access from a state trail.
Black Duck Flowage	A soft water drainage impoundment. The water has a light brown color, is	7.5 feet	It is managed for waterfowl but there is

	acid, and has a low transparency. It is not managed for fish. Mallard and wood duck nest at the flowage.		public access.
Dry Land Flowage	is a drained lake having very soft water. It is acid and the water has a light brown color and a low transparency. It is managed for waterfowl. During dry weather periods the flowage has very little water area.	5 feet	It has unimproved access
Funmaker Flowage	A drained impoundment with soft, light brown colored water, a low transparency, and a neutral pH. It is managed for waterfowl. During dry weather periods there is very little water area.	3 feet	It has an unimproved access.
Little Bear Flowage	A soft water drainage impoundment located on Dickey Creek. The water has a medium brown color, is alkaline, and has a low transparency. The flowage is used in waterfowl management.	5 feet	There is unimproved access.
Little Thunder Flowage	A drainage impoundment. The water is very soft, alkaline, has a dark brown color, and a low transparency. The flowage is managed for waterfowl.	3 feet	There is public access with parking.
Mallard Flowage	A drained impoundment. The water is a very soft, slightly acid, medium brown color and a low transparency. The lake is managed for waterfowl.	4.5 feet	There is unimproved access.
Partridge Crop Flowage	A very soft water drainage impoundment located on a ditch. It has medium brown colored water, a low transparency, and it is slightly alkaline. The flowage is managed for waterfowl.	3.5 feet	There is access from a state trail.
Pigeon Creek Flowage	A soft water drainage impoundment is located on Pigeon Creek. The water is alkaline, has a low transparency, and a medium brown color.	9 feet	There is a multiple use access which includes a boat launch, swimming, picnic area, and campground.
Rangeline Flowage	A very soft water drainage impoundment. The water is alkaline with light brown color and low transparency.	7 feet	There is public access to the flowage.

Seventeen Flowage	A very soft water drainage impoundment located on a ditch system within the forest. The water is alkaline, has a light brown color, and a low transparency.	4 feet	There is no public access to the flowage.
Squaw Mound Flowage	A soft water drainage impoundment. The water is alkaline and has a medium brown color. It is located on Levis Creek in the state forest.	6.5 feet	There is public access with parking.
Staffon Lake Flowage	A soft water drainage impoundment located on Hay Creek within the state forest. The water is acidic, has a light brown color and low transparency.	1.2 feet	There is public access and parking.
Tanner Flowage	A soft water drained impoundment with a low transparency, and medium brown color.	6.5 feet	There is unimproved access.
Teal Flowage	A a very soft water, light brown colored drainage impoundment located on Dickey Creek. The water is alkaline and has a low transparency. One of the few impoundments that has provided satisfactory fishing and has not had a history of winterkill conditions.	10 feet	There is public access and a picnic site.
Townline Flowage	A soft water drainage impoundment located on two unnamed streams and Hay Creek. The water is alkaline, has a medium brown color, and a low transparency.	6.5 feet	There is public access from State Highway 54.
Weber Flowage	A very soft water drainage impoundment located on a ditch system. The water has a low transparency, is alkaline and has a light brown color.	3.5 feet	There is unimproved access.
Whitetail Flowage	A soft water drainage impoundment with light brown water and is alkaline. It is located on an unnamed stream.	8 feet	There is public access and an unimproved boat launch.
Wildcat Flowage	An artificial seepage lake. Water color is light brown and slightly acid. It has a low transparency.	3 feet	There is unimproved access and a picnic area.
Wilson Marsh Flowage	A soft water drained impoundment that has medium brown colored water, is acid, and has low transparency. It is located at the	8.5 feet	There is unimproved access.

	upper end of Dickey Creek.		
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### **Wetlands**

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 landscape is generally flat with sterile soils. The 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 underlain by sand.

### **Streams**

The major drainages in the region include the Black River on the west and the East Fork of the Black River including streams in the Morrison Creek, Halls Creek and East Fork Black River watersheds. All the streams are characterized by stained water color caused by the organic (tannic) acids originating from the large wetland complexes within the watershed. Although historical stocking of trout was common, all of the streams within the boundary of the State Forest are naturally populated with warm water forge and sport fish. Although the Black River can have fairly high nutrient levels, the smaller streams draining through the Black River State Forest are relatively low in nutrients and do not experience eutrophication problems. The tributaries to the Black River, East Fork of the Black River, and Robinson Creek are mostly high gradient streams. Other significant streams include Halls Creek, Hay Creek, Morrison Creek, Pigeon Creek and Perry Creek. The forest has a range of stream sizes from 1<sup>st</sup> order headwaters to the Black River which is a 6<sup>th</sup> order stream with an average flow of 290 cfs. Many of the small tributaries of the Black River have been dammed to create flowages used for cranberry production and wildlife habitat. The largest concentration of flowages occurs in the Dike 17 Wildlife Area, where the goal is waterfowl management. Surface water in the area originates in wetlands with significant peat deposits. This organic material stains the water, giving many streams an amber color. There is very little groundwater input to most of the streams.

The Black River is a fast, large, warm, soft water stream. Approximately 12 miles are in the Black River State Forest. The species diversity is high and the river contains about 200 species of macroinvertebrates including one Endangered, two Threatened, and 18 Special Concern species. Also present is the state Threatened wood turtle, although the populations have decreased since 1994.

The East Fork of the Black River is a medium sized (5<sup>th</sup> order) warm, fast, brown-water stream with very soft water that approximately parallels the north edge of the study area. The East Fork Black River is nearly 60 miles long and flows through Clark, Wood, and Jackson counties. The river can sustain a sport fishery from its mouth to the village of City Point. During wet years, the sport fishery may extend upstream of City Point. The river flows largely through forested lands and receives flow from many tributaries which originate in wetlands. The East Fork of the Black River delivers very little sediment to Lake Arbutus as seen on aerial photos taken shortly after rain events. The bottom is mostly sand with rubble, bedrock, and silt also present.

Approximately 3.3 miles of the Black River are within the forest. Water quality information from 1992, 1993 and 1997 indicate relatively low nutrients (total phosphorus = 0.058 mg/L, organic nitrogen = 0.86 mg/L) with slightly acidic conditions (pH = 6.69) with low buffering capability (alkalinity = 9.35 mg/L).

Macroinvertebrate index of biological integrity rating from 1992 to 1996 generally reflect good stream conditions ranging between 4.00 (good) and 9.33 (excellent). Fisheries surveys in 2004 found 20 species (Table 9) as part of scheduled baseline sampling. The fisheries community is characteristic of a warm water sport fisheries and provides plenty of angling opportunities.

**Table 9. Fish Species in the East Fork of the Black River**

American Brook Lamprey	Common Shiner	Shorthead Redhorse
Banded Darter	Glass Pickerel	Smallmouth Bass
Black Crappie	Johnny Darter	Walleye
Blackside Darter	Largemouth Bass	White Sucker
Bluegill	Northern Hog Sucker	Yellow Bullhead
Central Mudminnow	Northern Pike	Yellow Perch
Common Carp	Rock Bass	

Source: Helsel, 2006

The area of the river along the East Fork Campground has the best density of freshwater mussels in the stream and good diversity with eight species (three Special Concern). Also found in the stream are a series of open and partially wooded seeps which harbor two special concern beetle species.

Robinson Creek is a medium sized stream with light brown, cool water; 5.2 miles of the stream are located in the forest. The stream originates as an unnamed flowage from about 12 headwater streams coming out of a portion of the Overmeyer Hills between Warrens and Millston. The portion named Robinson Creek originates in the Starlight Wetlands complex and the first few miles have cranberry flowages as tributaries. The creek has a high diversity of aquatic invertebrate species (60 taxa) plus 32 fish species. Several of the species are considered rare including two dragonflies, one damselfly, one stonefly, and one predaceous diving beetle. The macroinvertebrate index of biological integrity is rated fair based upon sampling in 2001. The stream is also the main drainage for the southern part of the forest. Robinson Creek Pines State Natural Area protects about one half mile of stream frontage. Baseline monitoring surveys in 2001 documented a fisheries community characteristic of a cold water stream including both brook and brown trout. Other species found in Robinson Creek include: American brook lamprey, blacknose dace, bluegill, brook stickleback, central mudminnow, creek chub, Johnny darter, largemouth bass, pearl dace, and white sucker.

Halls Creek is a small to moderate size (5<sup>th</sup> order) light brown stream that originates in the Western Coulee and Ridges Ecological Landscape and is a tributary to the Black River. Approximately 0.75 miles are in the forest. The stream contains ninety species of aquatic invertebrates and 28 fish species (none with special status). A baseline survey of Halls Creek in 1999 found seven different species dominated by American brook lamprey and brown trout. Other species include brook stickleback, brown trout, central mudminnow, Johnny darter, and white sucker. The macroinvertebrates collected in 1992 rate the biological integrity of the stream as good. No water quality information is available from Halls Creek. The eight species of mussels are high for a stream of its size.

Hay Creek is a small creek that originates in open wetlands in the Central Sands and approximately 4.8 miles runs through the forest. Water quality information from 1992, 1993 and 1997 indicate relatively acidic conditions (pH = 6.11) with low buffering capacity (Alkalinity = 3.78 mg/L) and is reflective of the large proportion of wetlands in the watershed. Hay Creek is relatively infertile with low nutrient levels (total phosphorus = 0.017 mg/L, organic nitrogen = 0.39 mg/L). The fisheries is characteristic of an infertile, cold water system with a relatively small number of species found in 2004, including American brook lamprey, blacknose dace, blackside darter, brook trout, central mudminnow, creek chub, hornyhead chub and white sucker. Some of the invertebrates found in the lower section are also indicative of cold water. The macroinvertebrate index of biological integrity for Hay Creek is generally good with ratings from 4.19 (fair) to 9.17 (excellent) over a period of time from 1992 to 2004. The lowermost portion of the creek is 2<sup>nd</sup> order in size and is somewhat entrenched with small seeps exposed along the banks. Ninety species of aquatic invertebrates and seven fish (none with special status) have been recorded but one species is considered globally rare.

Morrison Creek is a medium sized (5<sup>th</sup> order) brown-water stream. Approximately 15.8 miles are in the Black River State Forest. Morrison Creek begins in the far eastern portion of this watershed and flows west, through Potter's Flowage, the Black River State Forest and the Ho-Chunk Nation lands, before entering the Black River, 30 miles later. The lower eight miles of Morrison Creek contain sport fish. A warmwater forage fishery inhabits the remaining 22 miles of the creek. There are several impoundments on the forest in the Dike 17 wildlife area. The last 24 miles of Morrison Creek are not impounded. Above Oxbow Ponds there is an uncommon softwater spring that emerges near the bank and flows a few feet into Morrison Creek. The stream has a high macroinvertebrate diversity (41 species) and composition for a stream of its size. The macroinvertebrate index of biological integrity for Morrison Creek collected in 1992 and 2004 were classified as fair and good respectively. Four macroinvertebrate species are Special Concern, and two are globally rare. In addition some 21 fish species (none with special status) are found in the creek. No mussel species were found, probably because the water temperature is too low on average. A wide range of aquatic habitats are found including oxbows, floodplain wetlands, seeps, and at least one softwater spring and spring run.

Pigeon Creek has very soft, medium brown colored water and flows in a generally westerly direction. Sand is the most common bottom type with silt and gravel present. The stream is classified as a type two brook trout stream.

Perry Creek originates in the Central Poor Fens and is approximately 2.8 miles long. The entire creek is in the forest. The water is cold and light brown. Sand and muck are predominant substrates in the upper section changing to shallow sand and gravel or sandstone bedrock downstream. There is a high diversity of aquatic invertebrates (39 species) for a cool water system plus at least six fish species (none with special status). Above the flowages the tributary streams are considered trout waters. Included in the tributary 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, one only previously known from one site in Wisconsin and a state record caddisfly. This is the first record of this species anywhere in 57 years, and represents one of only three sites known anywhere.

Dickey Creek is a small, warm water stream that originates in open wetlands of the Black River State Forest within the Dike 17 Wildlife Area. The stream is stained by organic acids that are produced as shallow ground water percolates through the large amount of wetlands in the watershed. This stream flows in a northwesterly direction for approximately eight miles before discharging into Morrison Creek just above its confluence with the Black River. Five dams are located on this stream from its headwaters downstream approximately 3.5 miles. The predominant bottom type is shifting sand with sparse gravel which limits the diversity of aquatic invertebrate species. The substrate and low gradient water flows also limit its potential as a warm water sport fishery. There are 19 acres of adjoining wetland to Dickey Creek and 12.8 miles of public frontage.

Only a small portion of Levis Creek is located in the Black River State Forest and originates in an extensive wetland on the property. Ditches constructed decades ago to drain the wetland persist. Squaw Mound Flowage is a 14 acre impoundment located on the upper end of Levis Creek. Further downstream, beyond the boundary of the Black River State Forest, the stream is managed as a class I trout stream from its junction with Indian Grave Creek to the Black River. Upstream of Indian Grave Creek, forage fish inhabit the stream. Macrovertebrates samples collected in 1991 and 2003 from the lower portion of Levis Creek indicate a good quality stream. Although deeply stained by organic (tannic) acids, water quality samples collected in 2003 indicate relatively low nutrient levels.

Valentine Creek flows through the Black River State Forest and the Ho-Chunk Nation lands. Valentine Creek is designated as a three mile long Class I trout stream is a tributary to Morrison Creek near its confluence with the Black River; however recent fish surveys have found only limited number of trout and very poor to fair rated cold water fish index of biological integrity.

#### **Water Use Limitations and Opportunities**

The water in the streams is alkaline water with low transparency. Most of the streams in the forest are not classified as Class I trout waters. Clear Creek, Indian (Valentine) Creek, Creek 18-10, and Beltz Creek are small creeks within the forest boundaries designated as Class I brook trout streams. The forest contains three seepage lakes and 16 seepage and stream impoundments. Because many of the flowages are subject to annual or frequent winterkills and are drawn down in summer to be regenerated for waterfowl food, they do not lend themselves to fish management. Battle Point, Whitetail, Townline, and Teal flowages provide limited fishery for largemouth bass, northern pike, and panfish species. The ponds at Oxbow, constructed in 1967, have been managed as “put and take” trout waters. The ponds are stocked annually with brook and rainbow trout.

The Black River State Forest also contains a number of dams. The dams were created in the 1930’s by the Resettlement Administration. The dams created large shallow impoundments within the wetland areas of the forest. Over 90% of the impoundments created during the 1930’s are still present on the forest today. The dams on the state forest are listed in Table 10.

**Table 10. Dams in the Black River State Forest**

<b>Official Name of Dam</b>	<b>Popular Name of Dam</b>	<b>Comments</b>
Big Bear Flowage		Never inspected

Black River Camp		Never inspected
Koranda Flowage		Never inspected
Lower Wilson Flowage		Never inspected
No Name Flowage		Regrade crest, needs mowing
Resettlement Administration 1	Little Thunder Flowage	No work required
Resettlement Administration 2	Battlepoint Flowage	Tree removal along embankments and debris removal from spillway
Resettlement Administration 3	Wilson Marsh Flowage	Never inspected
Resettlement Administration 4	Weber Flowage	Tree removal along embankments
Resettlement Administration 5	Mallard Flowage	Monitor lateral movement of left wood wingwall; remove trees
Resettlement Administration 6	Tanner Flowage	Tree removal of large trees on right D/S embankment
Resettlement Administration 7	Sharptail Flowage	Never inspected
Resettlement Administration 8C	Townline Center	Tree removal
Resettlement Administration 8E	Townline East	Tree removal; backfill area behind wooden headwall
Resettlement Administration 8W	Townline West	Tree removal
Resettlement Administration 12	East Seventeen Flowage	Tree removal
Lower Seventeen Flowage		Never inspected
Resettlement Administration 13	Partridge Crop Flowage	Never inspected
Resettlement Administration 14	Black Duck Flowage	Never inspected
Resettlement Administration 15	Whitetail Flowage	Repair erosional feature adjacent to outlet pipe
Resettlement Administration 16	Wildcat Flowage	Needs inspection
Resettlement Administration 17	West Seventeen Flowage	West stop-log channel is damaged; Tree removal
Resettlement Administration 19	Staffon School Flowage	No work required
Resettlement Administration 20	Squaw Mound Flowage	Tree removal
Resettlement Administration 21	Little Bear Flowage	Repair erosional features in emergency spillway; remove trees
Resettlement Administration 23	Pigeon Creek Flowage	Tree removal

Resettlement Administration 24		Either remove or reconstruct
Resettlement Administration 25	Funmaker Flowage	Failed 2-28-2006, Possible removal
Resettlement Administration 26		Unable to locate; may have washed out
Resettlement Administration 27		Never inspected
Resettlement Administration 28		Unable to located; may have washed out.
Resettlement Administration 29	Teal Flowage	No work required
Resettlement Administration 29C		Failed; never removed
Resettlement Administration 29D		Failed; never removed
Resettlement Administration 32		Ownership issue
Resettlement Administration 34	Dryland Flowage	Tree removal; regrade crest
Resettlement Administration 51		Unable to located

Source: DNR 2006

## Upland and Lowland Vegetation

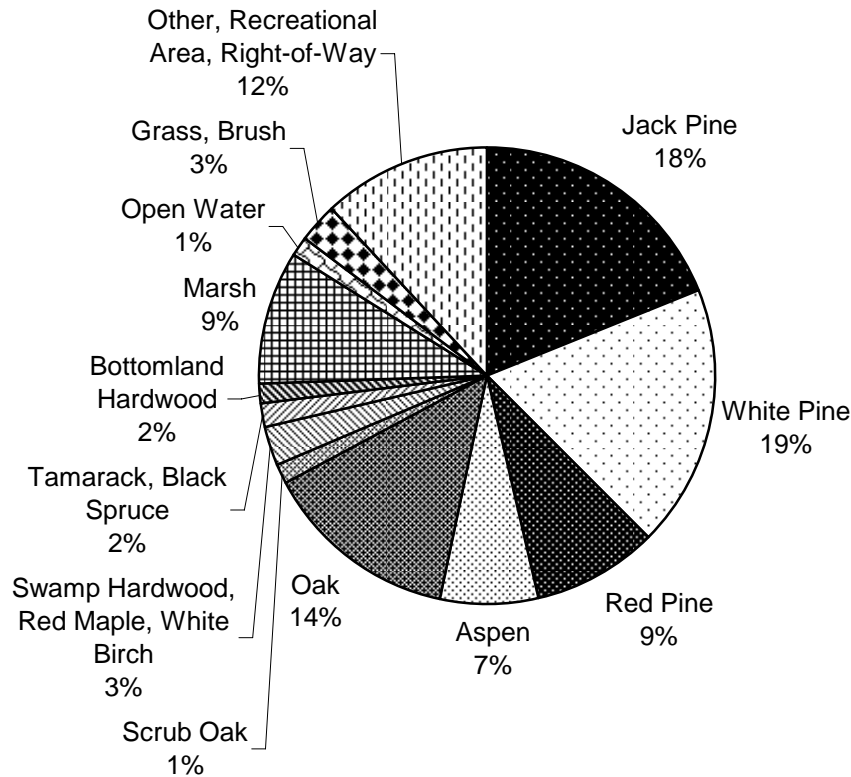
### Historic Vegetation

The Public Land Surveys (PLS) of the mid-1800's portray a landscape composed of extensive pine and oak forests on the uplands, and numerous tamarack swamps in the county. Concentrations of white pine or red pine dominated forests were noted south and east of Black River Falls, along the Black River and several tributaries (East Fork and Morrison Creek). The Obermeyer Hill-Wildcat Mound area contained black (*Quercus velutina*), white (*Quercus alba*), and red (*Quercus rubra*) oak forests. Mixed forests dominated by pines also contained some oaks. There was an abundance of forested lowlands dominated by tamarack and black spruce in the county.

The forest was heavily logged during Wisconsin's "big cutover" which started in the mid-1800s and lasted through the early 1900's. The logging activities peaked in the late 1800's with white pine and red pine the most heavily exploited species. Fires, due to logging activities, increased during the big cutover. The cutover of the forests did not go unnoticed and lead to a focus on forest conservation and the establishment of state and national forests.

### Current Vegetation

#### Figure 2. Current Cover Types in the Black River State Forest




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From DNR Recon, 2006

Today the area is much more heavily forested due to natural regeneration, tree planting, and fire suppression actions. The eco-region that includes the Black River State Forest has higher acreages of jack pine, red pine, and mixed conifer-hardwood forests than surrounding eco-regions (Figure 2). Several non-forested cover types are also well-represented in the forest, for example, wet meadows and lowland shrub cover types. Upland cover types include white pine, jack pine, and oak with red pine, aspens (trembling and bigtooth combined), and paper birch also common (WISCLAND data, WDNR 1999). Red maple is found but not dominant. The forest is mostly young and medium-aged. Stands exceeding 100 years of age are uncommon.

### Forests

The Black River State Forest contains a variety of forest communities that differ in composition and structure depending on site-specific factors like soil type, soil moisture and nutrient levels, landform, disturbance regime, and historical events. Although oak and aspen are important timber types in the forest, pines dominate in this landscape. When the state forest was established in 1957, the jack pine timber type surpassed all pines representing more than 33% of the forest cover while white pine, the most indigenous species, consisted of only 6% of the acreage. Associated with upland sites from dry to dry-mesic, jack pine was also found extensively on a range of moist to wet forest conditions. The widespread jack pine was due to its pioneer ability to capture burned over landscape once farming ceased and fire suppression began in the 1930's.

Second growth white pine following the logging era of the 1880-90's was mostly relegated to moist (stream terraces) sites and wet areas (swamps) that allowed them to survive wildfires of the settlement period (1900-1930's). These remnant pockets have been the primary seed source for white pine to regain prominence. Today, white pine is 19% of the property's acreage and now surpasses jack pine acreage. Throughout the nearly 50 years of the Black River State Forest's establishment, oak, aspen, and red pine acreage percentages have remained fairly constant.

Tree planting began before the property was officially designated a state forest. The first eight plantations were established in the fall of 1936 totaling 292 acres; all but one was a mix of jack, white, and red pine. The remaining plantation was entirely white pine. By 1940 the Farm Security Administration had planted 4,232 acres mostly on abandoned crop fields and some sparse, wooded pasture. From that beginning to 1957 a total of 5,674 acres were planted; the majority red pine, followed by jack pine, and white pine. The jack pine plantation acres have been harvested and are now mostly natural stands of mixed species. The forest also contains some areas of tamarack swamps and black spruce swamps. Much of the lowland terraces along the Black River are mixed species of bottomland hardwoods.

Tree planting has continued on the state forest since its establishment in 1957. The first 25 years concentrated on restoring open lands such as crop fields and old pastures to forest cover, primarily red pine plantations. By the mid 1970's most of the open lands were planted and annual planting tapered off. In 1977, two large forest fires burned nearly 30,000 acres which included nine red pine plantations. Those red pine plantations were replanted by 1979.

In the early 1990's, a jack pine budworm outbreak occurred. Salvage harvests followed with approximately 4,000 acres being harvested. Of these acres 3,000 acres naturally regenerated resulting in mixed stands of jack pine, white pine, oak, and some red maple and aspen. Tree planting on the remaining 1,000 acres focused primarily on jack pine with attempts to establish red pine at some locations. These attempts resulted in the establishment of approximately 200 acres of red pine plantations. The Braacke scarifier or a commercial trencher was used on many areas for site preparation. Some herbicide application was used for site preparation or follow-up competition control after tree planting. Success of these plantings ranged from good to poor depending on soil moisture for each site.

Planting on the state forest continues today focusing on supplemental planting to augment natural regeneration. Annual planting varies from 100 to 350 acres with the average being 200 acres. Jack pine is being the primary species planted. Previously, hand and/or machine planting was the method of choice. However, the most recent trend has focused on direct seeding of jack pine which tentatively appears to be the most economically viable method of regeneration.

Annual harvests of 970 acres for clearcuts and 300 acres for thinnings are scheduled in accordance with the allowable cut established in the 1983 master plan. Recently more emphasis has been placed on thinning prescriptions of the longer-lived species with a reduction of short-lived species. Harvest and regeneration techniques follow the WI DNR Silvicultural Handbook guidelines.

The Black River State Forest, in conjunction with all state forests in Wisconsin, conforms to the rigorous principles and criteria for sound management requirements of forest certification through both Forest Stewardship Council (FSC) and Sustainable Forest Initiative (SFI) assessments. The Wisconsin Natural Resources Board approved forest certification programs at its April 28, 2004 meeting.

Currently on the state forest there is a shift from early successional species such as aspen and jack pine to longer-lived species such as oak and white pine. This shifts the harvest emphasis from pulpwood to sawlog and lumber. Similarly the single species overstory composition of many stands is converting to a mixture of species.

Two major pulp/paper mills influence the market demand in the region. Both companies, Domtar (previously Nekoosa Paper Company) and Stora Enso (previously Consolidated Paper) are owned and operated by foreign interests. Although pulpwood producers are increasing utilization of boltwood and sawlog products, the markets for larger products have not increased proportionately to the availability of these products as the forest ages. There also has been a transition from one and two person logging operations utilizing chainsaws to highly mechanized harvest operators which need a very large capital investment to become established. Small logging operations continue to have an important role in harvesting operations and often can access more difficult terrain than large, mechanized firms.

### **Dry Forests**

Dry forests of oak, pine, or of mixed composition are extensive throughout the property. Most have been intensively managed, and some have been established as pine plantations on former farm fields. The greatest extent of relatively intact dry forest occurs on the sandstone ridges and mounds in the southeastern part of the forest (the Overmeyer Hills, Wildcat Ridge, and Wildcat Mound areas) where black and/or northern pin oak are often co-dominant with white oak and all three native pines. Aspen, black cherry, and red maple are typical associates. White pine is an important dry forest understory species at many locations. Sites with jack pine and oak are typically managed via even aged management utilizing clearcut prescriptions. Some of these sites contain wild lupine and the associated Karner Blue butterfly, both of which benefit from carefully planned clearcuts utilizing a shifting mosaic technique.

### **Dry-Mesic Forests**

Dry mesic forests, composed of white and red pines and often mixed with oaks, are represented by significant occurrences on the slopes and higher terraces along the Black River and several tributaries (including the East Fork of the Black, and Hall's, Morrison, Dickey, Valentine, Perry, and Robinson Creeks). In hardwood stands, dominants include white and red oaks and a different association of understory plants than is characteristic of the drier forests or those heavily dominated by conifers. Some clearcuts have occurred in these areas however, many of these areas have received little forest management due to slopes or limited accessibility. 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. These areas have received some even aged management via clearcuts primarily to release the white pine understory.

**Mesic Forests**

Mesic forests are rare within the state forest. 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. Harvest of elm occurred in some areas during the onset of Dutch Elm disease which resulted in regeneration of ash and maple in the gaps produced from this harvest, however, due to the limited extent and accessibility of this type, very little harvest has occurred.

**Wet-Mesic Forests**

Wet-mesic forests are best represented by mixed stands of white pine, red maple and jack pine. Springs are characteristic in this forest type which is subject to serious rutting, soil compaction, and is vulnerable to infestation by the exotic shrub, glossy buckthorn. Accessibility to these sites is very limited, however, some thinning has occurred when conditions allowed access in the white pine/red maple types and some even aged management via clearcuts has occurred in the jack pine/oak/red maple types.

**Floodplain Forest**

Floodplain forests are found within the state forest primarily along the Black River. This forest type includes silver maple, river birch, green ash, hackberry, and cottonwood. Harvest of elm occurred in some areas during the onset of Dutch Elm disease which resulted in regeneration of ash and maple in the gaps produced from this harvest.

**Conifer Swamps**

Conifer swamps of tamarack and black spruce are uncommon and localized within the state forest. Some tamarack harvest occurred prior to and during the mid 1980's for utilization in the tobacco drying industry.

**Savanna**

Savanna is best represented by the oak and pine barren communities, which are dynamic community types with highly variable structure. Tree density is determined by time elapsed since the last disturbance and site factors and cover type consists of a jack pine, or sometimes black or northern pin oak. Understory vegetation is mostly native grasses and forbs with some thickets of hazelnut, prairie willow, and scrub oak. The density of the trees is variable but in general is higher today than in previous decades. Limited restoration of these barren communities occurs at several sites in the forest including a 20 acre site in Morrison Creek Barrens and in part of the Dike 17 Wildlife Area. Both of these barrens restoration areas focus on management of the Karner Blue butterfly. Many populations of rare plant and animal species occur in small isolated barrens patches with jack pine and scrub oak stands, along roadsides, within railroad and utility corridors, on the margins of old log landings or skid trails, or in association with other partially disturbed sites kept free of dense woody plant cover.

**Shrub communities**

Wetland communities composed of tall shrubs are common throughout the state forest. They typically occur in the areas between forest and open meadow, fen or bog communities, and often occur in a narrow zone along the margins of many streams. Speckled alder is a common dominant, along with winterberry holly, chokeberry, bog holly, bog birch, willows and

dogwoods. Although an exact comparison with historic shrub communities is not available, it is likely that shrub-dominated wetlands are more prevalent now. Fire suppression and ditching impacted the larger wetlands in the region and favored the spread of shrubs and other woody vegetation. Upland shrub communities generally occur after timber harvesting or other disturbance activities on a site. Prescribed fire or mechanical bushing maintains some of this type such as at the Dike 17 Wildlife Management Area.

### **Open wetlands**

This community is broadly defined and includes open bog/poor fen, sedge meadow, and emergent marshes. Sphagnum mosses and sedges are the common dominant plants. Commercial moss harvesting in the forest requires a permit. True marshes contain cattails (*Typha* spp.), pond lilies, and pondweeds are uncommon in the forest. When present, this type of open wetland is associated with artificial flowages where a nutrient enhanced water source has allowed the growth of marsh plants that are not generally well-adapted to the acidic waters in the forest. The forest contains two large wetland sites, the Starlight Wetlands, and the Battlepoint-Dike 17 Complex which support several rare plants and animals.

### **Terrestrial grasslands**

True prairies are rare within the state forest. In areas where maintenance activities have kept certain places free of woody vegetation, many prairie species have survived. Typical sites occur along roadsides or within utility corridors. Historically, most of these prairies would have been much larger and occurred within extensive barrens complexes.

### **Cliffs**

Cambrian sandstone cliffs flank scattered stretches of the Black River, and are also prominent in the lower gorges of several tributaries to the Black River. 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 and the cliffs are dry.

### **Flora**

The flora of the Black River State Forest is a result of the geological history, the position in the tension zone, plant dispersal capabilities, disturbance regimes, and other characteristics. The combination of these factors resulted in unusual habitats and 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*), cross-leaved milkwort (*Polygala cruciata*); species that in Wisconsin are concentrated in the state forest and surround area including bog fern (*Thelypteris simulata*), long sedge (*Carex folliculata*); species that specialize in barrens, savannas or dry, sacy prairies such as sand violet (*Viola fimbriatula*) and dwarf milkweed (*Asclepias ovalifolia*); species that are at the southwest edge of their range in the state including purple bladderwort (*Utricularia purpurea*); species that are Midwest/near West endemics like woolly milkweed (*Asclepias lanuginosa*) and shadowy goldenrod (*Solidago sciaphila*); and species that are dependent on disturbance and that, on the state forest, have been recorded from artificial setting like roadside ditches and flowages.

### **Wildlife Resources**

Wildlife in the forest is diverse and provides a habitat for many species that require large, contiguous tracts of land. The species composition depends on cover type and successional stage of the forest. Aspen and oak forests are important for white-tailed deer, ruffed grouse, snowshoe hare, woodcock, black bear, beaver, as well as numerous species of small mammals and birds. Oak forests provides acorns as a food source and cover and browse for squirrels, deer, mice, raccoons, black bear, bluejays, and wild turkeys.

Jack pine stands are used by many species that utilize early successional stages of forest growth. A high density of trees in young jack pine stands is beneficial to birds and mammals for nesting sites, cover and resting areas. Deer frequently browse young pines. Jack pine stands are also home to Kirtland's warbler which is a recent rare occurrence on the forest.

Savannas and prairies are important to a number of ground-nesting species such as mallards, woodcock, sharp-tailed grouse, cottontail rabbits, mice, songbirds, and reptiles. Wetlands, rivers, streams, and flowages provide habitat for aquatic and semi-aquatic species. Amphibians, shorebirds, reptiles, waterfowl, fish as well as some species of furbearing mammals require aquatic habitat. Many upland species use the wet areas of the forest for feeding and drinking. The large open areas in marshes are utilized by sharp-tailed grouse. Flowages and streams in the forest contain limited gamefish species such as muskellunge, northern pike, largemouth bass, smallmouth bass, walleye, panfish, bullheads, catfish, yellow perch, and brook, brown, and rainbow trout.

Several wildlife species, including eagles, wolves, bears, deer, turkey, and sandhill cranes, have increasing populations on the property while other species, such as waterfowl and sharptailed grouse, are declining in number. Some species, such as the whooping crane, were previously not known to be on the state forest, but are currently found here. Elk is currently not on the forest but areas provide suitable habitat and as a result are being considered for elk reintroduction.

### **Recreational Facilities and Use**

The Black River State Forest provides a wide range of recreational opportunities. People come to enjoy camping, hiking, snowmobiling, fishing, bird watching, cross-country skiing, hunting and other activities. Snowmobilers, off highway vehicles, ATVs and dirt bikes use in the forest are increasing.

The Black River State Forest has extensive trails for hiking, skiing, biking, nature walks, snowmobiling, and ATV/motorcycles. There are 35 miles of hiking, skiing and biking trails. The majority of these multi-use trails are located about five miles northeast of Millston on County Highway O, then north about one mile on Smrekar Road. Along the Red Oak and Central trails there are two rest areas with an Adirondack shelter, small fireplace, and picnic table. Drinking water is available at the Central trail shelter. There are nine loops and all the trails are designed and marked for one-way skiing and bike travel with the exception of the link trails. The link trails are designed for two-way travel. The ski trails are groomed for both diagonal and skate style skiing. The trails are groomed after heavy weekend use and new snowfalls. A rustic ski shelter was recently constructed by the Black River Trail Foundation at the Smrekar parking lot. There are three nature trails totaling 4.0 miles in the forest at Castle Mound, East Fork and

Pigeon Creek, Castle Mound, Pigeon Creek, and the Group Camp also contain biking and skiing trails (Appendix D).

There are 51 miles of snowmobile trails in the state forest; approximately 30 miles of this total are also designated for ATV/motorcycle use. The state forest trails connect to the adjacent county forest trails so users have the ability to travel north/south between Millston and Lake Arbutus and east/west between Black River Falls and Pray. The large, linked trail system, along with easy access to the interstate, has generated a significant increase in ATV use on the property in recent years. The high use of the trails by ATVs during non-frozen conditions impacts the sustainability of the trails, increases maintenance needs, adds safety concerns, conflicts with other types of recreation and potentially creates environmental damage.

Camping and day-use: The property has three family campgrounds, one group camp, one horse campground, as well as picnic and day-use facilities. The family campgrounds are Castle Mound, Pigeon Creek, and East Fork. Castle Mound Campground located on Highway 12, one mile east of Black River Falls has 35 sites, six with electricity. Castle Mound also has showers, flush toilets, handicap accessible facilities, and sanitary dump station. The campground is open year round and campsites can be reserved between May 15<sup>th</sup> and October 1<sup>st</sup> and are first come, first serve the rest of the year. The campground also features a self-guided nature trail. Pigeon Creek Campground is located on North Settlement Road two miles northeast of Millston and is handicap accessible. The campground has 38 campsites, none with electricity; five sites are available year-round on a first come first serve basis. There is a five mile mountain bike trail at the campground that connects to 20 miles of hiking/skiing/biking trails. The Pigeon Creek Flowage has a beach for swimming and fishing. The East Fork Campground is located on the north end of the state forest on Campground Road. There are 25 sites, none with electricity; half of the sites are located along the bank of the East Fork of the Black River. Camping for all sites is available on a first come first serve basis. A small boat/canoe landing is located at the campground entrance. There is a nature trail along the bank of the East Fork of the Black River. Backpack camping, by permit, is also available on the property.

The Group Camp, located on the north end of the forest on Campground Road can accommodate up to 50 people. Water, pit toilets, picnic tables, cooking grills, a dog kennel, and a large fire ring are provided. The indoor building at the Group Camp is popular year round. Twelve people can sleep comfortably. There are wood bunks in the cabin as well as a stove, refrigerator, gas fireplace, heated floors, and a bathroom with shower. The indoor facility is ADA compliant. Reservations are required and a two-day minimum stay is required on summer weekends. The Group Camp is a popular facility and frequently occupied.

The Horse Campground is located on the north end of the forest on Campground Road. Twelve sites are available on a first come first serve basis and include a picnic table, fire ring and tethering post. None of the sites have electricity but the campground has pit toilets and a solar powered pump for water. The 20 mile horse trail begins at the campground.

South of Black River Falls, two campsites off of Hawk Island Road are available for canoeists. Camping is limited to a one night stay. Each site has a picnic table and fire ring. A unisex porta-potty is available.

Picnic facilities are located at the three campgrounds. All have hand pumps for water, picnic tables, grills and pit toilets. Castle Mound and Pigeon Creek have playground equipment and are handicap accessible. Perry Creek Park, Oxbow Pond, and Robinson Beach provide limited picnic facilities. There is also a log cabin picnic shelter at Castle Mound available by reservation. The shelter has a stone fireplace, electricity, tables, and outside cooking grills. Swimming is available at Robinson Beach and Pigeon Creek.

The forest also provides opportunities for other types of recreation. Hunting and trapping occur across the property for whitetail deer, turkey, grouse, bear, and small game such as rabbits, beaver, otter, muskrat, waterfowl and upland game. Archery hunting is increasing on the forest. An increase in illegal baiting for wildlife, especially deer has recently been noted. Fishing is also available on the flowages and on the Black River for panfish, northern pike, walleye, musky, sucker and bullhead. The forest contains 20 lakes totaling 572 acres, all are flowages except Lee Lake a 37-acre lake near Millston, Oxbow Pond, and a 6 acre unnamed lake located in the north end of the forest. Ten of the lakes are accessible only by a trail, three have a public boat launching facility, six do not have a defined access point, and one has a barrier-free boat ramp. (WDNR, 2003) An accessible fishing pier is available at Teal Flowage.

Because the contact stations at the family campgrounds, ski trail parking lots and Robinson Beach are irregularly staffed, determining accurate visitor attendance numbers is difficult. Most state forest visitors are “day use” only users. In the past five years there were over 42,000 day use visitors to the forest with the highest numbers in June, July, and August. Visitors who camp and pay a fee are easier to track. The highest campground use occurs in July and the lowest is from December to March. Table 11 shows campground use in the State Forest for 2005. The table lists the number of campers per night at the state forest.

**Table 11. Black River State Forest Approximate Campground Visitors in 2005 and Five Year Averages**

Campground	Jan-Feb	Mar-Apr	May-June	July-Aug	Sep-Oct	Nov-Dec	Total 2005	5-year Avg.
Castle Mound	44	244	2212	3592	1668	296	8056	7074
East Fork	4	152	1188	1580	1244	268	4436	4354
Pigeon Creek	40	324	1644	3248	1780	572	7608	7679
Group Camp	167	188	362	577	351	236	1881	1786
Canoe Camp	0	10	20	50	25	0	105	134
Horse Camp	0	52	192	104	212	4	564	465
Other (Backpack, Hunter)	2	85	199	118	168	658	1230	1524
<b>Total</b>	<b>257</b>	<b>1055</b>	<b>5817</b>	<b>9269</b>	<b>5448</b>	<b>2034</b>	<b>23880</b>	<b>27141</b>

Note: For the group and canoe camp, the campers list the number in their party, and for the campgrounds, the average party is four people so the numbers of paid nights are multiplied by four.

June, July and August are the busiest months at the three family campgrounds, though they are rarely occupied to full capacity. The percent occupancy for the summer months is shown in Table 12.

**Table 12. Percent Occupancy of Family Campgrounds in the Black River State Forest (June-August)**

Campground	June 2005	July 2005	August 2005	3- Month Average	5-Year Average
Castle Mound	48%	68%	53%	56%	54%
East Fork	21%	21%	28%	23%	29%
Pigeon Creek	19%	42%	27%	29%	32%

Dike 17 Wildlife Area, a 3,700 acre parcel, is primarily managed for waterfowl and sharptail grouse. Each fall ducks and geese are attracted to the area which in turn attracts hunters and sightseers. The twenty flowages of the Dike 17 area were constructed by the CCC and Works Progress Administration (WPA) crews in the 1930's. The area has an observation tower for bird and animal observations. Approximately 2,100 acres of the area is a wildlife refuge and is home to several endangered and threatened species such as bald eagle, osprey, Cooper's hawk, Blanding's turtle, and the Karner Blue Butterfly.

In 1989 the Black River State Forest released wild turkeys. The first spring hunt was conducted in 1992, followed by a fall hunt in 1994. Since their introduction, the turkey population has increased dramatically. From 1995 to 2003 the number of turkeys harvested in the spring increased from 382 to 686 and from 130 to 227 in the fall.

### **Social/Cultural**

Land ownership within the state forest property boundary is shown in Appendix B. Most of the land near and adjacent to the Black River State Forest is owned by the county. Other land adjacent to the forest includes private ownership some of which is under cranberry production or enrolled in the state forest tax law program and land owned by the Ho-Chunk Nation.

The State of Wisconsin Historical Society identified thirteen prehistoric archeological and historical sites on the forest plus an historic farmstead and cemetery, and an Indian pow-wow grounds. The farmstead, located in the Obermeyer Hills Wild Area, contains a root cellar, hand-dug well and an historic church cemetery. The site has been restored and is maintained by the forest. The historical sites on the property include five prehistoric campsites, four cemeteries, one group of burial mounds, a stone pipe findspot, a copper artifact findspot, and a "sacred spring".

### **Administrative and Other Facilities**

Black River State Forest has numerous administrative and operations buildings including: six storage buildings, three Park Entrance and Visitor Stations (PEVS), three recreation shelters, three wood bins, one indoor group camp and two observation towers. The PEVS are located at East Fork, Castle Mound and Pigeon Creek Campground. Four of the six storage buildings are located at Castle Mound ranging in size from 80 square feet to 2400 square feet. The East Fork, Pigeon Creek, and Castle Mound campgrounds each contain a wood bin that are each 150 square

feet. The indoor Group Camp is a 936 square foot wood building with electric heat and has a fireplace. The building is equipped with water, fire extinguishers, electricity, and a bathroom plus an outdoor four unit vault toilet and dog kennel. The DNR owns 15.5 miles of road within the forest and the municipalities own 134 miles of road. Parking lots in the forest total approximately 500 stalls. One observation tower is located at Castle Mound and was built in 1966 to replace a fire lookout cabin on top of the mound; the other observation tower is located at the Dike 17 Wildlife Area.

## **Property Capabilities and Limitations**

### **Statutory and other mandatory requirements**

Management of the Wisconsin State Forest System is guided by Wisconsin Statute 28.04 which ensures that state forests will provide a range of economic, ecological and social benefits for now and years to come. A sustainable forestry-based approach is used to enable these aspects of the forest environment to be maintained and enhanced for current and future generations. In addition, state forest management is now guided by our recent dual forest certification under the Forest Stewardship Council (FSC) and the Sustainable Forest Initiative (SFI). To maintain this certification, the state of Wisconsin must manage our state forests using strict environmental, social, and economic standards as outlined in the certification agreement.

The master plan process is guided by the following state and federal regulations:

- A. The Master Plan for the Black River State Forest will be developed within the parameters of Administrative Code NR 44, which governs Master Planning for DNR properties and requirements of WEPA (Wisconsin Environmental Policy Act).
- B. The Black River State Forest will be managed and developed as a State Forest as outlined in state statutes 28.04 Wis. Stats.
- C. The state forest will be managed and developed in accordance with Administrative Code NR 150 (Environmental Impact) and NR 1(Natural Resources Board Policies).
- D. Activities on DNR properties are governed by Administrative Code NR 45 (Use of Department Properties)
- E. All other state statutes, administrative codes, and DNR manual codes will apply.

### **Constraints to Ecological Capability**

The Black River State Forest and surrounding region is unique in that it is relatively intact, has low human population densities, and has large concentrations of public ownership. The potential exists for large-scale, cross ownership management or ecological restoration projects. The forest is important for many animals and plants but there are several threats to these species in the region. The main threats to the forest and region are fragmentation, habitat loss, ecological simplification, excessive herbivory, invasive species, and hydrological disruption. Although these threats have been itemized for convenience, 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.

### **Fragmentation**

Fragmentation occurs when large contiguous patches of habitat are broken up, resulting in smaller, isolated patches. The changes caused by fragmentation can limit seed dispersal, pollination, and movement; increase predation and competition; and decrease plant and animal

populations. The Black River State Forest and surrounding region are much less fragmented than many areas of Wisconsin which provides opportunities to maintain a comparatively intact landscape.

### **Habitat Loss**

Habitat loss is often a byproduct of management choices. For example, when fire suppression policies became widespread in the region, many areas that were formally open barrens succeeded into dense forests. This resulted in the loss of habitat for many specialized plants and animals. Habitat loss can also occur when native, mixed species stands are converted to single species monocultures resulting in lower species richness and structural diversity

### **Ecological Simplification**

Ecological simplification occurs when diverse, relatively natural habitats are “simplified” through various factors resulting in habitat loss and associated species loss. Simplification can occur from things such as invasive species, excessive herbivory, and sometimes various forestry practices such as herbicide use for site preparation. Impacts of sphagnum moss harvesting on peatland resources are poorly understood and may contribute to ecological simplification.

### **Excessive Herbivory**

Excessive browsing by the white-tailed deer has the potential to limit tree regeneration and reduce the diversity of ground layer plant species found within the forest. Negative impacts to tree regeneration are already evident on the forest indicating the need to further control the expanding deer herd. If this trend continues, there could be economic consequences via reduced crop tree production as well as a reduction in the quality of deer habitat and overall health of the herd.

### **Hydrological Disruption**

The majority of rivers in the region have been impacted by dam construction. Dams restrict the movement of aquatic organisms and affect streamside vegetation by altering floodplain systems. Many small streams in the area have been channelized, changing their natural course and making them unsuitable for some animals. Early attempts to drain parts of the forest resulted in numerous ditches. These ditches can be a conduit and dispersal route for invasive plants. Many of the drainages in the area have been impounded for wildlife management or cranberry production. Water has also been diverted from sections of the Black River for hydroelectric power.

### **Opportunities for Ecological Management**

*Rare and native communities:* The primary sites from the NHI Biotic Inventory report are the locations that contain the best examples of rare and representative native ecosystems, aquatic features, and sensitive species. These sites were given priority and were ranked based on least modification from natural condition, the potential for maintaining the community over time, and occur in relatively large stands. The following NHI protection and restoration opportunities are listed below.

General Protection and Management Opportunities (NHI, 2005; Ecological Landscapes of Wisconsin):

1. It is important to consider management at a landscape scale, and to consider stand level opportunities within the larger context of the surrounding landscape.
2. The BRSF offers the best opportunities south of the tension zone to manage for or re-establish large blocks of contiguous forest, barrens, and wetlands communities. The focus for management should be on maintaining functional community complexes across biotic and abiotic gradients (e.g. soil moisture, elevation etc.) Where the management of contiguous large blocks is impractical, it is generally desirable to maintain or re-establish connections between patches of habitat to avoid negative isolation effects.
3. Opportunities exist to protect, manage, and maintain viable examples of native communities, aquatic systems, and geological features throughout this area. Community priorities from a biodiversity standpoint include rare types, large patches, and missing or diminished successional stages.
4. The Black River and its' tributaries are important aquatic communities, and act as corridors to connect larger regions. Therefore, the ecological integrity of the Black River merits protection. This includes protection of adjacent upland community types. Boundary adjustments of the BRSF should be considered to extend protection to key sites including the East Fork of the Black River and the Black River corridor outside of the current BRSF boundaries.
5. The protection of the hydrology of wetland and aquatic systems is a major priority. The restoration of hydrological function to altered systems is also a priority, and should be considered on a case by case basis.
6. Continue to protect, manage, and maintain viable habitat of many types and age classes for common, rare or otherwise sensitive plants and animals.
7. Focus protection efforts on those sensitive species, natural communities, and aquatic systems that are especially characteristic of the Central Sand Plains Ecological Landscape or that offer opportunities not present elsewhere in Wisconsin.

#### General Restoration and Management Opportunities (NHI, 2005)

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. Management interest and emphasis varies among federal, state, county, tribal and private land ownerships.
4. Work with private groups and individuals interested in conserving the region's resources should continue to be a focal point.
5. Develop incentives for ownerships to maintain or re-establish diminished or declining resources.

#### Community Priorities and Opportunities

The management needs and opportunities for any ecological landscape are often described in terms of "natural communities". They are collections of native plants and animals that consistently occur together under similar conditions. The Department's Natural Heritage

Inventory (NHI) Program has expanded and refined Curtis's original classification of terrestrial and wetland-related natural communities in Wisconsin<sup>3</sup>.

Different natural communities occur in different parts of the state and as a result there are different opportunities to sustain these communities in different Ecological Landscapes. "Sustaining natural communities" means ensuring that a given natural community type will be present and has high potential to maintain its natural composition, structure, and ecological function over a long period of time (e.g., 100 years). The Ecological Landscapes of Wisconsin (NHI, 2005) describes which Ecological Landscapes provide the best opportunities for sustaining natural communities that occur in Wisconsin. This kind information can help guide land and water management activities (including active management for product extraction and recreation, preservation, and restoration of degraded or missing natural communities) to ensure that they are compatible with the local ecology of the Ecological Landscape and also maintain important components of ecological diversity and function.

The communities were chosen in the Biotic Inventory (NHI, 2005) because they contain occurrences of native plant communities that are relatively large and show little evidence of disturbances such as hydrological alteration.

#### **White Pine-Red Maple Swamp**

Known occurrences of this forested wetland community are concentrated in and around the bed of extinct Glacial Lake Wisconsin, with the vast majority found in the Central Sand Plains Ecological Landscape. Stands occur along the upper reaches of low gradient headwaters streams, or as a zone of vegetation at the wetland-upland interface on the margins of the large acid peatlands that are prominent features in central Wisconsin. The type is not of large extent within the state. Eastern white pine and red maple are the dominant trees, with other species, including yellow birch, black ash, and tamarack present in lesser amounts. Common understory shrubs are speckled alder, winterberry holly, dewberries (*Rubus hispidus*, and *R. pubescens*), and poison sumac; characteristic herbs include skunk cabbage, cinnamon fern, gold thread, and two disjuncts from the eastern United States, bog fern and long sedge. Sphagnum mosses and liverworts are common in some stands, and can form an almost continuous carpet over extensive areas.

Seepages and spring runs are often present, providing important microhabitats for invertebrates, herptiles, and plants. This community occupies a landscape position between wet acid peatlands forested with tamarack and black spruce, and dry forests composed of mixtures of pines and oaks. Transitions to the upland forests can be abrupt, with a sudden shift in the dominance of understory composition of wetland shrubs, herbs, and mosses, to dominance by bracken fern, blueberries (*Vaccinium angustifolium* and *V. myrtilloides*), huckleberry, and Pennsylvania sedge. Because this type has characteristics of an ecotone, with spatially variable microsites, high levels of ground cover, connectivity between wetland and upland communities, and uncommon structural features as compared with the surrounding landscape, it supports an unusual mix of

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<sup>3</sup> John Curtis' *The Vegetation of Wisconsin* (Curtis 1959) describes a novel way to determine natural communities based on plant associations and it remains the foundation from which most ecologists in the state categorize groups of species. Curtis focused on terrestrial and wetland communities, but did not address aquatic systems.

faunal species with high conservation value (e.g., red-shouldered hawk, amphibians, reptiles, and many species of neotropical migrant birds).

A majority of the older, intact occurrences of this type have been documented in the Central Sand Plains, making this Ecological Landscape the best place to maintain and potentially increase this type. The BRSF contains some of the most significant stands of this community.

- Large blocks of this habitat exist, and some of them occur within extensive forests. The best opportunities for developing blocks and connecting corridors are in the central and western parts of the Ecological Landscape, in the Black River State Forest, and on the Jackson, Wood, and Clark County Forests.
- Manage White Pine- Red Maple Swamp within large forest blocks to maximize ecological benefits where possible, and reduce stand vulnerability to excessive levels of windthrow.
- This community type should be managed as part of a complex with other forest and wetland types where possible. Isolated sites should be embedded in other forest habitats, or buffered from land uses that can degrade them.
- Restore altered hydrology where possible.
- Opportunities to manage for boreal birds, *Lepidoptera*, and other taxa are important; additional survey work should clarify the status of some of these species and enable conservationists to better prioritize protection and management projects.
- Best Management Practices and other sustainable forest management practices should be used to limit soil damage, erosion, sedimentation, and hydrologic changes.
- Promote awareness of the high ecological values of older, intact stands and work with managers to ensure that these are better represented on the landscape in the future.

### **Pine and Oak Barrens**

The Pine Barrens community is typically characterized by scattered jack pines, or less commonly, red pines, sometimes mixed with scrubby black and bur oaks. The scattered trees or groves are interspersed with openings in which shrubs such as hazelnuts, sand cherry, and prairie willow are prominent, along with prairie grasses and forbs. Pines may now be infrequent, even absent, in some stands in northern Wisconsin and elsewhere because of past logging, altered fire regimes, and an absence of seed source.

The Oak Barrens community Black oak is often the dominant tree in this fire-adapted savanna community of xeric sites, but white oak, bur oak, northern pin oak, and occasionally red oak, may also be present.

- This complex of community types is globally rare. Conservation will depend largely on restoration, and Wisconsin has some of the best opportunities in North America. These community types merit management emphasis in the Central Sand Plains, and there are legitimate restoration opportunities on the Black River State Forest.
- Opportunities exist to maintain and restore these community types and some restoration is already occurring. Where possible, this complex should be managed in the context of grasslands, barrens and other open habitats. Opportunities to develop partnerships with private groups should be explored and fostered. Restoration and management efforts are

underway at Necedah National Wildlife Refuge (Juneau County), Bauer-Brockway Barrens (Jackson County Forest), Quincy Bluff and Wetlands State Natural Area (Adams County), and Sandhill State Wildlife Area (Wood County). Additionally, restoration of large connected landscapes that include pine-oak barrens and wetlands (especially open sedge meadows, marshes and bogs) could benefit many rare plants and animals occurring here.

- Pine Barrens communities historically included oak groves and variable densities of pines. There is an opportunity to maintain a landscape-scale ecosystem that includes all these structural and compositional stages, including not only open barrens communities, but also transitional phases such as oak or pine savannas, and more dense oak and pine groves. Manage this type as a moving mosaic of habitat.
- Encourage use of prescribed fire to maintain this community, along with mechanical brushing and compatible forestry practices. Develop educational tools and demonstration areas that promote benefits of prescribed fire, and address the public's liability concerns. Follow existing WDNR screening guidance to minimize impacts on sensitive species.
- Protect sensitive areas from Off-road vehicles.

### **Central Poor Fen**

These open boggy peatlands are extensive within the Central Sands region which includes Jackson, Wood, Juneau, Monroe and part of Clark County. These acid meadows are common features of the central Wisconsin landscape. Layers of sphagnum mosses are typically present, with Canada bluejoint grass and several sedges the dominant graminoids. The state forest has extensive acreages of this type but many of the larger stands have been impacted by hydrologic modification and/or the harvest of sphagnum moss.

- Opportunities exist to maintain blocks of other wetlands and open communities surrounding or adjoining this community. Manage as complexes of co-occurring peatland communities.
- It is important to maintain natural hydrologic processes by preventing drainage or flooding where possible.
- Manage and monitor recreational uses so that they do not harm the environment and cause adverse impacts (i.e., erosion, spread of invasive species, habitat loss).
- Use Best Management Practices and sustainable forest management practices in and around fens, bogs and other peatland habitats.

### **Central Sands Pine-Oak Forest**

The most extensive forest type within the Central Sands region shares features with the dry and dry-mesic forests of northern Wisconsin but also exhibit attributes of composition that are not shared with northern forests and differ from other forests in southern Wisconsin. Rare species associated with this type include woolly milkweed, clustered sedge, Canada mountain-ricegrass, and sand violet. This forest community occurs on very dry to dry-mesic sites on low nutrient sands. Sandstone bedrock may be very close to the surface.

- Mixed pine-oak forests contribute significantly to the character and diversity of the forest, and it is desirable to maintain or restore them to represent the range of structural and compositional variability expressed by the type, in a range of patch sizes and age

classes. Preserve and connect remaining older dry forests, and seek opportunities to develop and maintain larger, older blocks of dry forest. The Central Sand Plains, and specifically the BRSF offer the best opportunities in the state for managing these types.

- Recognize that this community type is an early-to-mid-successional stage that will require active management to sustain. Encourage use of prescribed fire to regenerate dry forests, including the associated understory vegetation of this type. Follow existing management guidelines for prescribed fires to minimize impacts on sensitive species.
- There are opportunities to develop partnerships and coordinate management with other land owners in this area (e.g. county forests) in order to effectively enlarge the natural community patches and community diversity in the area.
- Use Best Management Practices and other sustainable forest community management practices to limit detrimental soil and water effects.
- Manage recreational uses so they are compatible with protecting the environment (e.g., limiting erosion, controlling spread of invasives, preventing damage to sensitive soils and vegetation).

### **Floodplain Forest**

In this Ecological Landscape, this community type occurs extensively along the Black, Yellow, Lemonweir and Wisconsin River valleys. The composition, disturbance regimes, dynamics and structure of this type are not well understood. There has been a major reduction of the American Elm component in this type due to Dutch Elm Disease, greatly reducing the structural variability of this type. Invasive plants have also altered species composition (e.g. reed canary grass).

Within the BRSF, this forest community is best developed within the floodplain of the Black River. Several rare species are associated with this type including Red-shouldered Hawk, Assiniboine sedge, wood turtle, Cerulean Warbler, water purslane, Yellow-crowned Night-Heron, and Prothonotary Warbler. Disturbances need to be minimized to maintain structural and microclimatic conditions needed by these habitat specialists.

- It is important to consider this type in the context of a gradient from lowlands well into the uplands. There are opportunities in the BRSF to manage from the floodplain all the way to the dry ridges of the river valley as a complex.
- There is also an opportunity in the BRSF to maintain large blocks of this type where they occur along the Black River itself. Where possible, connectivity of patches should be maintained or restored.
- There is an opportunity for additional research in order to better understand the composition, dynamics, disturbances and structure of this community type.

### **Southern Mesic Forest**

This forest community occurs in very limited acreage within the Central Sands region but the best occurrences are important components of the floodplain community and contain a collection of ground layer plants found in no other major community and support several rare species including Red-shouldered Hawk, Cerulean warbler, Acadian flycatcher, Kentucky Warbler, and one-flowered broomrape. This forest community is rare within the forest, 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.

- It is important to consider this type in the context of a gradient from lowlands well into the uplands along the Black River. There are opportunities in the BRSF to manage from the floodplain all the way to the dry ridges of the river valley as a complex.

### **Northern Dry-Mesic Forest**

This forest community is widespread within the Central Sands region. Dominant trees are white and red pines. Other canopy species 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 forest, the best developed stands are associated with sandstone bedrock outcrops.

- There are opportunities in the BRSF for managing and restoring large blocks of dry forest with dry-mesic community types included as an integral part of this complex.
- In recognition of the ecological, recreational and aesthetic values of old growth and big trees, continued application of extended rotations on State lands is supported. Continued efforts in identifying candidate old growth sites for Dry-mesic forests in the BRSF should continue.
- Opportunities exist to use prescribed burning to develop more structurally diverse forests, decrease competitive plant species such as hazel and red maple, and increase the oak and pine understory component.
- Of the overall red pine in this ecological landscape, plantation-origin red pine occupies approximately 98% (92,700 acres) of the total acreage according to FIA data summarized in 1996. Opportunities may exist to regenerate red pine through prescribed burning and other site preparation techniques. Relationships between canopy composition and seedling regeneration in red oak and white pine stands are evident. Though not scientifically documented, the alternating nature of white pine and red oak dominance in some forest stands within this Ecological Landscape warrants special consideration for management by recognizing the local environmental conditions that drive the regeneration potential of these stands. In some cases, foresters managing oak-dominated stands under a shelterwood system have actually enhanced conditions for white pine, and in managing white pine stands enhanced red oak dominance.
- Consider management actions to control gypsy moth outbreaks while maintaining oak forests on sites with high conservation value, taking care to not negatively affect other sensitive species.
- Investigate factors that lead to conversion to central hardwood species, and limit such conversion where sites have the potential to support rare species and SGCN.

### **Tamarack-Black Spruce Swamp**

The greatest acreage and concentration of “northern” conifer swamps in southern Wisconsin occurs within the Central Sands region. This community supports a highly distinctive group of plants and animals, many of them at their extreme southern range limits. Several important stands were documented on the forest. This community provides important habitat for many northern birds at or near their southern range limits in central Wisconsin. The common bird species associated with these acid conifer swamps are 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 are also found in this natural community.

More comprehensive survey work is needed to identify stands of high conservation value, especially those that are large, hydrologically intact, and of importance to sensitive species. Further survey work is also needed to identify species compositions within known stands.

- This community type should both be managed as part of a complex with other forest and wetland types where possible. Isolated sites should be embedded in other forest habitats, or buffered from land uses that can degrade them.
- Restore altered hydrology where possible.
- Opportunities to manage for boreal birds, *Lepidoptera*, and other taxa are important; additional survey work should clarify the status of some of these species and enable conservationists to better prioritize protection and management projects.
- WDNR's 'Peatlands Project' is expected to yield considerable information on wet forest types (among other peatland communities).
- Best Management Practices and other sustainable forest management practices should be used to limit soil damage, erosion, sedimentation, and hydrologic changes.
- Promote awareness of the high ecological values of older, intact stands and work with managers to ensure that these are better represented on the landscape in the future.

#### **Alder Thicket**

This community is common and widespread in northern Wisconsin but shrub swamps are more common in the Central Sands region than any other part of southern Wisconsin. At the site level, shrub swamps are considered integral components of wetland complexes. This community is found along stream margins and wetland edges.

#### **Dry Cliff**

Widespread in the Driftless Area and at several other locations in Wisconsin, dry sandstone cliff communities in the study area provide critical habitat for highly specialized plants, including several that are rare or special concern including rock clubmoss, shadowy goldenrod, and sand violet. The rare species on dry and moist cliffs were probably never abundant due to limited habitat. However, the habitat available is important for these specialists. Protection of these features should provide adequate habitat for these species. Sandstone cliffs occur along the Black River and some of its tributaries, such as Halls, Morrison, and Perry Creeks.

#### **Moist Cliff**

Several important occurrences of this community were documented in the forest. Several high specialized species that occur in this community are rock clubmoss and a purse casemaker caddisfly. This community is rare on the forest but there are highly significant occurrences along the Black River and its tributaries, Morrison, Halls, and Perry Creeks.

### **Recreational Resources and Use**

The Black River State Forest and adjacent county lands are a large area that has traditionally been used for land and water based recreation. The Black River and Lake Arbutus are popular

for canoeing, boating, fishing, and swimming. The numerous lakes and streams on the forest are popular fishing spots and there are four popular campgrounds on the forest that are used year-round with the heaviest use in the summer. The hunting opportunities on the forest bring in people from around the region. The Dike 17 area is popular with hunters, bird watchers, and hikers. One of the most popular parts of the forest is the extensive network of trails, some of which link to the county trail system. The trails are popular with hikers, bikers, skiers, horseback riders, snowmobiles and in recent years, with ATVs. Trail users are hard to count in the forest but outdoor recreation demands are expected to increase in the future according to the 2005-10 SCORP.

Currently one of the largest areas of recreational demand is for ATV trails. Within Wisconsin, riding ATVs has been one of the fastest growing recreation activities. Off-road driving with an ATV increased from 6% of the recreating public (2000-05 SCORP) to 23.4%. (2005-10 SCORP). The Western Sands Region which includes the Black River State Forest has one of the highest participation rates for riding ATVs of any region in the state due to its predominately rural, undeveloped nature and available ATV trail system. This rise in ATV use will increase pressure on the existing regional and state forest trail systems and will impact natural resources and recreational facilities. Dispersal corridors for invasive species will increase along with greater potential recreational user conflicts due to incompatible interests or the sheer number of people accessing the property. Increased use of the trails by ATVs creates the potential for more soil erosion which compromises the state forest's ability to guarantee a sustainable trail system. Each of these factors influences the property's budget and staffing needs.

The 2005 SCORP found a shortage of beaches, fishing piers, parks, trailerable boat launches, nature centers, and dog parks in the Western Sands Region.

## **FINDINGS AND CONCLUSIONS**

This analysis provides baseline information and as new information becomes available, it will be incorporated into the planning process as part of a dynamic and responsive tool used both by planners and property managers. The property and regional analysis identifies trends, issues and opportunities related to the property in a regional context, providing the basis for future decisions. The property, the region, and the role the property plays in a regional context will help shape and guide the master plan.

### **Forest Management Capability**

Forest management practices are the basis for creating a healthy forest and diverse wildlife habitat. Current forest management follows silviculture guidelines and considers the needs of numerous rare species. Timber harvests, conducted in accordance with acceptable silvicultural prescriptions, and within the annual allowable harvests, create age diversity critical for wildlife food and cover needs, generate a continual flow of forest products to the market, reduce the load of fuel for potential forest fires and stimulate the local economy by providing employment opportunities. Regeneration efforts, both natural and artificial, keep the state forest ownership in a productive status and ensure a variable range of species. The understory of the plantations of the forest is a mix of diverse species and as the plantations age, the forest is working towards managing them as natural stands.

The forest has higher percentages of jack pine, red pine, and mixed conifer-hardwoods than other parts of the state. White pine acreage has been steadily increasing and will provide opportunities to enter saw timber markets in the future. The forest also includes cover types such as oak, aspen, and paper birch which are primarily medium aged. Red maple is found but not dominant.

More pressure will be placed on publicly owned lands to provide the needs and expectations from escalating global demand for wood products. An increase in recreational demands and a decrease in private forestlands available for timber production also will impact the state forest resources.

### **Ecological Significance and Capability**

The large, continuous forested area, and the intermixed open areas and wet communities of the state forest and surrounding areas provide habitat and a niche for numerous wildlife species. This includes mammals that require large ranges (e.g. gray wolf, black bear), raptors that require open water or closed forest (e.g. eagle, red-shouldered hawk), birds that require expanses of savanna or prairie (e.g. woodcock, sharp-tailed grouse) as well as many others. The current diversity of wildlife also has been influenced by the creation and maintenance of a dike and dam system created in the early 1930s. For the continued health of the wildlife community, the maintenance of healthy natural communities is essential. This is not only for the benefit of the rare wildlife species, but also for a wide variety of species including white-tailed deer, turkey, grouse, beaver, songbirds, herptiles, invertebrates and fish. Efforts should also be directed to increase the

diversity of native wildlife species represented. For example, opportunities may exist to manage for an elk herd on the property.

Plants, animals, and natural communities that are geographically limited and highly localized in Wisconsin are well represented within the Black River State Forest. Area-sensitive species such as large predators, forest interior birds, and many grassland birds are present and can be maintained with appropriate resource management. The peatlands support many species that are rare or absent from similar habitats in northern Wisconsin. Older stands of White Pine-Red Maple Swamp support distinctive collections of plants and animals including many that are rare. There are opportunities to protect, maintain, manage, and restore pine-oak barrens, dry pine-oak forests, White Pine-Red Maple Swamp, Central Poor Fen, Muskeg, Tamarack-Black Spruce Swamp, Central Sands Pine-Oak Forest, Floodplain Forest, Southern Mesic Forest, Northern Dry-Mesic Forest, Dry Cliff, and Moist Cliff. These native plant communities were chosen because the state forest contains occurrences that are relatively large and show little evidence of disturbances such as hydrologic alteration. Many northern mammals, birds, invertebrates, and plants occur here at or near their southern range limits.

The soils in the Black River State Forest 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. Restrictive soil features for recreation development are ranked as "severe" (on a scale of slight, moderate, or severe) for all three major soil types on the forest due to the sandy and acidic nature of the soils.

Karner Blue butterfly is an important species on the forest and forest, recreation and wildlife management activities are compatible with the existing Habitat Conservation Plan (HCP). The Karner Blue butterfly is important because it has its largest global population in the region. Additional areas may be suitable for habitat manipulation to favor Karner Blue butterfly and other endangered or species of concern.

Invasive species are becoming a concern across the state and the Black River State Forest is no exception. Primary invasives are glossy or common buckthorn, spotted knapweed, and leafy spurge. Management strategies will need to be developed to identify, prioritize and control invasive plants and animals on the property to limit the loss of critical habitat and site quality.

The Black River corridor, its tributaries, and adjacent community types are vital components of the property both from a recreational point of view but also as an ecological resource for native species. The Black River corridor and its' tributaries 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. Every consideration should be given to maintaining the unique and valuable resource.

### **Recreational Significance and Capability**

The state forest's relative proximity to major population centers, along with the interstate artery, makes public access to the property and surrounding areas convenient and easy and is considered a regional destination for outdoor recreation opportunities. Recreational amenities abound, and

the flowages and rivers are already a large draw to recreational activities. Water based recreation activities such as boating, canoeing, fishing and swimming are popular on the property and public access to rivers and beaches provide a niche in the area. There are also four popular campgrounds in the forest which are available for year-round camping. The trail system on the forest provides some of the best opportunities in the region for hiking, biking, skiing, horseback riding, snowmobiling and ATVs. Another niche of the Black River State Forest and surrounding county forest land is the opportunity for hunting which draws people from around the region. Dike 17 is a unique and popular locale for hunters, bird watchers, and hikers alike.

Growth of motorized recreation uses needs to be balanced with the increasing interest in passive forms of recreation. The frequency of user conflicts may increase on the state forest when incompatible recreation activities overlap. The rise in motorized recreation will place more pressure on the property's existing ATV trail system and will impact the sustainability of the landscape. Local economic needs, which are influenced by state forest recreation uses, must be equalized with the forest's ecological capabilities. Private enterprise also provides access to many recreational experiences in the area so that the state forest does not need to provide the entire gamut of facilities. Jackson County and the surrounding Clark and Eau Claire Counties have over 300 miles of trails on public and private land.

## **Summary**

The Black River State Forest plays a significant role in the central sands area of Wisconsin because it is part of a large concentration of public ownership, forested areas, and is less fragmented than the southern portion of the state which creates unique opportunities for landscape scale management. The property is exemplified by lack of roads and low human population densities that are similar to the wildest areas of northern Wisconsin. Rare species and natural communities also abound including some that are globally rare and some where the state forest offers the best opportunities for management in the entire state.

The Black River State Forest offers timber production, recreation, and landscape scale natural community restoration opportunities that are unmatched this far south in Wisconsin. The state forest is a property that is highly suitable for providing a range of forest products and recreation opportunities while enhancing natural communities and habitats. Opportunities exist to protect additional water and land resources, to enhance management efficiencies, to buffer against development, and enhance connectivity. Given all of these points, modification of the forest boundaries could enhance connectivity between public lands, reduce some of the challenges and limitations for management and recreation, and buffer against problems associated with the development adjacent to natural communities. Boundary adjustments opportunities exist to extend protection to key sites including the East Fork of the Black River and the Black River corridor.

As the largest block of state ownership in the area, the Black River State Forest has a special role to play in providing ecological, recreational, economic, and cultural benefits to the region. The property needs to balance natural community management, recreation needs, timber production, and social needs within the capabilities of the land.

**REFERENCES**

Avers, P.E., D.T. Cleland and W.H. McNab. 1994. National Hierarchical Framework of Ecological Units. Pp 48-61. In L.H. Foley, ed. *Silviculture: from the Cradle of Forestry to the Ecosystem Management*, Proceedings of the National Silviculture Workshop, 1993, November 1-4. USDA, Forest Service, Southeastern Forest Experiment Station (Gen. Tech. Rpt. SE-88). Asheville, NC.

Black River Area Chamber of Commerce. 2006. *Black River Country Wisconsin*. 45pp.

Curtis, J.T. 1959. *The Vegetation of Wisconsin*. University of Wisconsin Press, Madison, WI. 657pp.

Miles, Patrick D. Dec-18-2006. Forest inventory mapmaker web-application version 2.1. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. [Available only on internet: [www.ncrs2.fs.fed.us/4801/fiadb/index.htm](http://www.ncrs2.fs.fed.us/4801/fiadb/index.htm)]

Mississippi River Regional Planning Commission. 2001. *Mississippi River Regional Planning Commission Industry Cluster and Regional Trade Report*. US Dept. of Commerce-Economic Development Administration. Project N. 06-86-0430. Chap. 4.

Mississippi River Regional Planning Commission. 2005. *2005 Comprehensive Economic Development Strategy*.

Natural Heritage Inventory Program. 2005. *Biotic Inventory and Analysis of the Black River State Forest/Meadow Valley Landscape*. Bureau of Endangered Resources. Department of Natural Resources. PUBL ER-805 2005.

State of Wisconsin. 2005. *Jackson County Workforce Profile*. Department of Workforce Development. Office of Economic Advisors. OEA-10619-P

U.S. Census Bureau. 2001. "Census 2000 Redistricting Data Summary File" for Wisconsin on CD-ROM released March 2001.

Wisconsin Department of Natural Resources. 1968. *Surface Water Resources of Jackson County*. WDNR, Madison WI.

Wisconsin Department of Natural Resources. 1995. *Wisconsin's Biodiversity as a Management Issue: A Report to Department of Natural Resources Managers*. Wisconsin DNR, Madison. 240 pp.

Wisconsin Department of Natural Resources. 1999. *Ecological Landscapes of Wisconsin Handbook*. WDNR, Madison, WI.

Wisconsin Department of Natural Resources. 1999. *Wisconsin's Northern State Forest Assessments: Regional Ecology*. WDNR, Madison, WI.

Wisconsin Department of Natural Resources. 2000. Wisconsin Forests at the Millennium: An Assessment. Publication PUB-FR-161 2000. 125pp

Wisconsin Department of Natural Resources. 2000. Fisheries, Wildlife, and Habitat Management Plan for Wisconsin 2001 - 2007, June 2000 Version.

Wisconsin Department of Natural Resources. 2000. Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan and Environmental Impact Statement. Wisconsin Department of Natural Resources. Madison, WI. PUBL-SS-947-00. 74pp

Wisconsin Department of Natural Resources. 2001. Wisconsin's Northern State Forest Assessments: Recreational Supply and Demand. WDNR, Madison, WI.

Wisconsin Department of Natural Resources. 2003. Recreational Assessment of the Black River State Forest Region. WDNR, Madison, WI.

Wisconsin Department of Natural Resources. 2004. Black River State Forest. PUB-FR-154 2004

Wisconsin Department of Natural Resources. 2004. Ecological Landscapes of Wisconsin Handbook 1805.1. <http://www.dnr.state.wi.us/landscapes/>

Wisconsin Department of Natural Resources. 2006. Wisconsin Land Legacy Report: An inventory of places to meet Wisconsin's future conservation and recreation needs. 232 pp. plus appendices.

Wisconsin Department of Natural Resources. 2006. Wisconsin Statewide Comprehensive Outdoor Recreation Plan 2005-2010.

Wisconsin Department of Transportation. 2000. Profile of Visitors on the Bike Trails of Western Wisconsin.

Wisconsin Department of Transportation. 2006. Economic Impact of Expenditures by Travelers on Wisconsin Calendar Year 2005.

Wyenberg, Michelle. 2006. Jackson and Clark Counties Awarded \$32,800 Tourism Grant. Jackson County Chronicle. November 3, 2006.