

# **Rapid Ecological Assessment for the 2007 Addition to the Brule River State Forest, Douglas County, WI**

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**An Addendum to the 1999 Biotic Inventory Report Summarizing Recent Findings**

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**Wisconsin's Natural Heritage Inventory Program**  
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## Authors & Contributors

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## Purpose and Objectives

The Wisconsin Natural Heritage Inventory (NHI) Program completed a biotic inventory and assessment for the Brule River State Forest (BRSF) in the late 1990s. As with other biotic inventory projects, the goals were to identify and evaluate species, natural communities, and ecologically important sites. The final report provided baseline information for property master planning, highlighting ecological issues and opportunities to conserve biological diversity (Epstein et al. 1999).

The Brule River State Forest Master Plan, completed in 2003, outlines management goals and objectives for the property (Wisconsin DNR 2003). The plan delineates different portions of the property using broad land management classifications defined in Wisconsin Administrative Code. In October 2007, the state acquired a major addition to the property from Wausau Paper Company. As this area (referred to hereafter as “Brule Addition”) was included in the boundary for the “Lake Superior Clay Plain Native Community Management Area” described in the master plan, its management goals and objectives were pre-determined.

Since it was privately owned, the NHI program did not survey the Brule Addition during the biotic inventory efforts of the 1990s. Although known to be young aspen-dominated working forest, the area was recognized to be contextually important since it helped form a contiguous block of forest in combination with an otherwise narrow, linear portion of the adjacent BRSF. The Brule Addition comprises almost 6000 acres of the Lake Superior Clay Plain, an area formerly containing most of Wisconsin’s only large blocks of Boreal Forest prior to European Settlement. Boreal Forest now exists in many areas as fragmented blocks.

Although goals and objectives were already in place for the Brule Addition, the department needed a better understanding of its ecological characteristics and potential rare species habitats since existing fine-scaled data were limited to a few rare plant and animal records. The NHI Program conducted a very limited effort, mainly in 2008, to identify potential habitats for rare species, as well as high-quality examples of natural communities. An additional goal was to identify any future information needs and/or management considerations. This document is meant only as a brief addendum to the 1999 biotic inventory report (Epstein et al. 1999); please refer to that document for much more detailed ecological information.

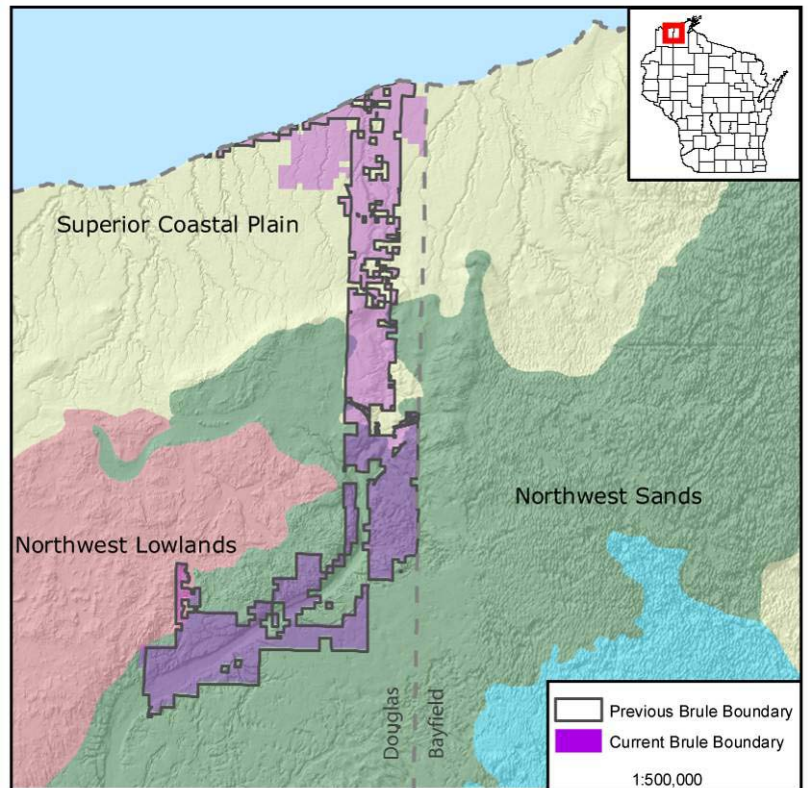
## Methods

The Wisconsin NHI program is part of the Wisconsin DNR’s Bureau of Endangered Resources and a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see [www.NatureServe.org](http://www.NatureServe.org) for more information), coordinates the network.

Natural heritage programs track certain *elements* of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other select natural features. The NHI Working List contains the elements tracked in Wisconsin; they include Endangered, Threatened and Special Concern plants and animals, as well as the natural community types recognized by NHI. The NHI Working List is periodically updated to reflect new information about the rarity and distribution of the state’s plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR Web site (<http://www.dnr.wi.gov/org/land/er/wlist/>).

NHI's biotic inventory projects typically start with a coarse-filter assessment, followed by targeted surveys for priority taxa, then data processing, analysis and report writing. Survey scope and intensity corresponds to the study area size and ecological complexity, as well as resource availability. Based on 2008 survey results, targeted species surveys were not conducted for the Brule Addition, except limited surveys for aquatic species in a few select areas.

Field surveys for the Brule Addition were conducted in 2008-2009 by Craig Anderson, NHI Botanist, and Andy Clark, NHI Conservation Biologist. Surveys were limited due to the size of the area, as well as the overall quality and condition of the natural communities present. Surveys were designed to provide a coarse-level assessment of the area while documenting any rare plants or high quality natural communities encountered. Targeted surveys for aquatic invertebrates are being conducted in 2009 for ecologically important streams lacking data. Data from these surveys will be available in early 2010 and could provide a baseline for future stream monitoring as the surrounding forest matures.



**Figure 1. Brule River State Forest, including the Brule Addition, and surrounding Ecological Landscapes (see [dnr.wi.gov/landscapes/](http://dnr.wi.gov/landscapes/))**

Surveys were guided using recent aerial photos, USGS 7.5' topographic maps, various GIS sources, information from past survey efforts, and the expertise of the biologists familiar with similar habitats in the region. Based on its location and ecological setting, key inventory considerations for the Brule Addition included identifying 1) high quality open and/or forested wetlands and 2) relatively intact examples of Boreal Forest. Private lands surrounding the property were not surveyed nor were areas within the original (pre-2007) BRSF boundary.

## General Background Information

The Brule Addition is approximately 5889 acres located on both the east and west sides of the previous boundary of the BRSF near the south shore of Lake Superior in Douglas County. The land was previously owned by the Wausau Paper Company and had been managed intensively for timber production. This acquisition should greatly expand future management opportunities. The location of the Brule Addition is especially favorable from an ecological standpoint, as the previous BRSF boundary extended only 0.25 to 1.5 miles away from the river in the northern half of the property.

## Ecological Context

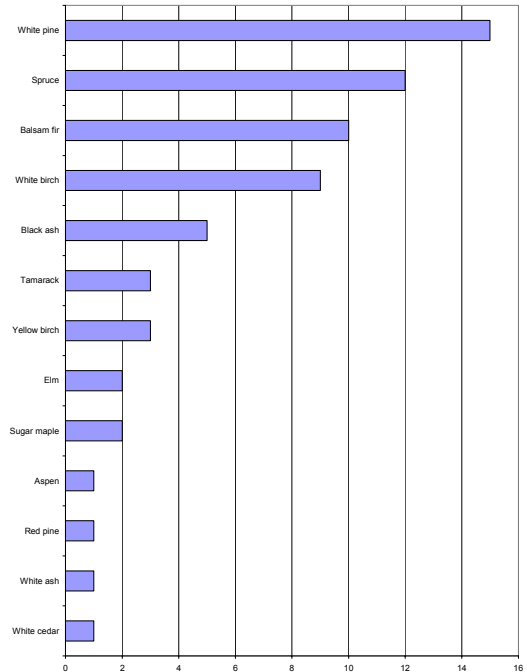
The Brule Addition is located entirely within the Superior Coastal Plains Ecological Landscape (Figure 1), an area strongly influenced by Lake Superior with many unique features, including habitat for numerous rare species (see Wisconsin DNR in prep). The Brule Addition and adjacent portions of the BRSF lie within the portion of the state known as the Lake Superior Clay Plain, characterized by heavy,

somewhat poorly drained red clay soils, narrow steep-sided stream valleys, and a cool-moist climate. This particular portion of the clay plain lies within Landtype Association 212Ya01 - Douglas Lake-Modified Till Plain from the National Hierarchy for Ecological Units (Avers et al. 1994, Bailey 1995).

The soils of the Brule Addition are mostly silty clay loams, clays, and clay loams with fairly level to gentle slopes. Other soils (ca. 6%) here are associated with the north-draining ravines that range from shallow to deeply incised.

Fisher and Smith creeks run the entire length of the addition, along with a few shorter unnamed streams. The deeply incised drainages have eroded the clay slopes in many areas. There are no lakes within the Brule Addition, although streams have been impounded by beavers, impacting flow and nearby wetlands.

Prior to European settlement, the Lake Superior Clay Plain supported Wisconsin's most extensive acreage of Boreal Forest. Historic records describe an abundance of conifers in this landscape including white pine, hemlock and spruce with a diverse mixture of other associates. Based on witness tree data collected during Public Land Surveys of the mid 1800s, the Brule Addition was likely dominated by white pine, spruce, balsam fir, and white birch with several other associates (Figure 2).



**Figure 2. Public Land Survey Witness Trees from the Brule Addition by species.**

As with most other portions of the Lake Superior Clay Plain, conifers are sparse in comparison to past conditions. Aspen is currently the dominant species over most of the Brule Addition, occurring mainly in small size classes (Table 1). Some portions of the addition have retained more conifers, some in larger size classes, but these areas are small and localized. Perhaps the largest, most intact area of Boreal Forest with a significant proportion of overstory conifers occurs near Smith Creek where 12-18" diameter white pine are found with white spruce, aspen, and balsam poplar.

Intact wetlands are limited to a few areas and include forested and unforested types. Non-forested wetlands include Alder Thicket and Northern Sedge Meadow, the latter sometimes impacted by beaver activity. The wetlands are typically surrounded by young aspen. Hardwood Swamps are found in several places; these have been logged in the past and are now dominated by 4-8" black ash.

**Table 1. Wisconsin DNR Forest Reconnaissance Data for the 2007 Brule Additon.**

Primary Forest Type	Diameter Class				Total
	0-5"	5-11"	9-15"	11-15"	
Aspen	2259	2466		311	5036
White Birch		35			35
Lowland Brush (including Alder)					93
White Pine			17		17
Swamp Hardwoods		599			599
White Spruce	71		12		83
Upland Brush					37
Total	2330	3100	29	311	5899

## Rare Species

No new rare species were documented as part of the 2008 assessment. Four NHI Working List elements (two plants, one animal, and one bird rookery) were documented during previous efforts. Survey results from 2009 aquatic invertebrate sampling will be available in early 2010 and may identify additional rare species. The following short summaries describe elements documented to-date for the Brule Addition.

### **Arrow-leaved Sweet-coltsfoot (*Petasites sagittatus*)**

Arrow-leaved Sweet-coltsfoot (*Petasites sagittatus*), a State Threatened plant, is found in cold marshes and swamp openings, often forming large clones. This species hybridizes with *Petasites palmatus*, a more common species also found in moist to wet places. Blooming occurs throughout May, and fruiting occurs throughout June. The optimal identification period for this species is late May through late August. To-date this plant is known from just one location in the Brule Addition, a small roadside depression documented during the BRSF biotic inventory and later relocated in 2008.

### **Bird Rookery**

A bird rookery is an area where more than one pair of birds nest in a group. The number of nests can vary from just a few to hundreds and can include one to many different bird species. Sites can include rare and non-rare species. The breeding time will vary based on the species present at the site. Rookeries are typically located in more remote locations including forests, shrub communities, wetlands adjacent to water (lakes, rivers or streams), and islands. These sites are important as large numbers of breeding individuals can be found in a single place. A Great Blue Heron rookery was found on the Brule Addition by WDNR Forestry during forest reconnaissance surveys; the rookery occurs near a small creek in an area flooded by beaver.

### **Gray Wolf**

Gray wolf (*Canis lupis*), or timber wolf, is the largest wild member of the dog family with males averaging about 10% larger than females. Gray wolves have a massive head and neck important in killing prey, which results in larger fore feet than hind feet. Body weight, height, and foot prints are important distinguishing characteristics when comparing gray wolves to other wild and domestic canids. Wolves are social animals, living in a family group (or pack). Pack sizes in Wisconsin average 2-6 individuals with a few packs as large as 8-10 animals. A wolf pack's territory may cover 20-120 square miles. One pack territory, the "Poplar River" pack, encompasses much of the Brule Addition. Four additional packs occur within 10 miles of the Poplar River pack (see [dnr.wi.gov/org/land/er/mammals/wolf/](http://dnr.wi.gov/org/land/er/mammals/wolf/) for more information).

### **Vasey Rush (*Juncus vaseyi*)**

Vasey Rush (*Juncus vaseyi*), a State Special Concern plant, is found in moist old fields, ditches, Northern Sedge Meadows, and moist prairies. It has been most commonly found on the Lake Superior Clay Plain. Blooming occurs from early July through late August, and fruiting occurs from early August through early September. The optimal identification period is early July through late August. This species has been documented just outside of the Brule Addition on the BRSF proper, and there could be additional locations within the addition itself.

## Natural Communities

No natural communities of sufficient quality and condition to be mapped as "Element Occurrences" were located for the Brule Addition. The forested and non-forested communities were too disturbed, too small, and/or contextually compromised (impacted by the surrounding landscape) to warrant inclusion in the NHI database. With time, however, the forest in this area will mature and conditions should improve, perhaps with active restoration in some areas. Below are general descriptions for the natural community types found to-date in this part of the BRSF.

### **Alder Thicket**

These wetlands are dominated by thick growths of tall shrubs, especially speckled alder (*Alnus incana*). Among the common herbaceous species are Canada bluejoint grass (*Calamagrostis canadensis*), orange jewelweed (*Impatiens capensis*), several asters (*Aster lanceolatus*, *A. puniceus*, and *A. umbellatus*), boneset (*Eupatorium perfoliatum*), rough bedstraw (*Galium asprellum*), marsh fern (*Thelypteris palustris*), arrow-leaved tearthumb (*Polygonum sagittatum*), and sensitive fern (*Onoclea sensibilis*). This type is common and widespread in northern and central Wisconsin, but also occurs in the southern part of the state.

### **Boreal Forest**

In Wisconsin, mature stands of this forest community are dominated by white spruce (*Picea glauca*) and balsam-fir (*Abies balsamea*), often mixed with white birch (*Betula papyrifera*), white cedar (*Thuja occidentalis*), white pine (*Pinus strobus*), balsam-poplar (*Populus balsamifera*) and quaking aspen (*Populus tremuloides*). Mountain-ash (*Sorbus* spp.) may also be present. Common understory herbs are large-leaved aster (*Aster macrophyllus*), bluebead lily (*Clintonia borealis*), Canada mayflower (*Maianthemum canadense*), wild sarsaparilla (*Aralia nudicaulis*), and bunchberry (*Cornus canadensis*). Most Wisconsin stands are associated with the Great Lakes, especially the clay plain of Lake Superior, and the eastern side of the northern Door Peninsula on Lake Michigan. Of potential interest from the perspectives of vegetation classification and restoration, white pine had the highest importance value of any tree in the Lake Superior region, as recorded during the original land survey of the mid-1800's.

### **Hardwood Swamp**

These are northern deciduous forested wetlands that occur along lakes or streams, or in insular basins in poorly drained morainal landscapes. The dominant tree species is black ash (*Fraxinus nigra*), but in some stands red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*), and (formerly) American elm (*Ulmus americana*) are also important. The tall shrub speckled alder (*Alnus incana*) may be locally common. The herbaceous flora is often diverse and may include many of the same species found in Alder Thickets. Typical species are marsh-marigold (*Caltha palustris*), swamp raspberry (*Rubus pubescens*), skullcap (*Scutellaria galericulata*), orange jewelweed (*Impatiens capensis*), and many sedges (*Carex* spp.). Soils may be mucks or mucky sands. The Hardwood Swamps found on the Brule Addition had been previously logged and were dominated by small diameter black ash.

### **Northern Sedge Meadow**

This open wetland community is dominated by sedges and grasses. There are several common subtypes: Tussock meadows, dominated by tussock sedge (*Carex stricta*) and Canada bluejoint grass (*Calamagrostis canadensis*); Broad-leaved sedge meadows, dominated by the robust sedges (*Carex lacustris* and/or *C. utriculata*); and Wire-leaved sedge meadows, dominated by such species as woolly sedge (*Carex lasiocarpa*) and few-seeded sedge (*C. oligosperma*). Frequent associates include marsh bluegrass (*Poa palustris*), manna grasses (*Glyceria* spp.), paniced aster (*Aster lanceolatus*), joy-pye-weed (*Eupatorium maculatum*), and the bulrushes (*Scirpus atrovirens* and *S. cyperinus*). Some examples of this type at the Brule Addition were impacted by beaver.

## Management Considerations and Opportunities to Conserve Biodiversity

The BRSF master plan highlighted the importance of this area through its inclusion in the Lake Superior Clay Plain Native Community Management Area (Wisconsin DNR 2003). The Brule Addition significantly expands the BRSF boundary, as well as the opportunities for management and protection of important natural resources. Further, the implementation phase of the Wisconsin Wildlife Action Plan designated the area comprising the Brule Addition a “Conservation Opportunity Area” because of its proximity to the BRSF and its opportunities for Boreal Forest Management (see [dnr.wi.gov/org/land/er/wwap/](http://dnr.wi.gov/org/land/er/wwap/) for more information).

Boreal Forest restoration and management is the most ecologically important opportunity for this area. This natural community was always geographically restricted in the state, it is currently rare, and has limited suitable locations in Wisconsin. The BRSF is Wisconsin’s only state forest containing Boreal Forest, and the Native Community Management Area will allow Boreal Forest restoration to occur at a scale not often possible.

The forests of the Brule Addition have been managed for timber production and are quite young. In many cases, the conifer component is sparse or lacking, yet there are some white pine and spruce patches that can provide a seed source for future Boreal Forest development over time. Perhaps the most contiguous example of mature Boreal Forest occurs near Smith Creek, where 12-18” diameter white pine are found, along with white spruce, balsam poplar, and aspen. This area is primarily restricted to the slopes of the creek, but the conifers extend farther in some areas. The master plan calls for some stands to support large trees of longer lived species with other structural features associated with older forest; the area near Smith Creek may be the only portion of the Brule Addition that offers this opportunity. For other portions of the addition, there may be opportunities to increase the conifer component through management; this has been successful for parts of the BRSF and is called for in the master plan.

The Wisconsin Wildlife Action Plan highlights “Ecological Priorities” for each Ecological Landscape, including combinations of natural communities and their associated vertebrate animal Species of Greatest Conservation Need. Boreal Forests in the Superior Coastal Plain Ecological Landscape are an Ecological Priority, along with the following Species of Greatest Conservation Need:

- American Marten
- Black-backed Woodpecker
- Canada Warbler
- Eastern Red Bat
- Four-toed Salamander
- Gray Wolf
- Hoary Bat
- Least Flycatcher
- Moose
- Northern Flying Squirrel
- Olive-sided Flycatcher
- Silver-haired Bat
- Veery
- Water Shrew
- Woodland Jumping Mouse

Of these, only the gray wolf has been documented for the Brule Addition. The current condition of the forest does not provide necessary habitat conditions for some of these species (e.g., American marten).

The Brule Addition's natural communities should improve with time. For example, the streams and other aquatic features will be further buffered to protect and stabilize the banks. Allowing the Hardwood Swamps to mature will provide habitat for additional species and protect the hydrology. The new expanded acreage of the Native Community Management Area should ensure protection of forested and non-forested habitats from the fragmentation that has become characteristic of many areas of the clay plain.

## Future Needs

This project was designed to provide a rapid assessment of biodiversity values for the Brule Addition and is an addendum to the information in the biotic inventory report (Epstein et al. 1999). The project relied, in large part, on one field season of survey work. Although the report should be considered adequate for planning purposes, additional efforts could help to inform adaptive management. As with all of the state lands, monitoring and control of invasive species, wherever possible, is needed to prevent major infestations.

## Glossary

**Ecological Landscape** - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

**Ecological Priority** – the natural communities (habitats) in each Ecological Landscape that are most important to the Species of Greatest Conservation Need, as identified in the Wisconsin Wildlife Action Plan (WDNR 2006). Three sources of data were used to derive this information: 1) the probability that a species will occur in a given landscape, 2) the degree to which a species is associated with a particular natural community, and 3) the degree to which there are opportunities for sustaining a given natural community in any given Ecological Landscape. See [dnr.wi.gov/org/land/er/wwap/explore/tool](http://dnr.wi.gov/org/land/er/wwap/explore/tool) for more information.

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

**Landtype Association (LTA)** - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

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

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

**natural community occurrence** - a place on the landscape that supports an example of a natural community that has been surveyed and evaluated by ecologists using standard NHI methodology and meets minimum criteria for condition, context, and size.

**“rare” natural community** - in this context the modifier can refer either to the relative scarcity of the community type itself, to the scarcity of a particular developmental stage, or to a specific attribute of the community occurrence.

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

**witness tree** – trees near section, quarter, and meander quarters that were marked and recorded during the original public land surveys (during the 1800s in Wisconsin) to allow for these points to be relocated.

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