



## Rapid Ecological Assessment for Sugar River Planning Group

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**A Rapid Ecological Assessment Focusing on Rare Plants, Selected Rare Animals, and High-quality Natural Communities**

**Properties included in this report are:**

<b>Dane County</b>	<b>Green County</b>	<b>Rock County</b>
Anthony Branch Fishery Area/SBPA	Albany Wildlife Area	Avon Bottoms Wildlife Area
Badfish Creek Wildlife Area	Albany Extensive Wildlife Habitat Area	Avon Bottoms State Natural Area
Brooklyn Wildlife Area	Avon Bottoms Wildlife Area	Evansville Wildlife Area
Hook Lake Bog State Natural Area	Brooklyn Wildlife Area	Footville Public Hunting Grounds
Hook Lake-Grass Lake Wildlife Area	Liberty Creek Wildlife Area	Swenson Wet Prairie State Natural Area
State Ice Age Trail Area (Montrose Segment)		

Wisconsin's Natural Heritage Inventory Program  
 Bureau of Natural Heritage Conservation  
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**Cover Photo:** Hook Lake Bog State Natural Area, by Rich Staffen.



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## Sugar River Planning Group At a Glance

### Exceptional Characteristics of the Study Area

- **Riparian Corridors, Aquatic and Wetland Habitats.** The Sugar River extending from just west of Brooklyn Wildlife Area down to the Illinois border holds statewide importance as a riparian corridor that provides diverse wetland and aquatic communities. This and other riparian corridors in the property group offer important habitat for a number of species, including bats, herptiles, aquatic invertebrates, and fish. Virtually all of the SRPG properties have a river or stream flowing through them. As a result, wetlands and aquatic habitats figure prominently in the cover types of this property group.
- **Prairie and Oak Savanna Conservation.** Less than 0.1% of original prairie remains in Wisconsin; remnant upland prairie is found at three sites on the SRPG, while remnant lowland prairie is found at six sites. Opportunities exist on SRPG properties to restore three types of oak savanna (Oak Openings, Oak Woodlands, and Oak Barrens), all of which are globally rare communities. Such actions would improve habitat for many plants and animals that are specialists of grassland, savanna, woodland, and barrens communities.
- **Bird Conservation.** The SRPG provides important opportunities for conservation of grassland and forest birds. Grassland birds have declined more steeply than any other group of birds in North America and the Midwest. Many of the rare forest birds found on SRPG properties have had significant population declines in Wisconsin and throughout their range. Protected large blocks of forest interior habitat are rare in south central Wisconsin, yet forests at Albany, Brooklyn and Avon Bottoms Wildlife Areas attract an impressive assemblage of rare forest birds.

### Site Specific Opportunities for Biodiversity Conservation

Ten ecologically important sites, or “Primary Sites,” were identified at Sugar River Watershed Planning Group. “Primary Sites” are typically delineated because they encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan.

- **Albany Sand Prairie and Oak Savanna.** A mosaic of state-imperiled and globally rare ecosystems are featured at this Primary Site, including Dry-mesic Prairie, Sand Prairie, Oak Barrens, Oak Opening, and Oak Woodland. Two rare plants are found in the prairie and Oak Woodland, along with numerous rare and declining grassland/shrubland birds. The sandy soils, proximity to water, abundant food resources, and variable cover types also make this site important for herptiles.
- **Anthony Branch Sedge Meadow and Fen Mounds.** Inclusions of Fen Mounds and Wet Prairie enhance the floral diversity of this 70-acre sedge meadow complex, providing habitat for rare or declining marsh birds.
- **Avon Bottoms Floodplain Forest.** Avon Bottoms Floodplain Forest Primary Site features an extensive area of lowland hardwood forest in the floodplain of the meandering Sugar River, coinciding with the Sugar River Conservation Opportunity Area (WDNR 2006a). This site provides vital habitat for bats, aquatic invertebrates, fishes, and birds (both breeding and migratory), along with a number of rare plants that are at the northern edge of their range. Avon Bottoms State Natural Area occurs within this Primary Site.

## Sugar River Planning Group At a Glance

### Site Specific Opportunities for Biodiversity Conservation (continued)

- **Badfish Creek Wet Prairie.** Based on analysis of Wet Prairie records in the NHI database, this site ranks among the top 15 statewide in terms of its size and intact hydrology. The floral diversity and significance of the site is further enhanced by a Southern Sedge Meadow and small complex of springs and associated spring runs.
- **Brooklyn Oak Savanna and Dry Prairie.** The site consists of a 10-acre prairie and a 50-acre block of Oak Woodland. Soil diversity in the prairie translates into diverse prairie types, from sandy to dry to dry-mesic. The Oak Woodland represents the largest and best-quality patch of oak savanna in the SRPG, and supports rare birds.
- **Brooklyn Wet Prairie.** The best remaining Wet Prairie at Brooklyn Wildlife Area is found at this Primary Site, along with a diverse ground flora of grasses, sedges, and forbs. Rare birds, turtles, and insects are known to use this important habitat.
- **Evansville Wet Prairie.** This site harbors a good-quality wetland refugium within a larger complex of degraded wetland at the north end of the wildlife area. Dominant communities here are Southern Sedge Meadow, Wet Prairie, Calcareous Fen and Springs/Spring Runs. Wet Prairie and Calcareous Fen are two of the state's rarest community types.
- **Hook Lake Bog State Natural Area.** The wetlands at this site rank among the highest quality in Dane County. The lake, located in a glacial pocket, is nearly closed in with vegetation, with only 50-70 acres of open water remaining. The rest is covered by Bog Relict, Tamarack (Rich) Swamp and Emergent Marsh. The Bog Relict harbors plant species that are rare in Dane County including the insectivorous round-leaved sundew, seven-angled pipewort, and bogbean. A diverse assemblage of breeding birds and herptiles call this site home.
- **Liberty Creek Sedge Meadow.** This Primary Site harbors good-quality Southern Sedge Meadow with small inclusions of Wet-mesic Prairie, providing a refugium for two rare natural community types and important habitat for rare species.
- **Swenson Wet Prairie and Woods.** The highlights of this site are an excellent example of a Wet-mesic Prairie and Southern Sedge Meadow with low river bottom savanna (Oak Opening) and scrub interspersed with shallow, abandoned river channels. Rare birds of grassland and savanna are known here, along with several rare plant species.

# Introduction

## Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the Sugar River Planning Group (SRPG; Map A). The regional ecological context for the SRPG is provided to assist in developing the Regional and Property Analysis that is part of the master plan. Properties included in this assessment are as follows:

- Albany Wildlife Area
- Albany Extensive Wildlife Habitat Area
- Anthony Branch Fishery Area/SBPA
- Avon Bottoms State Natural Area
- Avon Bottoms Wildlife Area
- Badfish Creek Wildlife Area
- Brooklyn Wildlife Area
- Evansville Wildlife Area
- Footville Public Hunting Grounds
- Hook Lake Bog State Natural Area
- Hook Lake-Grass Lake Wildlife Area
- Liberty Creek Wildlife Area
- State Ice Age Trail Area -- Montrose Segment
- Swenson Wet Prairie State Natural Area

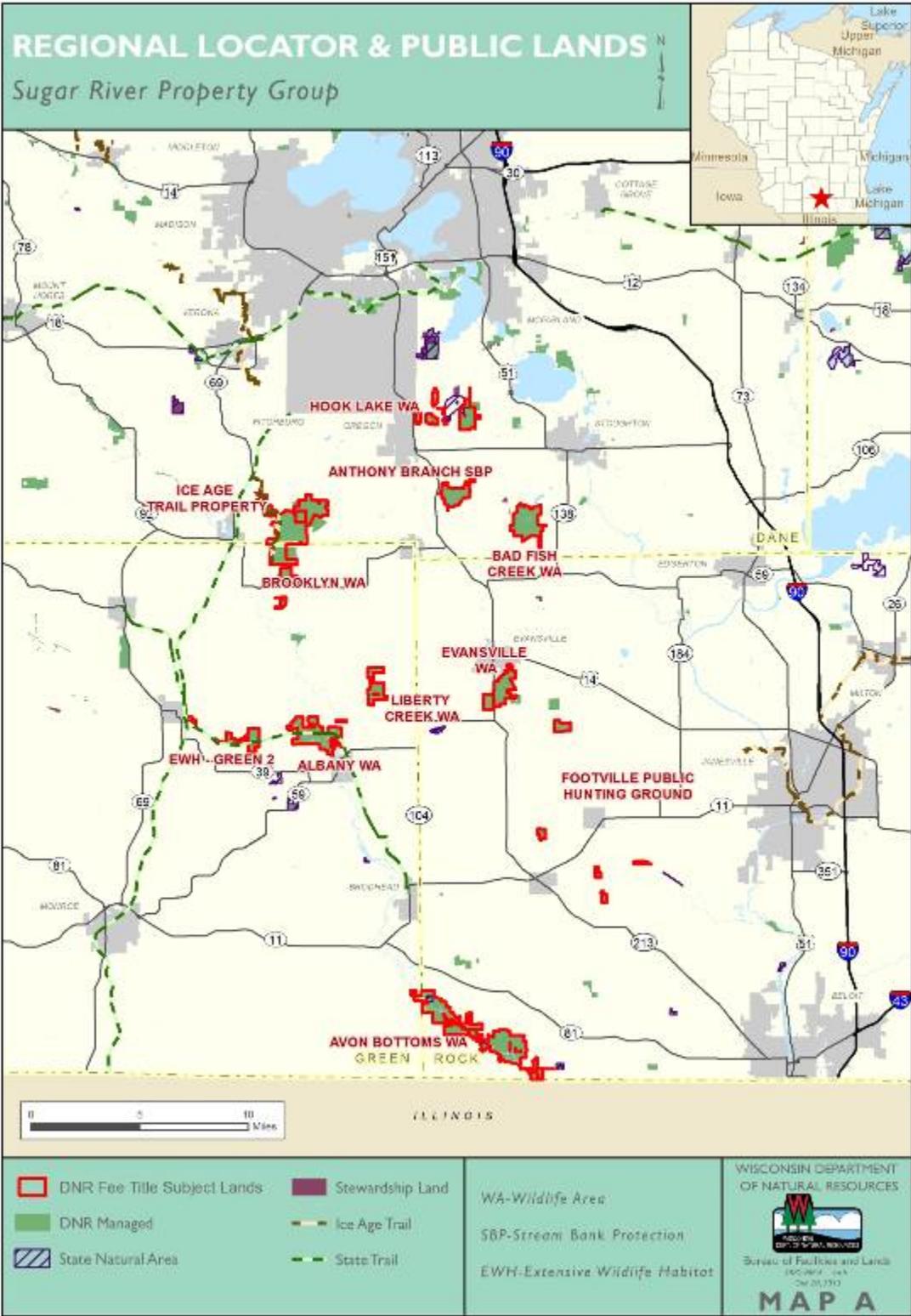
The primary objectives of this project were to collect biological inventory information relevant to the development of a master plan for the SRPG and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of documented or potential habitat for rare species and identifying natural community management opportunities.

Survey efforts for the SRPG were limited to a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning although inventory efforts were reduced compared to similar projects conducted on much larger properties such as state forests. There will undoubtedly be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work. Inventory data collected through this effort is a starting point for adaptive management of the SRPG and should be revisited as opportunity allows and updated when new information becomes available.

## Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR’s Bureau of Natural Heritage Conservation 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 selected natural features. The NHI Working List (WDNR 2011) 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 website (*Wisconsin Natural Heritage Working List*).



The Wisconsin NHI program uses standard methods for biotic inventory to support master planning (Appendix A). Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the SRPG were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureaus of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but include some surveys for rare plants and animals and 2) Rock County Natural Area Survey (Baller 2001); and 3) taxa-specific surveys.

The most recent taxa-specific field surveys for the study area were conducted during 2013. Surveys were limited in scope and focused on documenting high quality natural communities, rare plants, breeding birds (terrestrial, marsh, forest raptors), aquatic and terrestrial invertebrates, small mammals, and herptiles. The collective results from all of these surveys were used, along with other information, to identify ecologically important areas (Primary Sites) of the SRPG.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of properties within the SRPG, key inventory considerations included the identification of riparian forests, prairie remnants, oak savanna restoration opportunities, high-quality open wetlands, and the location of habitats that had the potential to support rare species. Private lands, including easements, surrounding the SRPG were not surveyed.

Scientific names for all species mentioned in the text are included in a list on page 57.

## Background on Past Efforts

Various large-scale research and planning efforts have identified the SRPG as being ecologically significant. The following are examples of such projects and the significant features identified.

### Important Bird Area

Avon Bottoms was identified as an Important Bird Area (IBA; WDNR 2007). Important Bird Areas are critical for the conservation and management of Wisconsin's birds. This IBA includes **Avon Bottoms Wildlife Area (WA)** and **State Natural Area (SNA)** and **Swenson Wet Prairie SNA**. Avon Bottoms IBA provides habitat for numerous Floodplain Forest species, including yellow-billed cuckoo (*Coccyzus americanus*) and wood thrush (*Hylocichla mustelina*) and three state-listed species. Grassland birds such as grasshopper sparrow (*A. savannarum*), field sparrow (*Spizella pusilla*), and Eastern meadowlark (*Sturnella magna*) also find important habitat here.

### Grassland Bird Priority Landscape

**Albany WA** falls within the larger Muralt/Monroe Grasslands, which is ranked as the highest priority grassland bird landscape in the "Southeastern Ridges and Lowlands" division (Sample and Mossman 1997). This holds particular significance because of the intensive agriculture and urbanization of this region of the state. The greatest potential for habitat protection and enhancement lies in State Wildlife Areas and private lands with wet meadows, pastures, and land enrolled in the Conservation Reserve Program (CRP). A state-threatened bird nests here, along with numerous other grassland bird species. **Brooklyn WA** is identified as a "key site" for conservation of "grassland-shrub" habitat in the Wisconsin

All-Bird Plan (Wisconsin Bird Conservation Initiative 2013); examples of shrubland birds that nest here include brown thrasher (*Toxostoma rufum*) and field sparrow (*Spizella pusilla*).

### **Wisconsin Wildlife Action Plan: Conservation Opportunity Area**

Conservation Opportunity Areas (COA) are places in Wisconsin containing ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective. The Wisconsin Wildlife Action Plan (WAP; WDNR 2006a) identifies three Conservation Opportunity Areas (COA) within which SRPG sites occur (see Appendix B for a map):

- **Albany WA** lies within the Muralt Bluff COA, which is identified as having statewide significance for extensive grassland communities, including Dry Prairie, Dry-mesic Prairie, and Surrogate Grasslands; opportunities for Oak Opening restoration are also recognized as significant here.
- **Avon Bottoms WA** occurs within the Avon Bottoms COA, which harbors Floodplain Forest of statewide significance.
- The northern terminus of the Sugar River COA is approximately 3/4 mile west of Brooklyn WA. From here, the COA encompasses approximately 50 river miles, passing through **Albany WA** and **Avon Bottoms WA**. This COA harbors diverse aquatic and wetland communities of statewide significance.

### **Legacy Places**

The Land Legacy Report (WDNR 2006b) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. **Hook Lake-Grass Lake WA, Badfish Creek WA** and **Anthony Branch Fishery Area (FA)** and **Streambank Protection Area (SBPA)** fall within the larger Dunn-Rutland Savanna and Potholes Land Legacy Site, which is recognized for its rolling topography with scattered woodlots, wetlands, pothole lakes, small creeks, remnant grasslands, and oak savannas. Within the Sugar River Legacy Place, a protected network of corridors in the valley could link **Brooklyn, Evansville, Liberty Creek, and Avon Bottoms WAs** with recreational trails in the area.

### **The Nature Conservancy's Prairie-Forest Border Conservation Plan**

**Avon Bottoms WA/SNA** and **Albany WA** lie within the larger "Pecatonica and Sugar Rivers" target site as designated by The Nature Conservancy in their 2001 conservation plan for the Prairie-Forest Border Ecoregion (The Nature Conservancy 2001). The Sugar River is recognized for its extensive floodplain forest and upland woods, unique sand communities, and migratory bird stopover importance.

### **Wetland Gem Designation**

The "Sugar River Floodplain Forest" Wetland Gem includes **Avon Bottoms WA/SNA**. The site harbors a complex mosaic of riverine wetland habitat types, including oxbows, sloughs, and potholes, that support diverse wetland plants and animals (Wisconsin Wetlands Association 2009).

### **Joint Venture**

The Upper Mississippi River and Great Lakes Region Joint Venture (Potter et al. 2007) was approved in 1991 under the North American Waterfowl Management Plan. The Joint Venture calls for improving or permanently protecting habitat on public and private lands for waterfowl and other wildlife. **Anthony Branch FA, Evansville WA, and Badfish Creek WA** are located within Priority 1 Joint Venture townships, as described in Wisconsin's Joint Venture implementation plan (WDNR 1992).

# Special Management Designations

## Outstanding/Exceptional Resource Waters

Outstanding and Exceptional Resource Waters (ORW and ERW) are officially designated (Wisconsin Administrative Code NR 102.11) waters that provide outstanding recreational opportunities, support valuable fish and wildlife habitat, have good water quality, are not significantly impacted by human activities, and, thereby recognized as being the highest quality waters in the state. While ORWs typically do not have any point sources discharging pollutants directly to the water, ERWs have existing point sources at the time of designation. Six SRPG sites have ERWs that flow through them; most of these also are Class II or III trout streams (Table 1).

**Table 1.** Exceptional Resource Waters (ERWs) that flow through SRPG sites.

Property Name	Waterbody Name	ORW/ERW	Trout Stream
Anthony Branch WA	Anthony Branch (aka Rutland Branch)	ERW	Class II
Brooklyn WA	Story Creek (aka Tipperary Creek)	ERW	Class II
Albany WA/EWHA	Sugar River	ERW	no
Liberty Creek WA	Liberty Creek	ERW	Class III
Evansville WA (W unit)	Allen Creek	ERW	Class II
Footville PHG	Bass Creek	ERW	no

## Wisconsin's Impaired Waters (303d)

Section 303(d) of the federal Clean Water Act requires states to develop a list of impaired waters ("303(d) list"). The identification and listing of waters as impaired is one step in a continual process of waterbody classification, assessment, and management, the ultimate goal of which is to protect, restore, and maintain the full potential of each waterbody to the maximum extent possible. Badfish Creek (which runs through Badfish Creek WA) is rated as an impaired water due to contaminated fish tissues and sediments (including PCBs).

## Forest Certification

Forest Certification is established on all DNR-managed lands, including state parks, wildlife and fishery areas, and natural areas. Certified forests are recognized by the Forest Stewardship Council and the Sustainable Forestry Initiative as being responsibly managed (WDNR 2009a). This certification emphasizes the state's commitment to responsibly managing and conserving its lands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

## State Ice Age Trail Areas

The primary purpose of State Ice Age Trail Areas (SIATA) is to permanently protect segments of the **Ice Age National Scenic Trail** and the natural resources along it for present and future public use and enjoyment. The Ice Age National Scenic Trail is one of America's eleven National Scenic Trails and was authorized by the U.S. Congress in 1980. It is predominantly an off-road hiking trail. The route generally follows the edges of the last continental glacier in North America, a time known as the Wisconsin glaciation, and runs almost 1,200 miles. Besides providing an excellent opportunity for hiking, the trail preserves some of the finest features of Wisconsin's glacial landscape as well as other scenic and natural resources.

## State Natural Areas

State Natural Areas (SNA) are places on the landscape that protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. Designation confers a significant level of land protection through state statutes, administrative rules, and guidelines. Three SNAs occur on the SRPG:

- **Avon Bottoms** is a 168-acre State Natural Area within Avon Bottoms WA.
- **Swenson Wet Prairie** is a 40-acre State Natural Area, also within Avon Bottoms WA.
- **Hook Lake Bog** is a 380-acre State Natural Area within Hook Lake WA.

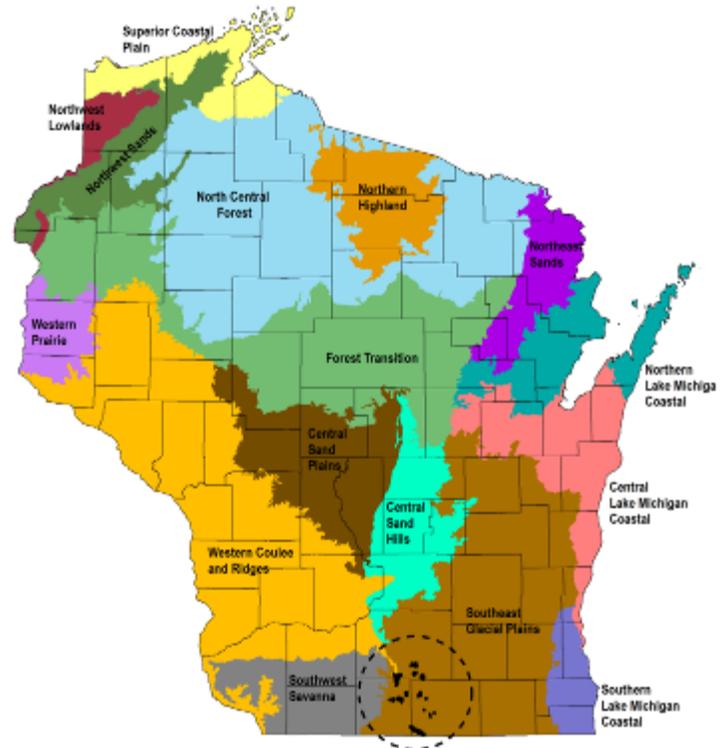
## Regional Ecological Context

*Text largely reproduced from Ecological Landscapes of Wisconsin (WDNR In prep. a).*

### Overview of Ecological Landscapes

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers.

The SRPG falls almost completely within the **Southeast Glacial Plains Ecological Landscape**, although the SIATA (Montrose Segment) lies within the **Western Coulee and Ridges Ecological Landscape**. See Figure 1 for the study area in relation to Ecological Landscapes. *For more details on these Ecological Landscapes as they pertain to the SRGP, see the Regional Property Analysis for the Sugar River Planning Group.*



**Figure 1.** Ecological Landscapes of Wisconsin and the study area.

### Overview of Regional Natural Resources

Opportunities for sustaining natural communities in Ecological Landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007) and later focused on wildlife Species of Greatest Conservation Need and their habitat in the Wisconsin Wildlife Action Plan (WDNR 2006a). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the Ecological Landscape while maintaining important components of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within each Ecological Landscape.

There are "major" and "important" management opportunities for 34 natural communities in the **Southeast Glacial Plains Ecological Landscape**, 20 of which occur within the SRPG (Table 2). In the

**Western Coulee and Ridges Ecological Landscape**, there are "major" and "important" management opportunities for 44 natural communities, three of which occur on the SIATA – Montrose Segment (the only study area property within that ecological landscape).

There are also 21 vertebrate SGCN significantly associated with the **Southeast Glacial Plains Ecological Landscape** and 16 associated with the **Western Coulee and Ridges Ecological Landscape** (see Appendix E). This means that these species are (and/or historically were) significantly associated with this Ecological Landscape, and that restoration of natural communities with which these species are associated would significantly improve their conditions.

*For more details on regional natural community management opportunities and rare species as they pertain to the SRGP, see the Regional and Property Analysis for the Sugar River Planning Group.*

## Description of the Study Area

### Location and Size

The Sugar River Planning Group is located in Dane, Green and Rock Counties, and is made up of scattered properties totaling 12,849 acres. All acreages are based on fee simple ownership from DNR Facilities and Lands GIS records as of September 2013; acreage may not include easements, leases and some permanent water bodies.

### Physical Environment

*A brief summary of the geology, soils and hydrology of the SRPG is provided here. For more details, see the Regional and Property Analysis for the SRPG.*

The majority of the SRPG, including Brooklyn WA, SIATA (Montrose Segment), Albany WA, Liberty Creek WA, Evansville Wildlife Area, Footville Public Hunting Grounds (PHG), and Avon Bottoms WA, lies within a landscape that was glaciated long before the Wisconsin Glaciation. This longer span of time post-glaciation has allowed erosional forces to create a more rolling to hilly bedrock-influenced topography. The Sugar River is considered by geologists to be a glacial spillway, supported by the presence of outwash material at high elevation along the sides of the river valley; Avon Bottoms WA, Albany WA and EWHA, Liberty Creek WA, and Brooklyn WA lie within this spillway. Evansville WA and parts of Footville PHG lie within a nearly level outwash plain. The SRPG is primarily underlain by Cambrian sandstones, along with occasional strata of dolomite, limestone and shale.

A number of SRPG sites (Albany WA, Albany EWHA, Avon Bottoms WA, Brooklyn WA, Liberty Creek WA) are strongly associated with the lowland/alluvial areas of the Sugar River and its tributaries, and are characterized by floodplains, terraces, and lake plains with predominantly loams and silts over gravelly sandy outwash and silty alluvium. Upland soils here are silt loams, and may be shallow over sandstone or limestone bedrock on steeper slopes. In the northern part of the property group (Hook Lake/Grass Lake WA, Anthony Branch FA, Badfish Creek WA), soils are predominantly wet or poorly drained, with Hook and Grass Lakes underlain by muck and marsh soils; upland soils here are comprised of more well-drained silt loams. Organic muck soils are typical at Evansville WA, where groundwater is at or near the surface throughout the year. At Footville PHG, soils are mostly loams and silt loams, although muck comprises a large part of the central unit.

Water bodies are associated with each of the SRPG properties (Table 2), belying the importance of aquatic and wetland habitats in the early designation of these sites as fishery and wildlife areas.

**Table 2.** Water bodies of the Sugar River Planning Group

Property Name	Waterbody Name	WBIC	ORW/ERW	Trout Stream
Anthony Branch WA	Anthony Branch (aka Rutland Branch)	8010000	ERW	Class II
Badfish Creek WA	Badfish Creek	0799500	no	no
Brooklyn WA	Story Creek (aka Tipperary Creek)	0885400	ERW	Class II
Albany WA/EWHA	Little Sugar River	0880100	no	no
Albany WA/EWHA	Sugar River	0875300	ERW	no
Liberty Creek WA	Liberty Creek	0883800	ERW	Class III
Evansville WA (E unit)	Marsh Creek	0797700	no	no
Evansville WA (W unit)	Allen Creek	0883700	ERW	Class II
Footville PHG	Bass Creek	0795800	ERW	no
Avon Bottoms	Sugar River	0875300	no	no
Avon Bottoms	Taylor Creek	0876300	no	no

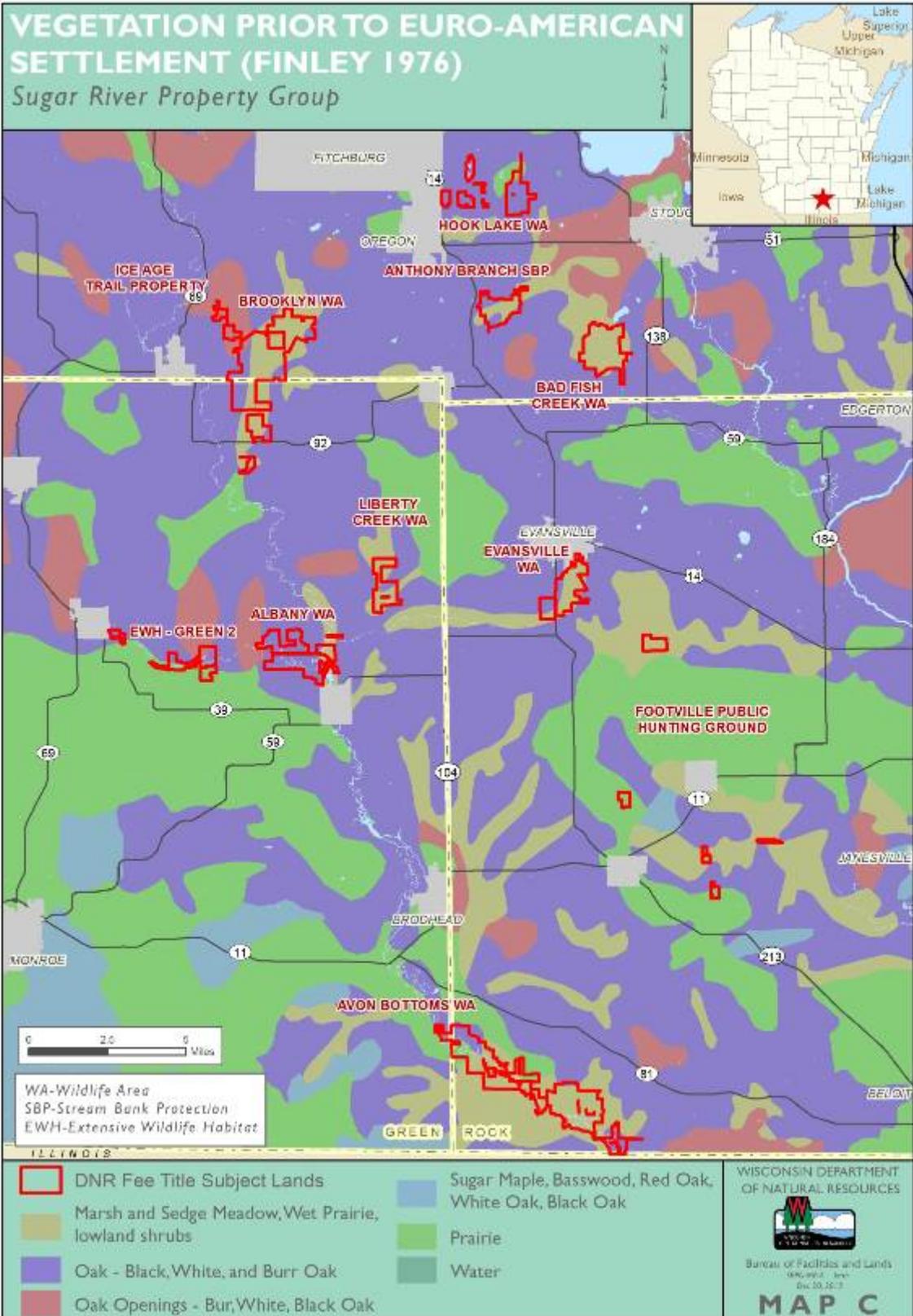
## Vegetation

### Historical Vegetation

There is value in determining the nature of a site's vegetation before European settlement as well as its historical alterations and uses. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Maintaining or restoring some lands to more closely resemble historic systems and including some structural or compositional components of the historic landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In prep. a).

The early vegetation of Wisconsin was mapped based on notes and maps from the original Public Land Surveys (Finley 1976, Map C), which were conducted for the area comprising SRPG in 1833-1834. It's important to note that Public Land Surveys served to clearly establish a standardized grid for land ownership, not to describe early vegetation and natural communities. This data is most informative by looking for patterns at a landscape scale; property-specific details may or may not be entirely accurate. This reconstruction of historical vegetation shows most of the study area was a mosaic of prairie, wetland (marsh, sedge meadow, wet prairie), and oak (*Quercus*)-dominated uplands. The prairies and savannas typically would have been found on ridge tops and drier slopes, with oak forests on moister slopes. Marshes, wet prairies and sedge meadows would have occurred in areas with poorly drained soils, typically associated with streams and rivers.

Ecological processes that historically maintained these systems included frequent wildfire. The vegetation pattern and structure documented in 1833-34 is typical for fire-prone landscapes such as the SRPG, in which periodic wildfires historically burned in an irregular fashion depending on timing, weather conditions, fuel loading, and natural fire breaks to create a shifting heterogeneous vegetation matrix.



## Current Vegetation

Many of the factors that impacted vegetation historically continue to impact the study area today, and include but are not limited to geology, soils, hydrology, and climate. These factors are superseded in many areas, however, by more recent human influences on the land, particularly conversion of land to agriculture, damming of rivers and streams, draining of wetlands, grazing, logging, fire suppression, and the introduction and spread of non-native invasive species.

The SRPG represents a mosaic of grasslands, oak savanna/forest, open wetlands, and Floodplain Forest. Virtually all of the SRPG properties have a river or stream flowing through them (Map D). As a result, wetlands and aquatic habitats figure prominently in the cover types of this property group. Marshes, wet prairies, fens and sedge meadows occur in areas with poorly drained soils, typically associated with streams and rivers. Floodplain Forests are found along the Sugar River and Little Sugar River. Grasslands in the form of remnant prairie along with oak savannas are typically found on ridge tops and drier slopes, with oak forests on moister slopes. Sandy upland terraces can also harbor remnant prairie and oak savanna. Other cover types include surrogate grassland, pine plantation, crops, and fallow fields. Descriptions of the most prevalent cover types are provided below.

### Surrogate Grassland

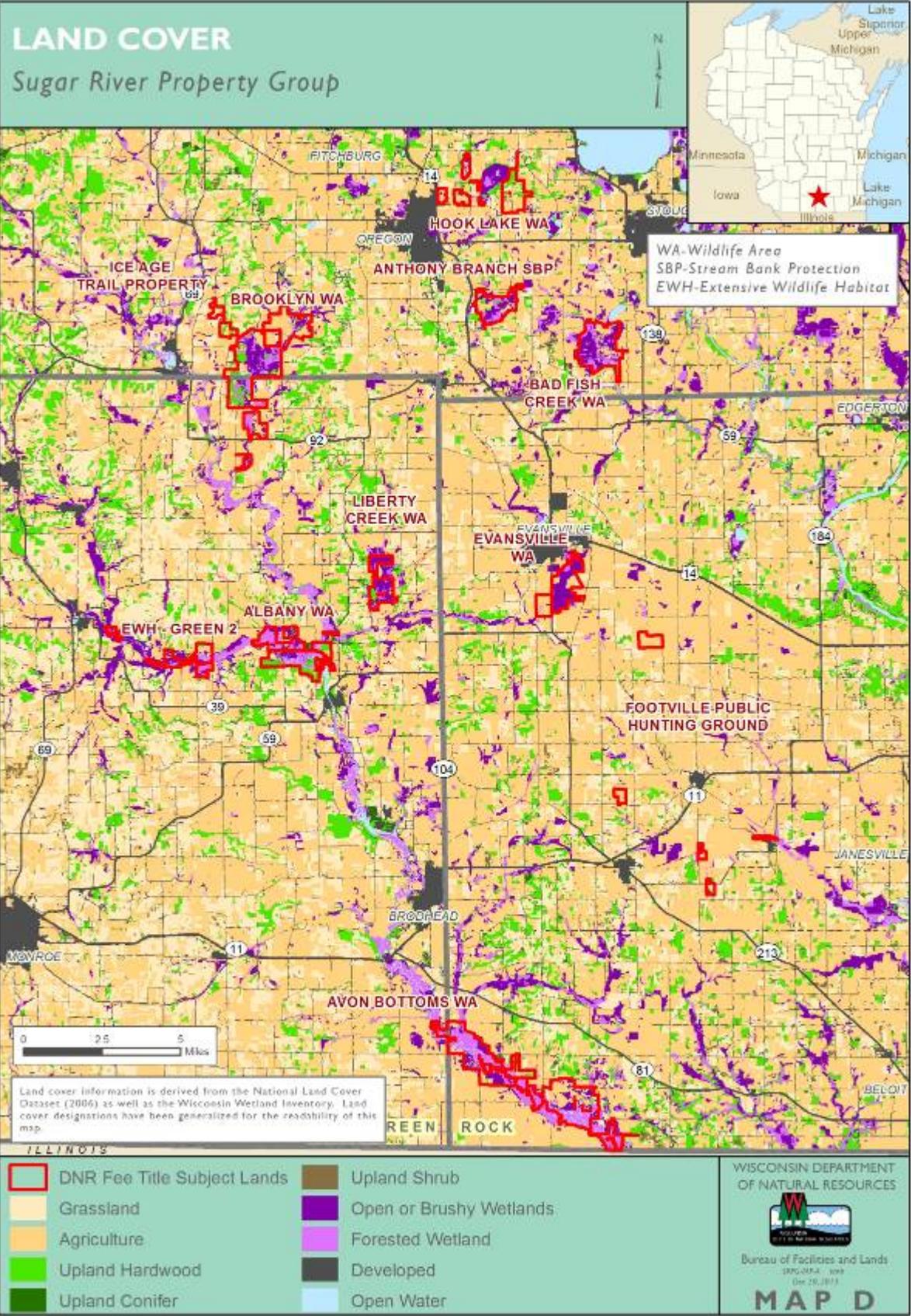
Many of the former croplands of the SRPG have been planted with native, local genotype prairie species, providing important habitat for wildlife. Some prairie plantings, especially those done in the early days of restoration, have two or three native grass and forb species, and primarily serve to establish target structure for upland game birds. Other plantings have 20 or more native prairie species, providing additional wildlife services such as diverse nectar plants for insects and complex cover types for a variety of bird and other animal species. Old fields are another type of surrogate grassland that are dominated by non-native grasses (especially smooth brome [*Bromus inermis*]), and are typically low in plant diversity and habitat structures.

### Upland Remnant Prairie

Upland prairie remnants occur in the study area on shallow rocky soils, often on steep south- and west-facing slopes (Dry and Dry-mesic Prairie), and on sandy soils on level or gently rolling terrain (Sand Prairie). A general definition of “prairie” is an open grassland with less than one tree per acre (typically bur oak [*Quercus macrocarpa*]) (Curtis 1959). Prairies are dominated, in terms of biomass, by grasses, but in terms of species diversity, the wildflowers, or “forbs,” capture the majority – 90% or more. Small shrubs such as wild roses (*Rosa* spp.), New Jersey tea (*Ceanothus americana*), and leadplant (*Amorpha canescens*) complete the compositional picture. Some indicator species for Dry Prairie include little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), American pasqueflower (*Anemone patens*) and old field goldenrod (*Solidago nemoralis*). For Dry-mesic Prairie, some indicator species are prairie drop-seed (*Sporobolus heterolepis*), needle grass (*Hesperostipa spartea*), Leonard’s skullcap (*Scutellaria parvula* var. *missouriensis*) and western sunflower (*Helianthus occidentalis*).



Pasqueflower is a spring bloomer of Dry and Sand Prairies. Photo by Robert H. Read.



Typical Sand Prairie associates include hairy panic grass (*Dichanthelium acuminatum*), hairy hawkweed (*Hieracium longipilum*), goat's rue (*Tephrosia virginiana*) and long-branch frostweed (*Helianthemum canadense*).

Remnant upland prairie is found at three sites on the SRPG:

- **State Ice Age Trail Area (Montrose Segment)**
- **Brooklyn Oak Savanna and Dry Prairie Primary Site**
- **Albany Wildlife Area**

#### Open and Brushy Wetlands

Open and brushy wetlands comprise the majority of land cover on the SRPG. Natural community types represented here include Southern Sedge Meadow, Shrub-carr, Wet Prairie, Wet-mesic Prairie, Calcareous Fen, Emergent Marsh, Floating-leaved Marsh, and Bog Relict. Although Southern Sedge Meadow is probably the dominant natural community of the SRPG, the wetland landscape actually comprises a mosaic of intertwined wetland types where Calcareous Fen, Wet Prairie, Wet-mesic Prairie, and Emergent Marsh intergrade with sedge meadow due to variations in topography, hydrology, soil type, and disturbance history. Their quality and extent is largely influenced by modification of local hydrology through damming of adjoining waterways and ditching/tiling of the wetlands, as well as by past land uses (e.g., cropping and grazing). Run-off from croplands, residential areas, and eroding streambanks also have a negative impact on wetlands. Non-native invasives, especially reed canary grass (*Phalaris arundinacea*), common buckthorn, and glossy buckthorn can also dominate and eventually supplant native wetland plants.

*Southern Sedge Meadow, Wet Meadow, and Shrub-carr.* Southern Sedge Meadow occurs on saturated soils (muck or peat), and is typically dominated by tussock sedge (*Carex stricta*) and blue-joint grass (*Calamagrostis canadensis*). Some sedges, especially the tussock sedge, form hummocks; these may be accentuated by grazing and frost action. Common sedge meadow associates are northern water-horehound (*Lycopus uniflorus*), panicled aster (*Aster lanceolatus* var. *simplex*), blue flag (*Iris virginica* var. *shrevei*), Canada goldenrod (*Solidago canadensis*), spotted Joe-Pye-weed (*Eupatorium maculatum*), broad-leaved cat-tail (*Typha latifolia*), and swamp milkweed (*Asclepias incarnata*).



Southern Sedge Meadow at Evansville Wildlife Area dominated by tussock sedge. Photo by Andy Clark.

Several sites harbor good-quality Southern Sedge Meadow:

- **Anthony Branch Sedge Meadow and Springs Primary Site**
- **Liberty Creek Sedge Meadow Primary Site**
- **Evansville Wet Prairie Primary Site**

Other properties with significant areas of Southern Sedge Meadow include:

- **Albany WA**
- **Albany EWHA**

Opportunities for conservation and restoration of these communities are described in detail in the section below entitled "Riparian Corridors, Aquatic and Wetland Habitats."

Areas of Shrub-carr usually occur wherever there is sedge meadow, especially along habitat edges. This wetland community occurs on saturated to seasonally-flooded soils, and is dominated by tall shrubs such as red-osier dogwood (*Cornus stolonifera*), white meadowsweet (*Spiraea alba*), and various willows (*Salix discolor*, *S. bebbiana*, and *S. exigua*). Vegetation growing underneath the woody species is usually typical of Southern Sedge Meadow, most commonly reed canary grass, less commonly blue-joint grass, lake sedge (*Carex lacustris*), and tussock sedge. Artificial drainage and fire suppression may contribute to expansion of Shrub-carr.

Many of the open wetlands dominated by grasses or sedges (graminoids) in the study area were drained in the past, then plowed or grazed. As wetlands were destroyed or degraded, stream flow during rain events became flashier, resulting in deeply-incised stream banks and heavy deposition of sediment. Nutrient-laden runoff from proximal urban and agricultural lands further contributed to the degradation of these wetlands. Wetlands that experienced such extensive disturbance are sometimes called "Wet Meadow" (Eggers and Reed 1997). They are typically dominated by reed canary grass and/or lake sedge, and harbor a small number of forb generalists such as sawtooth sunflower (*Helianthus grosseserratus*), spotted Joe-Pye-weed, giant goldenrod (*Solidago gigantea*), swamp aster (*Aster puniceus*), New England aster (*Aster novae-angliae*), orange jewelweed (*Impatiens capensis*), and tall meadow-rue (*Thalictrum dasycarpum*). With the exception of SIATA (Montrose Segment), all of the SRPG properties have some reed canary grass-dominated wetlands, or "wet meadow."

Properties that have extensive "wet meadows" include:

- **Evansville WA**
- **Liberty Creek WA**
- **Anthony Branch FA**
- **Badfish Creek FA**
- **Brooklyn WA**



Reed canary grass-dominated wetland, or "wet meadow." Photo by Paul Berry, WDNR website.

**Wet and Wet-mesic Prairie.** Wet and wet-mesic Prairies occur on mineral soils, often with high organic matter content, on glacial outwash, poorly drained ground moraines, or along streams, rivers, and lakes. Soils are saturated, and may sometimes be seasonally inundated. Moisture sources include ground water seepage, precipitation events, high water table, spring runoff, and sometimes floods within river and stream floodplains.

Grasses are dominant in this natural community. The dominant grasses of **Wet Prairie** are prairie cordgrass (*Spartina pectinata*) and blue-joint grass. Other graminoids, especially sedges, are important members of the Wet Prairie community. Representative forbs in Wet Prairie include New England aster, swamp thistle (*Cirsium muticum*), northern bedstraw (*Galium boreale*), Michigan lily (*Lilium michiganense*), cowbane (*Oxypolis rigidior*), mountain mint (*Pycnanthemum virginianum*), and tall meadow-rue.

The dominant grasses of **Wet-mesic Prairie** include prairie cordgrass, blue-joint grass, big bluestem (*Andropogon gerardii*) and Canada wild rye (*Elymus canadensis*). Wet-mesic Prairie may have a diverse forb component, including saw-tooth sunflower, eastern shooting-star (*Dodecatheon meadia*), golden Alexanders (*Zizia aurea*), prairie blazing star (*Liatris pycnostachya*), prairie phlox (*Phlox pilosa*), prairie dock (*Silphium terebinthinaceum*), stiff goldenrod (*Solidago rigida*), and Culver's-root (*Veronicastrum virginicum*).

Good examples of **Wet Prairie** are found at:

- **Badfish Creek Wet Prairie Primary Site**
- **Brooklyn Wet Prairie Primary Site**
- **Evansville Wet Prairie Primary Site**

Good-quality examples of **Wet-mesic Prairie** occur at:

- **Swenson Wet Prairie SNA**
- **Liberty Creek WA (including but not restricted to Liberty Creek Wet Prairie Primary Site)**



Wet-mesic prairie at Swenson Wet Prairie State Natural Area with prairie cordgrass, tussock sedge, prairie dropseed, prairie blazing star, and white wild indigo. Photo by Andy Clark.

*Calcareous Fen, Springs, and Spring Runs.* In the SRPG, calciphiles (plants that favor wetland sites that are fed by carbonate-rich groundwater) occur in small pockets within larger wetland complexes of Southern Sedge Meadow, and are found in association with Calcareous Fen (often in the form of mounds), springs, and spring runs. Some of the characteristic Calcareous Fen species within the range of the SRPG include graminoids such as fen panicled sedge (*Carex prairea*), water sedge (*C. aquatilis*), long-scaled tussock sedge (*C. haydenii*), broad-leaved woolly sedge (*C. pellita*), tussock sedge, and marsh muhly (*Muhlenbergia glomerata*), and forbs such as marsh fern (*Thelypteris palustris*), Riddell's goldenrod (*S. riddellii*), fen grass-of-Parnassus (*Parnassia glauca*), brook lobelia (*Lobelia kalmii*), swamp lousewort (*Pedicularis lanceolata*), and edible valerian (*Valeriana edulis*). Low shrubs such as shrubby cinquefoil (*Pentaphylloides floribunda*) and red-osier dogwood are often present and may achieve high cover values, especially at sites from which fire has been excluded. Springs and spring runs are important microhabitats found in many fens, and these may support their own group of specialists such as low water-parsnip (*Berula erecta*). While none of the occurrences of these community types on the SRPG met the minimum mapping requirements for NHI (due to their small size), they are important for their enhancement of overall floral diversity within larger wetland complexes.

Sites where Calcareous Fen, Springs, and Spring Runs occur include:

- **Anthony Branch**
- **Albany WA (northwest part)**
- **Albany EWHA (north of river, section 14)**
- **Liberty Creek WA**
- **Evansville WA**

*Emergent Marsh and Floating-leaved Marsh.* These open communities occur where there is permanent standing water. Emergent Marsh is dominated by robust plants that emerge from the water. The most common emergents are cat-tails (*Typha* spp.), bulrushes (particularly *Bulboschoenus fluviatilis* and *Schoenoplectus tabernaemontani*), bur-reeds (*Sparganium* spp.), water-plantains (*Alisma* spp.), and arrowheads (*Sagittaria* spp.). Floating-leaved Marsh is dominated by aquatic plants with leaves that rest on and cover at least 50% of the water's surface. Characteristic species include white water-lily (*Nymphaea odorata*), bull-head pond-lily (*Nuphar variegata*), and water-shield (*Brasenia schreberi*).



Floating-leaved Marsh around outer edges of the bog at Hook Lake Bog State Natural Area, with water-lily, bull-head pond-lily, and water-shield. Photo by Andy Clark.

Good examples of Emergent Marsh may be found at:

- **Hook Lake-Grass Lake WA**
  - **Hook Lake Bog SNA**
  - **Grass Lake**
- **Albany WA**

A good example of Floating-leaved Marsh may be found at:

- **Hook Lake Bog SNA**

#### Bog Relict and Tamarack (rich) Swamp

These boggy, acidic, weakly minerotrophic peatlands occur south of the Tension Zone within a matrix of "southern" vegetation, and may be associated with kettle depressions on outwash or ground moraine landforms. Many of these stands are fed by groundwater seepage. The surface may include areas of relatively firm peat, but watery muck is often present as well. Tamarack (rich) Swamp often occurs within a Bog Relict matrix, thus the communities are very closely related.

Tamarack (*Larix laricina*) is the canopy dominant of this natural community; its cover can range from dense to patchy. Canopy associates may include red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), black ash (*Fraxinus nigra*), and green ash (*F. pennsylvanica*). The tall shrub layer is often well-developed and dense, and may include poison sumac (*Toxicodendron vernix*), silky dogwood (*Cornus amomum*), red-osier dogwood, gray dogwood (*C. racemosa*), water-willow (*Decodon verticillata*), alder-leaved buckthorn (*Rhamnus alnifolia*), and willow (*Salix* spp.). Leather-leaf (*Chamaedaphne calyculata*) is also an important shrub, and can be dominant in Bog Relicts. Moss cover is highly variable in composition and cover. Those bogs with a thick *Sphagnum* moss layer may support acidophilic herbs and shrubs more typical of northern bogs such as leather-leaf and purple pitcher plant (*Sarracenia purpurea*). Common graminoids are lake sedge, common fox sedge (*Carex stipata*), tussock sedge, fringed brome (*Bromus ciliatus*), blue-joint grass, and fowl manna grass (*Glyceria striata*). Other herbs associated with southern tamarack swamps include small-spike false nettle (*Boehmeria cylindrica*), wild calla (*Calla palustris*), marsh marigold (*Caltha palustris*), royal fern (*Osmunda regalis*), swamp lousewort (*Pedicularis lanceolata*), swamp saxifrage (*Saxifraga pensylvanica*), and skunk cabbage (*Symplocarpus foetidus*).

A good example (and the only one in the SRPG) of Bog Relict and Tamarack (rich) Swamp occurs at:

- **Hook Lake Bog SNA**

#### Oak Savanna

Three types of oak savanna occur on the SRPG: Oak



Hook Lake Bog State Natural Area with a floating mat of narrow-leaved woolly sedge and Sphagnum, and Tamarack (rich) Swamp in the background. Photo by Andy Clark.

Opening, Oak Woodland, and Oak Barrens. The Oak Savanna Management Guide (Staffen 2010) provides a good summary of these communities, which is reproduced with minor modifications here:

*Oak Opening - As defined by Curtis (1959), this is an oak-dominated savanna community in which there is more than one tree per acre and less than 50% tree canopy coverage. They can occur over a variety of geological substrates on loamy soils that range from dry to wet-mesic. Burr, white, and black oaks (Quercus macrocarpa, Q. alba, and Q. velutina) are dominant, typically as large, open-grown tree. Shagbark hickory (Carya ovata), red oak (Q. rubra), hackberry (Celtis occidentalis) and black cherry (Prunus serotina) are also sometimes present. American hazelnut is a common understory shrub. Under and between the oaks grow a mixture of sun-loving prairie plants, shade-loving woodland plants, and true savanna plants that prefer dappled sunlight.*

*Oak Barrens - Black oak is the dominant tree in this fire-adapted savanna community of dry, sandy sites, although white oak, burr oak, northern pin oak (Quercus ellipsoidalis), and occasionally red oak may also be present. Common ground layer species include sand prairie associates such as lead plant, goat's rue, June grass (Koeleria macrantha), little bluestem, flowering spurge (Euphorbia corollata), and frostweeds (Helianthemum spp.). Frequent fires can reduce the oaks to short, multi-stemmed "grubs."*

*Oak Woodland – Oak Woodland occupies a position on the vegetation continuum that is intermediate between Oak Opening/Oak Barrens and Southern Dry/Dry-mesic Forest. Oak Woodland differs from other oak savanna types in that the trees have more compact crowns and more vertically-oriented limbs, canopy closure is greater (50-95%). As compared to oak forests, oak woodlands have a far more open subcanopy and understory, with ground layer herbs holding a more prominent position in the community than tall shrubs and saplings. The dominant tree of the Oak Woodland is the white oak, with lesser amounts of burr oak and black oak, and sometimes red oak, shagbark hickory, hackberry and black cherry. The diverse herb layer includes some members of the prairie, Oak Opening, and oak forest communities, but also features many grasses, sedges, legumes, composites and other forbs that are best adapted to the highly-filtered shade of the oak woodland.*

A number of oak savanna sites were identified in the SRPG that show good restoration potential:

- **Brooklyn Oak Savanna and Dry Prairie Primary Site**
- **Badfish Creek WA (southeast corner)**
- **Anthony Branch FA (northwest part of site)**
- **Albany Sand Prairie and Oak Savanna Primary Site**
- **Swenson Wet Prairie SNA**

Opportunities for conservation of these community types are described in further detail in the section entitled "Conservation of Oak Savanna."



Yellow false foxglove is an indicator of oak savanna. Photo by Stephen L. Solheim, Wisconsin State Herbarium website.

### Oak Forest

Sites with Southern Dry and Dry-mesic Forest are mostly degraded due to past grazing, logging, fire suppression, and invasion of shade-tolerant and non-native species. They are typically located on well-drained sites on south- and west-facing slopes of hills or in areas where sandy soils predominate. They may adjoin Oak Woodland or Oak Opening.

The dominant canopy trees of Southern Dry Forests are usually white oak and burr oak, with lesser amounts of red oak and black oak (especially on sandy soils). Canopy oaks on most of the SRPG properties range from 18-24" diameter at breast height (DBH). The subcanopy can be variable in composition, but is most often occupied by black cherry, shagbark hickory, black walnut (*Juglans nigra*), green ash, and trembling aspen (*Populus tremuloides*). These forests are very brushy, especially when light penetration is high through canopy openings; this character is amplified by past grazing and fire suppression. Common shrubs include gooseberries/currants (*Ribes* spp.), raspberries and blackberries (*Rubus* spp.), American hazelnut and the non-native invasives multiflora rose (*Rosa multiflora*), common buckthorn (*Rhamnus cathartica*), and Eurasian bush honeysuckle (*Lonicera* spp.).



Southern Dry Forest at Albany Wildlife Area dominated by white oak. Photo by Rich Staffen.

In the Southern Dry-mesic Forests of the SRPG, red oak typically surpasses white and burr oak as the dominant canopy species; big-toothed aspen (*Populus grandidentata*) is often a co-dominant. Other trees that often occupy the canopy and subcanopy include red maple, sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and slippery elm (*Ulmus rubra*). Canopy closure is more pronounced here, resulting in a less-developed shrub layer.

The ground layer of these sites varies depending on soils as well as the impacts of past grazing, fire suppression, and non-native invasive species. Most SRPG oak forests have garlic mustard, common buckthorn and exotic bush honeysuckle, often resulting in a sparse ground layer with just the most common oak forest generalists hanging on such as wild geranium (*Geranium maculatum*), Virginia creeper (*Parthenocissus quinquefolia*), enchanter's night-shade (*Circaea lutetiana*), white snakeroot

(*Eupatorium rugosum*), and Virginia waterleaf (*Hydrophyllum virginianum*). Sandy sites may be dominated almost exclusively by Pennsylvania sedge (*Carex pensylvanica*). Indicators of higher quality oak forest include high ground layer diversity, the presence of spring ephemerals such as trout lily (*Erythronium albidum*) and Dutchman's breeches (*Dicentra cucullaria*), and the presence of rare or conservative species such as blue cohosh (*Caulophyllum thalictroides*), yellow lady's slipper (*Cypripedium parviflorum* var. *pubescens*), and bishop's cap (*Mitella diphylla*).

Good-quality examples of Southern Dry and Dry-mesic Forest were found at two SRPG properties:

- **Albany WA** (north and west of Rubens Cave Drive and south of Zurfluh Road). An oak regeneration project began here in 2012 by destroying invasive species, with the proposed harvest likely occurring during winter of 2013-14. This project may alter community structure and composition such that characteristics described in this report may no longer apply.
- **Brooklyn WA** (south-central part of the core land holding).

### Floodplain Forest

Floodplain Forest occurs along large rivers and streams and is most extensive and diverse in southern Wisconsin. The dominant trees are deciduous species adapted to periodic inundation, especially silver maple (*Acer saccharinum*), green ash, swamp white oak (*Quercus bicolor*), river birch (*Betula nigra*), and cottonwood (*Populus deltoides*). River floodplains may contain complex, highly variable microtopography and substrates, yielding a diverse mosaic of habitats and vegetation. Buttonbush (*Cephalanthus occidentalis*) is often a dominant shrub, especially at the margins of oxbow lakes and sloughs. Vines such as Virginia creeper, grapes (*Vitis* spp.), Canada moonseed (*Menispermum canadense*), and poison-ivy (*Toxicodendron radicans*) are often common. Common graminoids include Virginia wild-rye (*Elymus virginicus*), common woodreed (*Cinna arundinacea*), and cutgrasses (*Leersia* spp.), hop sedge (*Carex lupulina*), and Tuckerman's sedge (*C. tuckermanii*). Other characteristic herbs are various nettles (*Laportea canadensis*, *Urtica dioica*, *Pilea pumila*), cut-leaved coneflower (*Rudbeckia laciniata*), Virginia bluebells (*Mertensia virginiana*), green dragon (*Arisaema dracontium*), and false dragonhead (*Physostegia virginiana*). Ferns, especially ostrich fern (*Matteucia struthiopteris*) and sensitive fern (*Onoclea sensibilis*), are often present.

The only good-quality Floodplain Forest in the SRPG occurs at:

- **Avon Bottoms WA**



Floodplain Forest at Avon Bottoms Wildlife Area with swamp white oak, silver maple, American elm, and green ash. Photo by Andy Clark.

## Rare Species and High-Quality Natural Communities of Sugar River Planning Group

Rare species and high-quality natural communities have been documented at the Sugar River Planning Group (SRPG) (Table 3). See Appendix C for rare species occurrences by property and Appendix D for summary descriptions of the species. Bird occurrences refer only to breeding activity. It's important to note that other rare or declining species may be present on the SRGP, but escaped detection during surveys. Please refer to Appendix E for a complete list of SGCN that may occur within the Southeast Glacial Plains Ecological Landscape in natural communities of the SRGP.

**Table 3.** Documented rare species and high-quality natural communities of the Sugar River Planning Group

*For an explanation of state and global ranks, as well as state status, see Appendix F. State status, tracking status, and ranks are based on the working list published June 1, 2011. Species with a “W” in the “Tracked by NHI” column are on the Watch List (see Appendix F) and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list. \*Species reported but not confirmed or did not meet criteria as an element occurrence.*

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Mammals</b>								
Big Brown Bat*	Eptesicus fuscus	2013	S2S4	G5	THR		N	Y
Deer Mouse	Peromyscus maniculatus	2013	S4	G5	SC/N		N	W
Eastern Pipistrelle*	Perimyotis subflavus	2013	S1S3	G3	THR		N	Y
Eastern Red Bat*	Lasiurus borealis	2013	S3	G5	SC/N		Y	N
Hoary Bat*	Lasiurus cinereus	2013	S3	G5	SC/N		Y	N
Little Brown Bat*	Myotis lucifugus	2013	S2S4	G3	THR		N	Y
Northern Long-eared Bat*	Myotis septentrionalis	2013	S1S3	G1G3	THR		Y	Y
Prairie Vole*	Microtus ochrogaster	2013	S2	G5	SC/N		Y	Y
Western Harvest Mouse	Reithrodontomys megalotis	2013	SU	G5	SC/N		N	Y
<b>Birds</b>								
Acadian Flycatcher	Empidonax vireescens	2013	S3B	G5	THR		Y	Y
American Bittern	Botaurus lentiginosus	2009	S3B	G4	SC/M		Y	Y
American Woodcock	Scolopax minor	2013	S3S4B	G5	SC/M		Y	W
Bald Eagle	Haliaeetus leucocephalus	2013	S4B,S4N	G5	SC/P		Y	Y
Bell's Vireo	Vireo bellii	2013	S2B	G5	THR		Y	Y
Black-billed Cuckoo	Coccyzus erythrophthalmus	2013	S3S4B	G5	SC/M		Y	W
Black Tern	Chlidonias niger	2013	S2B	G4	SC/M		Y	Y
Black-crowned Night-Heron	Nycticorax nycticorax	2013	S2B	G5	SC/M		N	Y
Blue-winged Teal	Anas discors	2013	S3S4B	G5	SC/M		Y	W
Blue-winged Warbler	Vermivora pinus	2013	S4B	G5	SC/M		Y	W
Bobolink	Dolichonyx oryzivorus	2013	S3S4B	G5	SC/M		Y	W

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Brown Thrasher	Toxostoma rufum	2013	S3S4B	G5	SC/M		Y	W
Cerulean Warbler	Dendroica cerulea	2013	S2S3B	G4	THR		Y	Y
Common Nighthawk*	Chordeiles minor	2013	S2S3B	G5	SC/M		N	Y
Dickcissel	Spiza americana	2013	S3B	G5	SC/M		Y	W
Eastern Meadowlark	Sturnella magna	2013	S3S4B	G5	SC/M		Y	W
Field Sparrow	Spizella pusilla	2013	S3S4B	G5	SC/M		Y	W
Grasshopper Sparrow	Ammodramus savannarum	2013	S3B	G5	SC/M		Y	W
Henslow's Sparrow	Ammodramus henslowii	2013	S2S3B	G4	THR		Y	Y
Hooded Warbler	Wilsonia citrina	2013	S2S3B	G5	THR		Y	Y
Kentucky Warbler	Oporornis formosus	2013	S1S2?B	G5	THR		Y	Y
Lark Sparrow	Chondestes grammacus	2013	S3B	G5	SC/M		Y	Y
Least Flycatcher	Empidonax minimus	2013	S4B	G5	SC/M		Y	W
Loggerhead Shrike	Lanius ludovicianus	1987	S1B	G4	END		Y	Y
Northern Bobwhite	Colinus virginianus	2012	S2S3B	G5	SC/M		Y	Y
Northern Harrier	Circus cyaneus	2013	S3B,S2N	G5	SC/M		Y	W
Prothonotary Warbler	Protonotaria citrea	2013	S3B	G5	SC/M		Y	Y
Red-headed Woodpecker	Melanerpes erythrocephalus	2013	S3B	G5	SC/M		Y	W
Red-shouldered Hawk	Buteo lineatus	2013	S3S4B,S1N	G5	THR		Y	Y
Veery	Catharus fuscescens	2013	S3S4B	G5	SC/M		Y	W
Vesper Sparrow	Poocetes gramineus	2013	S3S4B	G5	SC/M		Y	W
Whip-poor-Will	Caprimulgus vociferus	2013	S3B	G5	SC/M		Y	W
Willow Flycatcher	Empidonax trailii	2013	S4B	G5	SC/M		Y	W
Wood Thrush	Hylocichla mustelina	2013	S4B	G5	SC/M		Y	W
Yellow-billed Cuckoo	Coccyzus americanus	2013	S3B	G5	SC/M		Y	Y
Yellow-breasted Chat	Icteria virens	2013	S2B	G5	SC/M		N	Y
Yellow-crowned Night-Heron	Nyctanassa violacea	1989	S1B	G5	THR		Y	Y
Yellow-throated Warbler	Dendroica dominica	2013	S1?B	G5	END		Y	Y
<b>Amphibians</b>								
American Bullfrog	Lithobates catesbeianus	2013	S3S4	G5	SC/H		N	W
Northern Leopard Frog	Lithobates pipiens	2013	S4?	G5	SC/H		N	W
Pickerel Frog	Lithobates palustris	2013	S3?	G5	SC/H		Y	Y
<b>Reptiles</b>								
Blanding's Turtle	Emydoidea blandingii	2013	S3S4	G4	THR		Y	Y
Eastern Massasauga	Sistrurus catenatus catenatus	1982	S1	G3G4T3Q	END	C	Y	Y
Ornate Box Turtle	Terrapene ornata	2013	S1	G5	END		Y	Y

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Fishes</b>								
American Eel	<i>Anguilla rostrata</i>	1974	S2	G4	SC/N		Y	Y
Black Buffalo	<i>Ictiobus niger</i>	2004	S2	G5	THR		Y	Y
Least Darter	<i>Etheostoma microperca</i>	1965	S3	G5	SC/N		Y	Y
Silver Chub	<i>Macrhybopsis storeriana</i>	2007	S3	G5	SC/N		N	Y
Starhead Topminnow	<i>Fundulus dispar</i>	2010	S2	G4	END		Y	Y
Weed Shiner	<i>Notropis texanus</i>	1974	S3	G5	SC/N		N	Y
<b>Mussels</b>								
Black Sandshell*	<i>Ligumia recta</i>	2003	S3	G5	SC/P		N	W
<b>Dragonflies</b>								
Dark Rubyspot	<i>Hetaerina titia</i>	2008	S1S2	G5	SC/N		NA	Y
Riverine Clubtail	<i>Stylurus amnicola</i>	1992	S3S4	G4	SC/N		NA	N
Russet-tipped Clubtail	<i>Stylurus plagiatus</i>	1992	S3S4	G5	SC/N		NA	N
<b>Mayflies</b>								
A Brush-legged Mayfly	<i>Homoeoneuria ammophila</i>	1992	S2?	G4	SC/N		NA	Y
A Common Burrower Mayfly	<i>Pentagenia vittigera</i>	1992	S2S3	G5	SC/N		NA	Y
Fox Small Square-gilled Mayfly	<i>Cercobrachys fox</i>	1992	S2S3	G3G4	SC/N		NA	Y
Ojibwe Small Square-gilled Mayfly	<i>Brachycercus ojibwe</i>	1992	S2S3	G3	SC/N		NA	Y
Winnebago Small Square-gilled Mayfly	<i>Cercobrachys winnebago</i>	1992	S1S2	G3G4	SC/N		NA	Y
Wisconsin Small Square-gilled Mayfly	<i>Cercobrachys lilliei</i>	1992	S1S2	G2	SC/N		NA	Y
<b>Ants, Wasps and Bees</b>								
Rusty-patched Bumble Bee	<i>Bombus affinis</i>	2013	S2	GU	SC/N		NA	Y
<b>Plants</b>								
Azure Bluets	<i>Houstonia caerulea</i>	1998	S2	G5	SC		NA	Y
Beak Grass	<i>Diarrhena obovata</i>	2013	S2	G4G5	END		NA	Y
Glade Mallow	<i>Napaea dioica</i>	1987	S3	G4	SC		NA	W
Kentucky Coffee-tree	<i>Gymnocladus dioicus</i>	2013	S2	G5	SC			Y
Kitten Tails	<i>Besseyia bullii</i>	2008	S3	G3	THR		NA	Y
Nodding Rattlesnake-root	<i>Prenanthes crepidinea</i>	2005	S1	G4	END			Y
Pale Purple Coneflower	<i>Echinacea pallida</i>	1991	S3	G4	THR		NA	Y
Prairie Indian-Plantain	<i>Cacalia tuberosa</i>	1991	S3	G4G5	THR		NA	Y
Prairie Milkweed	<i>Asclepias sullivantii</i>	1957	S2S3	G5	THR		NA	Y
Prairie Straw Sedge	<i>Carex suberecta</i>	1957	S1	G4	SC		NA	Y

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Purple Meadow-parsnip	Thaspium trifoliatum var. flavum	1958	S2	G5T5	SC		NA	Y
Rough Rattlesnake-root	Prenanthes aspera	1948	S1	G4?	END		NA	Y
Round-fruited St. John's-wort	Hypericum sphaerocarpum	2013	S1S2	G5	THR		NA	Y
Short's Rock-cress	Arabis shortii	2013	S1S2	G5	SC		NA	Y
Small White Lady's-slipper	Cypripedium candidum	1930	S3	G4	THR		NA	Y
Smooth Black-haw	Viburnum prunifolium	2013	S2	G5	SC		NA	Y
Spreading Chervil	Chaerophyllum procumbens	2013	S1	G5	SC		NA	Y
Sycamore	Platanus occidentalis	2013	S2	G5	SC		NA	Y
Wafer-ash	Ptelea trifoliata	2013	S2	G5	SC		NA	Y
Yellow Giant Hyssop	Agastache nepetoides	1996	S3	G5	THR		NA	Y
<b>Natural Communities</b>								
Bog Relict	Bog relict	2013	S3	G3	NA		NA	Y
Calcareous Fen*	Calcareous Fen	2013	S3	G3	NA		NA	Y
Dry-mesic Prairie*	Dry-mesic prairie	2013	S2	G3	NA		NA	Y
Dry Prairie	Dry Prairie	2013	S3	G3	NA		NA	Y
Emergent Marsh	Emergent marsh	2013	S4	G4	NA		NA	Y
Floating-leaved Marsh	Floating-leaved Marsh	2013	S4	G5	NA		NA	Y
Floodplain Forest	Floodplain forest	2013	S3	G3?	NA		NA	Y
Lake--Shallow, Hard, Seepage	Lake--shallow, hard, seepage	1974	SU	GNR	NA		NA	Y
Oak Opening	Oak opening	2013	S1	G1	NA		NA	Y
Oak Woodland	Oak Woodland	2013	S1?	GNR	NA		NA	Y
Riverine Lake/Pond	Riverine Lake/Pond	2013	SU	GNR	NA		NA	Y
Sand Prairie	Sand Prairie	2013	S2	GNR	NA		NA	Y
Southern Sedge Meadow	Southern sedge meadow	2013	S3	G4?	NA		NA	Y
Tamarack (rich) Swamp	Tamarack (rich) Swamp	2013	S2	G3	NA		NA	Y
Wet-mesic Prairie	Wet-mesic prairie	2013	S2	G2	NA		NA	Y
Wet Prairie	Wet Prairie	2013	SU	G3	NA		NA	Y

# Management Considerations and Opportunities for Biodiversity Conservation

## The Sugar River and Avon Bottoms

The Sugar River (and associated riparian natural communities) is one of the most important and biologically diverse river systems in Wisconsin, featuring at least 50 species of fishes. A Conservation Opportunity Area (COA) encompasses **Avon Bottoms WA** and surrounding lands (Figure 2). (Based on biological importance, this area could be extended upstream to the dam at Decatur Lake [Bill Smith, Pers. Com.]). This stretch of river was not only recognized as a COA by the WDNR in their 2006 Wildlife Action Plan but also by The Nature Conservancy in their 2001 conservation plan for the Prairie-Forest Border Ecoregion.

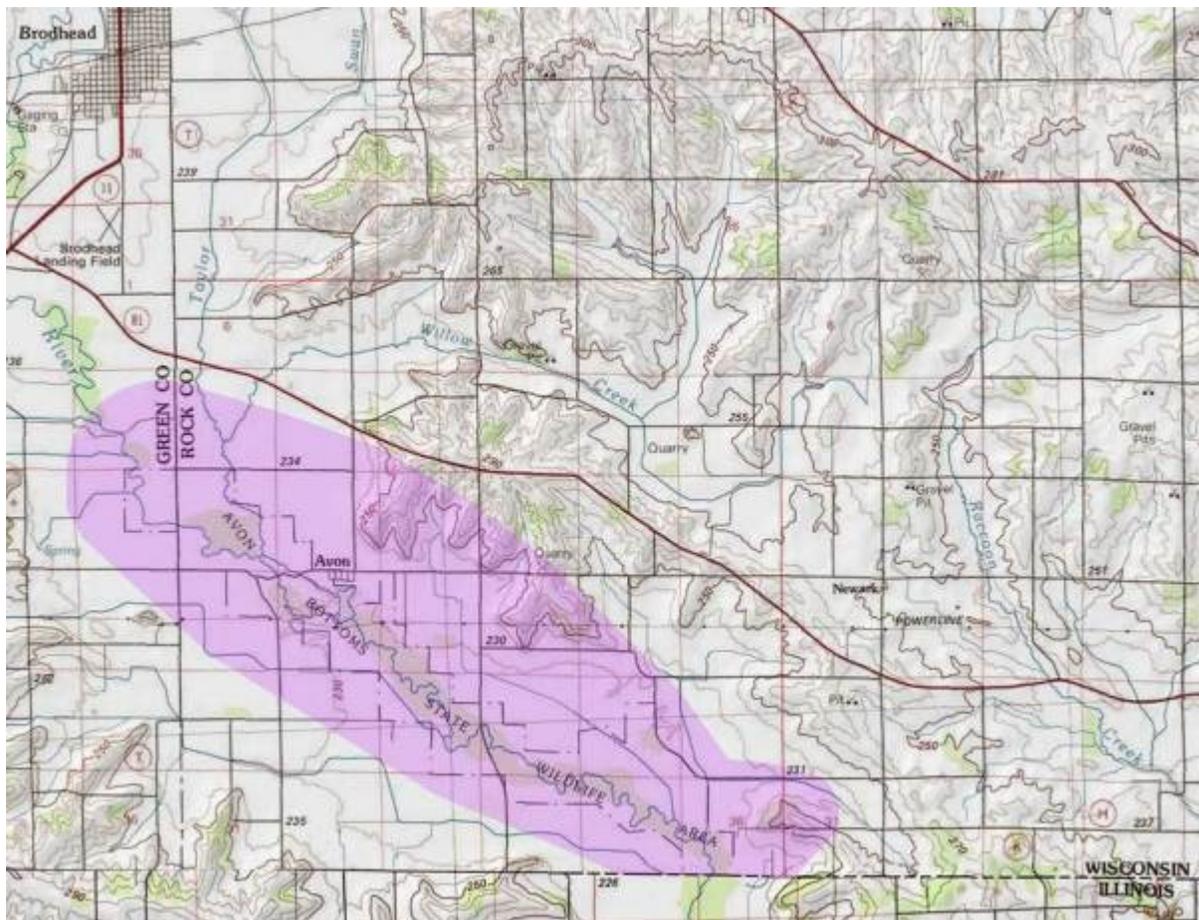


Figure 2. Sugar River Conservation Opportunity Area. (Wisconsin Wildlife Action Plan, WDNR 2006).

Part of what makes the Sugar River unique is its relatively undisturbed geomorphology. While most streams in southern Wisconsin have been channelized, the Sugar River, especially in the vicinity of **Avon Bottoms WA**, retains its natural meandering and braided character, allowing development of riffle-pool-run sequences, backwater sloughs, and seasonally recharged depressions such as potholes and oxbows. A diverse flora and fauna mirror the relatively unaltered state of the riparian corridor.

The Sugar River at **Avon Bottoms WA** provides a major opportunity to manage for a large and complex mosaic of riparian wetland habitat types including Floodplain Forest, Wet-mesic Prairie, Southern Sedge Meadow, and Emergent Marsh. The river and its backwater sloughs, oxbows and ponds also represent important natural communities with unique assemblages of aquatic plants. Together, these communities create vital habitat for rare and declining plants, birds, herptiles, bats, fishes, and aquatic invertebrates.

### Floodplain Forest

The Floodplain Forest at **Avon Bottoms WA** exists primarily due to the convergence of favorable conditions, one of which is frequent flooding on the Sugar River, which limits most human development. This high flood frequency combines with somewhat poor soils, tight river meanders (difficult for farm equipment to navigate), and limited fire and grazing to support growth of Floodplain Forest species.

Wisconsin plays a key role in the conservation of Floodplain Forest, especially in the more fragmented landscapes of southern and eastern Wisconsin, where this habitat type provides some of the only remaining intact and

extensive areas of contiguous forest cover in the region. Avon Bottoms is considered one of the highest quality Floodplain Forests in the state, and is thus conferred the special distinction of 'ecological reference area,' providing a template for Floodplain Forest restorations elsewhere. This particular Floodplain Forest is also unique in the state for its high number of rare plants that are at the northern extent of their range.



Young sycamore at Avon Bottoms Wildlife Area. Photo by Rich Staffen.

### Birds

#### **Avon Bottoms WA**

provides the best opportunity for providing forest bird habitat in the entire planning group, and is recognized as an Important Bird Area of statewide significance. This extensive corridor of mature forest combines with a unique tree composition to attract high conservation priority bird species such as red-shouldered hawk and prothonotary warbler. See "Forest Birds" below for more information. This wildlife area also provides important habitat for grassland birds, including eastern meadowlark, dickcissel, and Henslow's sparrow. See "Grassland Birds" below for more information.

### Herptiles

**Avon Bottoms WA** provides important wetland habitat for basking, foraging, and overwintering of numerous rare or uncommon amphibians and reptiles, including northern leopard frog (*Lithobates pipiens*), American bullfrog (*Lithobates catesbeianus*), and Blanding's turtle (*Emydoidea blandingii*). See "Herptiles and Wetlands" below for more information. Although none were detected during surveys, the planted sand prairies along Smith and Carroll Roads potentially provide suitable habitat for rare reptiles. See "Herptiles and Prairie Conservation" below for more information.

## Bats

Acoustic bat surveys were performed at seven properties (**Albany WA, Avon Bottoms WA, Badfish Creek WA, Brooklyn WA, Liberty Creek WA, and Hook Lake-Grassy Lake WA**) in the SRPG. The results of these surveys were consistent with the understanding that bats need water sources for drinking and foraging, and that long, narrow aquatic features like rivers are preferred over large open water bodies. Surveys along the Sugar River through **Avon Bottoms WA** produced the highest number of bat species and greatest species richness of all the surveys. Five of the seven species of Wisconsin's summer resident bats were recorded at this site during surveys. The remaining sites surveyed found between two to four species during the summer resident period. The Sugar River may also be an important migratory corridor for bats due to its north-south orientation, remaining forests, and water resources.

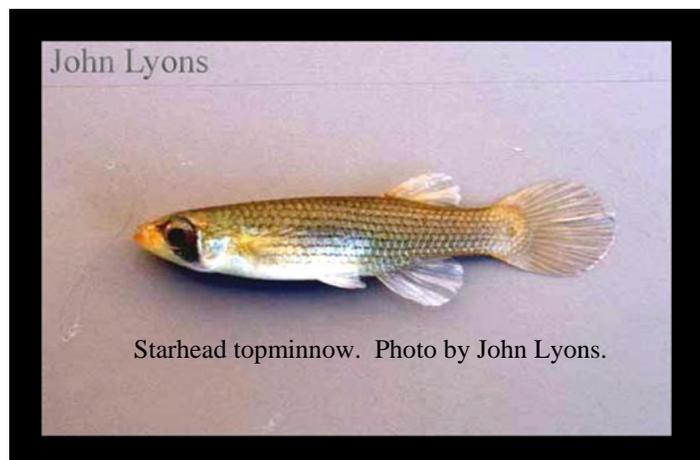
River systems have been found to produce greater diversity and species richness than lakes and ponds. This is likely because river systems have greater amounts of insects and are also utilized by bats for commuting and navigating. Forested areas in close proximity to water provide the best summer roosting habitat for bats. In addition, rivers support a habitat mosaic of forests, marshy sloughs, and shrub-swamps that different bat species require on the landscape. Protecting and managing riparian forests such as that at **Avon Bottoms WA** would go a long way in conserving bat populations in the SRPG.

## Aquatic Habitats

The lower Sugar River provides important aquatic habitat for fishes and aquatic invertebrates such as mussels, mayflies, dragonflies and damselflies. While records tying some species specifically to the Sugar River at **Avon Bottoms WA** may be lacking, their presence in the river in proximity to the wildlife area merits special attention in this report. In most if not all cases, it is likely that these species either use habitat at **Avon Bottoms WA**, or their continued survival and viability is influenced by the high-quality aquatic and wetland habitats at the wildlife area. Further survey work of all of these taxa groups along the lower Sugar River is recommended.

*Fishes.* The Sugar River has one of the most diverse warmwater fisheries in southern Wisconsin; at least 50 different species have been identified there, including seven that are rare. While a few older rare fish observations occur further upstream, most of the rare fishes are found within or near the Sugar River COA at **Avon Bottoms WA**.

The state-endangered starhead topminnow (*Fundulus dispar*) was identified as recently as 2010 in the Sugar River below Brodhead dam (Wisconsin Department of Natural Resources Fish Distribution Database). This population varies from year to year depending upon its access to the floodplain, which is only available during high flow years. To ensure sustainable populations of this and other off-channel fish populations, the effects of floodplain aggradation would need to be minimized. This could be achieved through selective excavation to restore groundwater connectivity to oxbows (Marshall, personal communication).



A small population of State-Threatened river redhorse (*Moxostoma carinatum*) was noted as recently as 2009 during sampling just a few miles upstream from **Avon Bottoms WA**. It is plausible that this highly

mobile species could be occupying habitat at **Avon Bottoms WA**, but escaped detection there due to small numbers (Lyons, personal communication). Similarly, gravel chub (*Erimystax x-punctatus*) was detected a short distance upstream from **Avon Bottoms WA**, and could feasibly use habitat there. The distribution of this state-endangered species hasn't been investigated in the Sugar River since 1987.

*Mussels.* Virtually all of Wisconsin's mussel species require fish to complete their life cycle, thus a diverse and healthy fish community ensures adequate mussel reproduction. The lower Sugar River hosts 12 freshwater mussel species, including the State-Threatened Buckhorn (*Tritogonia verrucosa*) at its southeasternmost location in Wisconsin. It also hosts three Special Concern Species – the Elktoe (*Alasmidonta marginata*), the Black Sandshell (*Ligumia recta*), and the Mucket (*Actinonaias ligamentina*). Formal inventories have not been conducted in the lower Sugar River in many years, and it is likely that additional rare mussel species are present. Most of the species found here, including the three rare species, require main channel habitat with occasional firm substrate.

*Dragonflies and Damselflies.* Some 28 species of Odonata (dragonflies and damselflies) breed in the lower Sugar River, seven of which are Special Concern species in Wisconsin. Most of these odonates occur in the main channel. The plains clubtail (*Gomphus externus*) is a species of large, warm water streams with high sediment load. The dark rubyspot (*Hetaerina titia*) is at the northern edge of its range here; the Sugar River population is the only one documented in Wisconsin. Other Special Concern species include the skillet clubtail (*Gomphurus ventricosus*) – otherwise only known from the northern half of Wisconsin in high-quality streams, and the swift river cruiser (*Macromia illinoensis*) -- normally found in streams and lakes in northern and central Wisconsin. Finally, four of the state's Hanging Clubtail species are found here, three of which are Special Concern, which reflects the abundant sand-silt substrate in the lower Sugar River.

*Mayflies.* The lower Sugar River hosts 24 mayfly species, and holds particular importance for nine rare mayfly species, four of which are globally rare or imperiled (Lillie 1995). Also, four of these are endemic to the Midwest or Wisconsin. Wisconsin small square-gilled mayfly (*Cercobrachys lilliei*) is one of these endemics and was recently named in honor of retired WDNR Researcher Dick Lillie. Winnebago small square-gilled mayfly (*Cercobrachys winnebago*) is only known from the Sugar River in Wisconsin and Illinois. Most of these rare mayflies use sandy substrates of large, warm water streams.

Key considerations for ensuring good aquatic habitat for fish and invertebrates are as follows: 1) To the extent possible, maintain natural hydrology and connectivity with the main river channel so that fish can move freely between the main channel and the backwaters as water levels rise and fall with the seasons – construction of dikes or berms for artificial water level manipulation may limit this; 2) Limit or reduce sedimentation from adjacent uplands, and promote and maintain clean upland groundwater flow to the backwaters, including limiting row crops and fertilizer applications adjacent to the river and its floodplain; 3) Minimize dredging and rip-rapping within the backwater areas except as necessary to maintain connectivity; 4) Limit introduction and spread of aquatic invasive species; and 5) Restore and maintain native aquatic plant communities (especially floating-leaved plants), and 6) Retain trees and tree roots that overhang the water along with coarse woody debris in the water.

#### Threats to Avon Bottoms and its denizens

The Sugar River is dammed in six places along its entire length, including a large dam at Brodhead (Decatur Lake) and a large dam at Lake Albany. In general, dams affect aquatic species and habitats by fragmenting them into disjunct segments, preventing the movements of some species between different stretches of the river. In addition, dams may disrupt the natural hydrological fluctuations associated with free-flowing rivers and streams that are integral to wetlands formed under fluctuating water levels and the many species that depend upon them, including amphibians that rely on a specific hydrological regime to

complete certain life-stages (PARC 2002). Canopy tree dominants such as cottonwood and silver maple that may have used the natural hydrological fluctuations to obtain a niche on certain geomorphic surfaces (point bars, levees, swales) may have declined in dominance, while the importance of opportunistic species may have increased (Tingle et al. 2001).

Possibly the most significant impact of these hydrological manipulations is decreased variability of water levels, especially high-water and low-water extremes, and the commensurate alteration of floodplain landform development (sand bars, islands, slough channels, levees, etc.). Since diversity in landforms is correlated with plant species diversity (Crow et al. 2000), this change has the potential to have long-term impacts on plants and community composition. In addition, alterations to flooding regimes affect the inundation period of floodplain habitats. On the Lower Wisconsin River, Pfeiffer (2001) showed that the decrease in maximum flows has a significant impact on the frequency of complete inundation, resulting in a decrease in the amount of time the ridges and higher areas of the floodplain are fully saturated. Oxygen depletion of the root zone thus occurs less frequently, resulting in greater tree survival and possibly more closed-canopy forests. The decrease in flood severity and duration of flood periods may also impact



Dams such as this one at Albany on the Sugar River may fragment fish habitat, disrupt natural hydrological fluctuations that support wetland plant communities, and inhibit amphibian life cycles. Photo by WDNR staff.

lower-elevation floodplain habitats, as less scouring is occurring and anoxic conditions may not be long enough to favor species that can tolerate these conditions.

Although these alterations have undoubtedly impacted the Floodplain Forest of **Avon Bottoms WA**, understanding precisely how they have changed the composition, structure, and age class distribution of this forest ecosystem is difficult. This and many other Floodplain Forests in Wisconsin may, in fact, be transitioning to novel ecosystems due to hydrological manipulation. Ecological restoration that aims to restore plant communities to reflect undisturbed conditions may not be

appropriate, at least in this setting, given the long history of hydrological modification and other disturbances here (Tingle et al. 2001). Given that many of the changes to these forests were made by factors that are likely to continue into the future, key management considerations involve determining how to maximize beneficial changes to these forests (e.g., habitat for rare and declining species) while reducing the less beneficial aspects (e.g., ecological simplification).

#### Partnerships that promote landscape-scale conservation

Southwest of the Sugar River, approximately 350 acres of former cropland at **Avon Bottoms WA** have been restored to prairie/sedge meadow through hydrological restoration and seeding. This adjoins 3,500 acres of wetland and floodplain easements that the Natural Resources Conservation Service (NRCS) acquired on private lands that have been restored to floodplain hardwoods and wet prairie. Natural Heritage Land Trust (NHLT) and Pheasants Forever are also making significant contributions to land protection in the area. WDNR lands combine with those protected and restored by NRCS, NHLT, and Pheasants Forever to create a vast and complex landscape matrix of open and forested wetlands,

providing untold benefits to diverse animal species and creating an important natural buffer for the riparian natural communities here.

There is a significant opportunity for expansion of the Avon Bottoms and Sugar River COAs by coordinating with Winnebago County Forest Preserves on lands immediately to the south in Illinois. Three preserves protect approximately 1,300 acres of land south of Avon Bottoms WA: Sugar River Alder, Colored Sands, and Sugar River. These preserves harbor lowland hardwoods, wetlands, riparian habitats, and sand prairie. The southern third of Colored Sands harbors several Illinois endangered and threatened plant and animal species. The Sand Bluff Bird Observatory, also within Colored Sands, is one of the largest small-bird banding facilities in the country.

## **Wetlands of the SRPG**

With the exception of the **SIATA (Montrose Segment)**, all of the SRPG properties have a river or stream flowing through them (Table 5). As a result, wetlands and aquatic habitats figure prominently in the habitat types of this property group. It is notable that eight of the ten Primary Sites designated for this property group are wetlands, bespeaking the significant role they play in the larger landscape. Riparian corridors and associated wetlands offer important habitat for a number of species, including bats, herptiles, aquatic invertebrates, and fish. The Sugar River extending from just west of **Brooklyn WA** down to the Illinois border holds statewide importance as a riparian corridor that provides diverse wetland and aquatic communities (WDNR 2006a). An opportunity also exists to protect the floodplain corridor along the Little Sugar River between Albany WA and extensive wildlife habitats to the west.

**Table 4. Wetlands of the Sugar River Planning Group**

Primary source: Wisconsin Wetlands Inventory

Property Name	Remnant Wetlands										Anthropogenic Wetlands		Approximate Total Wetland Area (Acres)
	Bog Relict	Calcareous Fen	Emergent Marsh	Floating-leaved Marsh	Floodplain Forest	Shrub-carr	Southern Sedge Meadow	Tamarack (rich) Swamp	Wet-mesic Prairie	Wet Prairie	Wet Meadow	Wetland Planting (former cropland)	
Albany WA		x	x		x	x	x				x		741
Albany EWHA			x		x	x	x				x		322
Anthony Branch FA		x				x	x				x		383
Avon Bottoms WA					x				x	x	x	x	1,956
Badfish Creek WA			x			x	x			x	x		831
Brooklyn WA			x			x	x		x	x	x		1,298
Evansville WA		x					x			x	x		590
Footville PHG <sup>1</sup>										x	x		30
Hook Lake-Grass Lake WA	x		x	x				x					450
Liberty Creek WA*						x	x		x	x	x		520
SIATA (Montrose Segment)													0

\*Wetlands Inventory data not available. Acreage based on NHI inventory data.

Riparian wetlands are common throughout the property group. They serve to slow the release of water during storms (thus minimizing flooding), filter nutrients and pollutants that are carried in runoff, and provide moisture banks during low water periods or droughts. Riparian wetlands also provide vital habitat to many animals, as well as natural corridors for their migration.

Open and brushy wetlands comprise the majority of land cover on the SRPG. Natural community types represented here include Southern Sedge Meadow, Shrub-carr, Wet Prairie, Wet-mesic Prairie, Calcareous Fen, Emergent Marsh, Floating-leaved Marsh, and Bog Relict (Table 7). Although Southern Sedge Meadow is probably the dominant natural community of the SRPG, the wetland landscape actually comprises a mosaic of intertwined wetland types where Calcareous Fen, Wet Prairie, Wet-mesic Prairie, and Emergent Marsh intergrade with sedge meadow due to variations in topography, hydrology, soil type, and disturbance history. Their quality and extent is largely influenced by modification of local hydrology through damming of adjoining waterways and ditching/tiling of the wetlands. Run-off from croplands, residential areas, and eroding streambanks also have a negative impact on wetlands. Non-native invasives, especially reed canary grass, can also dominate and eventually supplant native wetland plants. Extensive areas of disturbed, reed canary grass-dominated wetlands occur throughout the property group, and are termed "wet meadows;" these may represent either remnant but severely degraded sedge meadows or anthropogenic sites where the original natural community was destroyed (Eggers and Reed 1997).

<sup>1</sup> Analysis only considers land owned by WDNR; project boundary includes significant acreages of easement lands with wetlands present.

At some properties, formerly drained and cropped wetlands have been restored hydrologically and planted with native wetland species. Notable initiatives of this type of wetland restoration are found at **Avon Bottoms WA and Brooklyn WA**. It is important to acknowledge that thousands of acres of seasonal or semi-permanent farmed wetlands may be present during wet years (e.g., in the Evansville-Footville area, particularly in the Marsh Creek and Bass Creek drainages). While protecting and, where resources allow, restoring wetlands on WDNR properties represents a significant conservation action in itself, enhancing availability of wetlands on proximal farmlands could represent a major conservation opportunity.

Many of the open wetland types represented at the SRPG are rare both at the state level and globally. Communities that have an "S2" state element rank (imperiled in Wisconsin) include Tamarack (rich) Swamp, Wet Prairie and Wet-mesic Prairie, while those with an "S3" rank (rare or uncommon in Wisconsin) include Bog Relict, Southern Sedge Meadow, and Calcareous Fen. This rarity translates into many rare plant associates such as the state-threatened round-fruited St. John's-wort (*Hypericum sphaerocarpum*), and the state special concern glade mallow (*Napaea dioica*).



Turtle nesting site at Albany Wildlife Area with several depredated nests and encroaching brush and trees. Photo by R. Staffen

*Herptiles and Wetlands.* Amphibians are important indicators of wetland health and environmental conditions as their permeable skin makes them especially vulnerable to pollutants. They can make up a large portion of the vertebrate biomass in some ecosystems, and are important both as consumers of insects and other invertebrates and as prey in aquatic and terrestrial food webs (Burton and Likens 1975, Petraska and Murray 2001). Many amphibian species around the world are experiencing population declines (Alford and Richards 1999, Houlahan et al. 2000, Kiesecker et al. 2001). These declines are attributed to numerous factors, but habitat loss via destruction, fragmentation and alteration are likely to be the most serious culprits (WDNR 2001). In Wisconsin, more than 50% of our presettlement wetland acreage has been lost (WDNR 2001).

The properties making up the SRPG protect large wetlands associated with the Sugar River and its tributaries. These wetlands provide basking, foraging, and overwintering habitat for numerous rare or uncommon amphibians and reptiles. Frog and toad calling surveys in spring and summer 2013 within the planning group found records of uncommon or declining amphibians including pickerel frog, northern leopard frog, and bullfrog. There are historical records of the state endangered northern cricket frog in the SRPG, but none were heard during the inventory effort. Pickerel frogs (*Lithobates palustris*) breed in wetlands in close proximity to cold water streams and spring runs. The northern leopard frog breeds in a wide variety of wetland ponds and can be found in prairies and meadows at long distances from water.

Blanding's turtles are found in good numbers in wetlands throughout the planning group. This semi-aquatic turtle spends much of its life cycle in marshes along large rivers and streams but requires open, sandy habitat in close proximity to these area for nesting. The loss or succession of open nesting habitats

forces many turtles to nest on roadside shoulders where they are more susceptible to vehicle collisions or clustered together in small upland sites where they are more prone to depredation by abundant meso-predators like common raccoons (*Procyon lotor*) and striped skunks (*Mephitis mephitis*). Other aquatic turtles known to commonly occur in the SRPG are the snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), and spiny softshell turtle (*Apalone spinifera*).

## Oak Savanna Conservation

Historically, Oak Openings were abundant in Wisconsin, covering approximately 5.5 million acres (Curtis 1959) south of the Tension Zone. Review of historical literature indicates that Oak Openings once supported an exceptionally diverse flora, about 25% of the entire native flora of Wisconsin (Leach and Givnish 1999). Of the about 75,000 acres (Hoffman 2009) of Oak Opening remaining in Wisconsin, many of these are highly degraded or have succeeded to closed-canopy oak forests. The few extant remnants are mostly on drier sites, with the mesic and wet-mesic Oak Openings almost totally destroyed by conversion to agricultural or residential uses and by the encroachment of other woody plants due to fire suppression. Oak Woodland once occupied approximately 1.4 million acres (Curtis 1959) in pre-widespread Euro-American settlement Wisconsin; today, it is extraordinarily rare – only about 140,000 acres remain in the state (Hoffman 2009). Most of these remnants are highly degraded and have converted to closed-canopy oak forest. Oak Barrens historically occupied approximately 1.8 million acres in Pre-European Settlement Wisconsin (Richard Henderson, personal communication), but is now reduced to approximately 95,000 acres (Hoffman 2009; includes both pine and oak barrens).

Opportunities exist on SRPG properties to restore Oak Openings, Oak Woodlands, and Oak Barrens, and to increase their connectivity. Such actions would also improve habitat for many plants and animals that are specialists of grassland, savanna, woodland, and barrens. Rare plant species already known on the property group that may recover or increase in number with Oak Opening and Oak Woodland restoration include yellow giant hyssop (*Agastache nepetoides*, State-Threatened), kitten tails (*Besseyia bullii*, State-Threatened), and purple meadow-parsnip (*Thaspium trifoliatum* var. *flavum*, Special Concern). Prairies, barrens and oak savannas are all critically important habitats for snakes and lizards, including some that are rare or declining (see "Herptiles" section below). Restoration of Oak Woodland/Southern Dry Forest with dense leaf litter on well-drained soils could also benefit rare small mammals such as the woodland vole (*Microtus pinetorum*, Special Concern). A number of bird species also will benefit from oak savanna restoration, including SGCN such as red-headed woodpecker (*Melanerpes erythrocephalus*), black-billed cuckoo (*Coccyzus erythrophthalmus*), field sparrow, and upland game birds such as northern bobwhite (*Colinus virginianus*) and wild turkey (*Meleagris gallopavo*).



Kitten tails. Photo by Thomas Meyer.

Typical oak savanna restorations in Wisconsin require aggressive and intensive management for a period of 15 or more years. This reflects the highly degraded state of most sites, and the time and effort required to effectively restore system structure and function. Be aware that limited short-term efforts could result in merely a structural restoration with no ecosystem functionality, and may be considered wasteful. Also bear in mind that many former oak savannas are now closed-canopy forests that provide critical habitat for numerous bird species. Ecological restoration that converts closed-canopy forests to oak savanna may benefit some savanna specialist species at the expense of other species. As with all ecological restoration

opportunities, sufficient resources must be available to ensure success of the project before the difficult decision of limiting habitat for some species in favor of other species is made.

While most oak savannas in southern Wisconsin are by nature highly degraded, several oak savanna sites were identified in the SRPG that show good restoration potential:

- **Brooklyn Oak Savanna and Dry Prairie Primary Site**
- **Badfish Creek WA (southeast corner)**
- **Anthony Branch FA (northwest part of site)**
- **Albany Sand Prairie and Oak Savanna Primary Site**
- **Swenson Wet Prairie SNA**

## Prairie Conservation

Prairie once occupied approximately 2.1 million acres in Wisconsin. Now, approximately 2,000 acres remain – less than 0.1% (Leach and Givnish 1999). Of these, only those prairies that occurred at the wet and dry ends of the soil spectrum survived. Virtually all deep-soil Mesic Prairies were converted to agricultural or residential uses. The surviving remnants are highly degraded due to fire suppression, overgrazing, invasion of woody species, invasive species and, in the case of Wet Prairies, ditching, and tiling. Virtually all of the upland deep-soil prairies of the SRPG were plowed in the past for farm land. Dry Prairie remnants that survive today are on shallow rocky soils, often on steep south- and west-facing slopes, while Sand Prairies can occur on sandy soils on level or gently rolling terrain. These remnants are small and generally degraded due to past grazing, fire suppression, and invasion of woody and non-native species.

A number of rare prairie plants are already known on the SRPG, thus protection and restoration of remnant prairies are essential for their conservation (Table 6).

**Table 5. Rare Plants of the Sugar River Planning Group Associated with Prairie**

<b>Common Name</b>	<b>Latin Name</b>	<b>State Status</b>	<b>Prairie Types</b>
Prairie Milkweed	<i>Asclepias sullivantii</i>	THR	Mesic, Wet-mesic
Prairie Indian-Plantain	<i>Cacalia tuberosa</i>	THR	Dry, Wet-mesic, Wet
Small White Lady's-slipper	<i>Cypripedium candidum</i>	THR	Mesic, Wet-mesic, Wet
Pale Purple Coneflower	<i>Echinacea pallida</i>	THR	Dry, Dry-mesic, Mesic
Round-fruited St. John's-wort	<i>Hypericum sphaerocarpum</i>	THR	Mesic, Wet-mesic, Wet
Rough Rattlesnake-root	<i>Prenanthes aspera</i>	END	Dry, Dry-mesic, Sand

Remnant upland prairie is found at three sites on the SRPG:

- **State Ice Age Trail Area (Montrose Segment)**
- **Brooklyn Oak Savanna and Dry Prairie Primary Site**
- **Albany Wildlife Area**

While these remnants are small and of low- to moderate quality, they are important for protecting relicts of exceptionally rare community types as well as for providing a venue for citizen engagement through volunteer-led land management.

Good examples of remnant Wet Prairie are found at:

- **Badfish Creek Wet Prairie Primary Site**
- **Brooklyn Wet Prairie Primary Site**
- **Evansville Wet Prairie Primary Site**

Good-quality examples of remnant Wet-mesic Prairie occur at:

- **Swenson Wet Prairie State Natural Area**
- **Liberty Creek Wildlife Area (including but not restricted to Liberty Creek Wet Prairie Primary Site)**

*Herptiles and Prairie Conservation.* Prairies, barrens and oak savannas are all critically important habitats for snakes and lizards, including some that are rare or declining. By providing a continuum of these management dependant natural communities, the habitat needs for numerous wildlife species are maximized, and their safe movement from one location to the next is ensured. These connections enable access to critical areas for basking and thermoregulation, overwintering, staging, nesting, and foraging. Management aimed at retaining or restoring open qualities of prairies, barrens, and savannas by controlling brush and invasive species would benefit many reptile species. Extensive spotted knapweed (*Centaurea biebersteinii*) populations are thought to deter reptiles nesting in Sand Prairies and should be a priority for control efforts (Bob Hay, Per. Com.). Maintaining open grassland, barrens and savanna habitats for herptiles will also benefit many bird, small mammal, and invertebrate species that rely on these habitat types as well.

Based on current distributional records and the habitat characteristics, **Albany Sand Prairie and Oak Savanna Primary Site** appears to be an important nesting area for turtles and is potentially suitable habitat for a variety of rare herptiles. At **Avon Bottoms WA**, the planted sand prairies along Smith and Carroll Roads potentially provide similar suitable habitat for these same sand-loving reptiles.

*Small mammals and grassland conservation.* Small mammals play important roles in ecosystem function: they serve as prey for numerous predators, they spread mycorrhizal fungi through their soil disturbance, and they influence the size and composition of some insect communities. Many native small mammals have declined both in range and abundance in the past 100 years due to habitat degradation and destruction (Stephens 2011). Given their relatively short dispersal capabilities, loss of these animals from an area makes it very difficult for them to recolonize unless a local source population exists nearby. Thus, it is important to determine the extent to which these sensitive species occur and when found, utilize adaptive management techniques in order to allow the species to persist as part of a functioning ecosystem.

During limited trapping efforts in the SRPG in prairie and surrogate grassland habitats, the Special Concern prairie vole (*Microtus ochrogaster*), prairie deer mouse (*Peromyscus maniculatus bairdii*), and western harvest mouse (*Reithrodontomys megalotis*) were located.

## Non-Game Bird Conservation

### Grassland Birds

Biologists and birders are concerned about population declines of many grassland bird species. Since the North American Breeding Bird Survey (BBS) began in 1966, grassland birds have declined more steeply than any other group of birds in North America and the Midwest (Sample and Mossman 1997, Askins et al. 2007). The SRPG provides significant opportunities for grassland and shrub bird conservation (Table 7).

Managing from a landscape perspective can better accommodate the complex habitat needs of a greater number and variety of grassland birds and other grassland obligate species, and may include wetland, upland, and shrub components. Grassland bird habitat may be managed at three different scales: large (>10,000 acres), medium (1,000-9,000 acres), and small (400-1,000 acres).<sup>2</sup> Although it may be inappropriate to manage isolated grassland communities in landscapes where row crops are the dominant cover type, large (500 acres and greater) grassland restorations may be justifiable in that context. Continued expansion and connection of prairies, wetlands, fallow fields, pastures, and surrogate grasslands on SRPG properties can provide grassland bird habitat at a landscape scale.



Eastern Meadowlark. Photo © Laura Erickson.

Grassland bird habitat occurs in the SRPG in both upland (sand prairie, idle warm-season grasses/forbs, idle cool-season grasses/forbs, old field, fallow fields, upland shrub, and oak savanna ) and wetland (Southern Sedge Meadow, Wet Prairie, Wet-mesic Prairie, wet meadow, wet old field) settings. The most important types for both common and uncommon/vulnerable birds are sedge meadow, idle warm- and cool-season grasses/forbs, and upland shrub (Sample and Mossman 1997).

Grassland bird habitat is most effectively maintained as large landscapes of continuous grassland, uninterrupted by hedgerows<sup>3</sup>, with the cover of woody plants less than 5% (Sample and Mossman 1997). Hedgerows fragment grasslands and provide habitat/movement corridors for predators of grassland birds. Structural diversity within the grassland, including short and tall grass, a mix of grasses and forbs, and a management rotation of type, intensity, and frequency, is also important for grassland bird habitat.

**Table 6.** Grassland and shrub bird species of conservation concern of the SRPG. Listing status based on June 2011 NHI Working List.

Common Name	Scientific Name	State Status
Bell's vireo	<i>Vireo bellii</i>	THR
blue-winged teal	<i>Anas discors</i>	SC
blue-winged warbler	<i>Vermivora pinus</i>	SC
bobolink	<i>Dolichonyx oryzivorus</i>	SC
brown thrasher	<i>Toxostoma rufum</i>	SC
dickcissel	<i>Spiza americana</i>	SC
eastern meadowlark	<i>Sturnella magna</i>	SC

<sup>2</sup> For further guidance on landscape-scale grassland bird conservation, see Sample and Mossman 1997, Rich et al. 2004, and Potter et al. 2007.

<sup>3</sup> A "hedgerow" is a row of shrubs or trees that form a hedge, especially around a field or along a road or path.

*Table 7, continued*

Common Name	Scientific Name	State Status
field sparrow	<i>Spizella pusilla</i>	SC
grasshopper sparrow	<i>Ammodramus savannarum</i>	SC
Henslow's sparrow	<i>Ammodramus henslowii</i>	THR
lark sparrow	<i>Chondestes grammicus</i>	SC
northern bobwhite	<i>Colinus virginianus</i>	SC
northern harrier	<i>Circus cyaneus</i>	SC
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	SC
vesper sparrow	<i>Pooecetes gramineus</i>	SC
willow flycatcher	<i>Empidonax traillii</i>	SC
yellow-breasted chat	<i>Icteria virens</i>	SC

The following four properties present the best potential for managing for grassland birds in the SRPG due to their large size and landscape context, in order of priority from highest to lowest:

- **Avon Bottoms WA** (medium-scale landscape)
- **Brooklyn WA** (medium-scale landscape)
- **Badfish Creek WA** (small-scale landscape)
- **Hook Lake-Grass Lake WA** (small-scale landscape)

**Avon Bottoms WA** supports a strong population of eastern meadowlark, more than 100 pairs of dickcissel, bobolink, and several rare species. The USDA Natural Resources Conservation Service has also restored thousands of acres of wetlands and grasslands on private land easements adjacent to Avon Bottoms which, when combined with the wildlife area lands, provide more than 2,000 acres of grassland habitat. **Brooklyn WA** was identified as a "key site" for conservation of "grassland-shrub" habitat in the Wisconsin All-Bird Plan (Wisconsin Bird Conservation Initiative 2013), with approximately 2,000 acres of grasslands and wetlands. Numerous examples of obligate grassland birds and many that require shrubs for nesting were located during the recent biotic inventory. **Hook Lake-Grass Lake WA** harbors over 500 acres of prairie plantings and open wetlands, with opportunities to connect with grassland restoration projects on adjoining private lands and federal Waterfowl Production Areas (WPA). **Badfish Creek WA** harbors at least 600 acres of grassland and sedge meadow. A possible opportunity for promoting a medium-scale landscape exists if the grassland management area is expanded to include **Hook Lake-Grass Lake WA**, **Badfish Creek WA**, **Anthony Branch WA**, and proximal WPAs.

### Forest Birds

Older stands of oaks and bottomland forests found at **Albany WA**, **Brooklyn WA**, and **Avon Bottoms WA** have attracted an impressive assemblage of rare or declining forest birds (Table 8). Some of these bird species are at the northerly extent of their range in Wisconsin, adding to the diversity and species richness of the sites.

**Table 7. Forest interior birds of conservation concern of the SRPG**

Common Name	Scientific Name	State Status
Acadian flycatcher	<i>Empidonax virescens</i>	THR
cerulean warbler	<i>Dendroica cerulea</i>	THR
hooded warbler	<i>Wilsonia citrina</i>	THR
Kentucky warbler	<i>Oporornis formosus</i>	THR
least flycatcher	<i>Empidonax minimus</i>	SC
red-shouldered hawk	<i>Buteo lineatus</i>	THR
wood thrush	<i>Hylocichla mustelina</i>	SC
veery	<i>Catharus fuscescens</i>	SC

Large, protected blocks of forest are rare in south-central Wisconsin. Historically, this was a landscape of expansive prairies, marsh and wet meadow, and oak-dominated forests and savannas. Today, oak forests in this part of the Southeast Glacial Plains Ecological Landscape are largely isolated and fragmented second-growth woodlots or restricted to areas along major river systems like the Sugar River. Indeed, the habitat context of the oak-dominated areas of the SRGP where forest birds have been observed is somewhat poor and the stands are fragmented, often resulting in low population numbers and uncertain nesting success. It is debatable whether some of these areas can actually promote viable long-term populations of forest birds, particularly those that rely on large uninterrupted blocks of forest ("forest interior birds"). The master plan team may find it helpful to consider three alternatives for bird conservation in oak forests: 1) promote larger forest acreages to better support declining forest interior birds; 2) promote small blocks of oak forest that support more common forest birds; or 3) promote oak savanna habitat (which can include Oak Woodland) and a different suite of birds that is also declining.

Primary determinants of forest interior habitat quality include stand composition, age, size, structure, and canopy closure, proximity to water or roads, slope and aspect, stand size and shape, and proximity to other stands on the landscape (Wilson 2008). In general, forest interior birds benefit from blocks that are 250-300 acres or larger (also translates as continuous forest cover within a 6-mile radius). Limiting fragmentation associated with, but not limited to clear-cutting, road building, or utility and pipeline development is important to the continued viability of these large blocks of forest and their associated bird species (WDNR 2006a).

**Avon Bottoms WA** provides the best opportunity for forest birds in the entire planning group and has also been recognized as an Important Bird Area. This extensive corridor of mature forest combines with a unique tree composition, large diameter canopy trees, vertical structural diversity, and abundant snags to attract a diverse array of forest birds, including some high conservation priority bird species.

**Albany WA** and **Brooklyn WA** have areas of older-aged Oak Woodland and Southern Dry Forest dominated by white, black, and red oak that attract diverse forest birds, including some "forest interior birds" of high conservation priority. Several stands at **Albany WA** are planned for oak regeneration harvest that will leave them unsuitable for forest interior birds for many decades.

### **Wetland Birds**

Southern Sedge Meadow, Emergent Marsh, and Submergent Marsh on the SRGP provide important habitat for marsh birds such as sedge wren and American bittern (Special Concern), as well as for waterfowl and water birds such as black tern (*Chlidonias niger*, Special Concern<sup>4</sup>).

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<sup>4</sup> The status of this bird will change to State-Endangered on January 1, 2014.

## Wildlife Action Plan Implementation and the SRPG Conservation Opportunity Areas

Conservation Opportunity Areas (COAs) are places in Wisconsin that contain ecological features, natural communities, or SGCN habitat that present the greatest likelihood of successfully implementing conservation actions when viewed from the global, continental, upper Midwest, or state perspective. Several SRPG properties fall within COAs (see also the map in Appendix B):

- **Albany WA** lies within Muralt Bluff COA, which holds statewide significance for extensive grassland communities, including Dry Prairie, Dry-mesic Prairie, and Surrogate Grasslands; opportunities for Oak Opening restoration are also significant here.
- **Avon Bottoms WA** occurs within the Avon Bottoms COA, which harbors Floodplain Forest of statewide significance.
- Sugar River COA runs through **Albany WA** and **Avon Bottoms WA**, which is recognized for its diverse aquatic communities of statewide significance.
- **Brooklyn WA** lies within an unmapped COA called "Southeast Glacial Plain Marshes," which holds statewide significance for high quality wetland communities.

The Wisconsin Wildlife Action Plan identifies Ecological Priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the SGCN. Appendix E highlights the Ecological Priorities for vertebrate SGCN at SRPG properties. Note that these ecological priorities include all of the SGCN that may possibly occur on the SRPG within the existing natural communities, not just those species detected during surveys. This intersection of SGCN with priority natural communities in the Southeast Glacial Plains Ecological Landscape represents the best opportunities for management at the SRPG properties from an ecological/biodiversity perspective.

### Priority Conservation Actions

The Wildlife Action Plan also describes Priority Conservation Actions that make effective use of limited resources and address multiple species with each action. Implementing these actions and avoiding activities that may preclude successful implementation of these actions in the future would greatly benefit the SGCN at SRPG. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006a) for the **Southeast Glacial Plains** Ecological Landscape that apply to SRPG include:

- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie and savanna management practices within the context of smoke management and clean air parameters.
- Identify additional sites containing high quality or restorable oak barrens, oak savannas and woodlands.
- Preserve and manage all wet-mesic prairie sites, restore degraded sites, and manage the sites in a matrix of surrogate grasslands and other shrub and savanna habitats for area-sensitive species.
- Monitor wet-mesic prairies to determine whether prescribed burning and other management activities are maintaining invertebrate diversity.
- Preserve and manage all wet-mesic prairie, calcareous fen and tamarack fen sites; restore degraded sites (emphasizing restoration of hydrology), and manage the sites in a matrix of sedge meadow, surrogate grasslands and other shrub and savanna habitats for area-sensitive species.
- Conduct inventories to better delineate Cerulean Warbler populations on public and private lands.
- Maintain large blocks of open sedge meadow and manage within a complex of associated wetlands such as wet prairie, emergent marsh, shrub-carr, and floodplain forest by maintaining hydrology, tree cutting and harvest, prescribed fire and eradicating invasive plant species.

- Protect the ecological river corridor gradients from lowlands to uplands, along with protection of the floodplain corridor. This will enlarge the amount of habitat available, allow for the movement of species upslope and downslope as environmental conditions change over time, provide suitable habitat for species that require large areas or are dependent upon a mosaic of interconnected habitats for their long-term survival, and will provide migratory bird stopover habitat.
- Partner with prairie and savanna restoration groups to more efficiently accomplish habitat management.

Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006a) for the **Western Coulee and Ridges Ecological Landscape** that apply to SRPG (specifically, SIATA [Montrose Segment]) include:

- Restore oak openings and woodlands and expand and enhance dry prairie and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
- Develop educational tools and demonstration/training areas that promote prescribed fire and other prairie and savanna management practices.
- Partner with prairie/savanna/forest restoration groups to manage and protect habitats to effectively keep SGCNs on the landscape.

### Opportunities for Natural Community Conservation

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006a) identifies 34 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Southeast Glacial Plains Ecological Landscape**. Of these, 18 are present at the SRPG (Table 9).

**Table 8.** Major and Important Natural Community Management Opportunities in the Southeast Glacial Plains Ecological Landscape that occur in the SRPG (WDNR 2006a).

Major Opportunity	Important Opportunity
Bog Relict	Coolwater Streams
Calcareous Fen	
Dry-mesic Prairie	
Emergent Marsh	
Floodplain Forest	
Inland Lakes	
Mesic Prairie	
Oak Opening	
Oak Woodland	
Shrub Carr	
Southern Dry Forest	
Southern Dry-mesic Forest	
Southern Sedge Meadow	
Surrogate Grasslands	
Warmwater Rivers	
Warmwater Streams	
Wet-mesic Prairie	

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006a) also identifies 37 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Western Coulee and Ridges Ecological Landscape**. Of these, six are present at the SRPG at the SIATA (Montrose Segment; Table 10).

**Table 9.** Major and Important Natural Community Management Opportunities in the Western Coulee and Ridges Ecological Landscape that occur at Brooklyn Wildlife Area in the SRPG (WDNR 2006a).

Major Opportunity	Important Opportunity
Southern Dry-mesic Forest	
Surrogate Grasslands	
Dry Prairie	

## Wisconsin’s Statewide Forest Strategy and the SRPG

Wisconsin’s Statewide Forest Assessment (WDNR 2010a) was based on Wisconsin’s Forest Sustainability Framework (Wisconsin Council on Forestry 2008) and was designed to assess the current state of Wisconsin’s public and private forests and analyze the sustainability of our forested ecosystems. Wisconsin’s Statewide Forest Strategy (WDNR 2010b) contains a collection of strategies and actions designed to address the management and landscape priorities identified in the Statewide Forest Assessment. The strategies are broad guides intended to focus the actions of the forestry community. These documents include topics related to biological diversity in Wisconsin’s forests, and provide information useful for department master planning and management activities. Several Statewide Forest Strategies are particularly pertinent to the SRPG planning efforts in regard to opportunities to maintain or enhance biological diversity (Table 11, WDNR 2010b).

**Table 10.** Selection of Wisconsin Statewide Forest Strategies Relevant to the SRPG.

Strategy Number	Strategy
11	Encourage the management of under-represented forest communities.
13	Increase forest structure and diversity.
14	Encourage the use of disturbance mechanisms to maintain diverse forest communities.
15	Maintain appropriate forest types for the ecological landscape while protecting forest health and
19	Adapt forest management practices to sustainably manage forests with locally high deer
22	Strive to prevent infestations of invasive species before they arrive.
23	Work to detect new (invasive species) infestations early and respond rapidly to minimize impacts
24	Control and manage existing (invasive species) infestations.
25	Rehabilitate, restore, or adapt native forest habitats and ecosystems.

## Non-Native Invasive Species

Non-native invasive species thrive in newly disturbed areas, but also may invade and compromise high-quality natural areas. They establish quickly, tolerate a wide range of conditions, are easily dispersed, and are relatively free of the diseases, predators, and competitors that kept their populations in check in their native range. Non-native invasive plants can out-compete and even kill native plants by monopolizing light, water, and nutrients, and by altering soil chemistry and mycorrhizal relationships. In situations where non-native invasive plants become dominant, they may even alter ecological processes by limiting use of prescribed fire, by modifying hydrology, and by limiting tree regeneration and ultimately

impacting forest composition (WDNR In prep. b). In addition to the threats to native communities and native species diversity, non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation, agriculture, and human health (by causing skin rashes and increasing incidence of tick-borne diseases). For example, in bottomland forests, dense patches of reed canary grass can prevent regeneration of trees and a minor infestation can become dense if the canopy is opened beyond 80% cover (WDNR In prep. b). Non-native invasive plants and animals can also have negative impacts on fish and wildlife species by long-term displacement of native food sources (e.g., for white-tailed deer [*Odocoileus virginianus*] and turkey; Gorchov and Trisel 2003), diminishing habitat for ground-nesting birds (e.g., ovenbirds [*Seiurus aurocapillus*] and woodcock [*Scolopax minor*]; Miller and Jordan 2011, Loss et al. 2012) and altering aquatic macroinvertebrate communities in streams, thereby impacting fish that feed on them (McNeish et al. 2012).

The frequent usage of the SRPG for recreation has contributed to the introduction and spread of non-native invasive species throughout the properties. Parking areas, trails, and other high-use areas are typical entry points for non-native invasive species that are introduced by visitors' footwear, clothing, vehicle tires, boats, and recreational equipment. Once established, these invasives may continue to spread along natural corridors (e.g., waterways) and along human-made corridors (e.g. trails and roads). They even have the potential to invade remote natural areas via vectors such as wind, water, and wildlife. Non-native invasive species may also be spread inadvertently through management activities such as timber operations and roadside mowing, especially if Best Management Practices aren't followed.

Non-native invasive species that are widespread at SRPG and pose the greatest immediate threat to native species diversity, rare species habitats, or high-quality natural communities are listed in Table 12. See Table 13 for invasive species that are currently not known at SRPG, but could appear there.

When resources for complete control of widespread invasives are lacking, containment (i.e., limiting further spread) should be considered as an alternative action. Prevention of spread is, in fact, the most cost-effective means of dealing with invasive species. Forest inventory and management operations should take care to follow Best Management Practices related to non-native invasive species to avoid further spread. Roads, trails, access points for fishing, and other high-use areas are typical entry points for invasive species that are introduced by visitors' footwear, clothing, vehicle tires, boats, and recreational equipment. Once established, these invasives may continue to spread along natural corridors (e.g., streams) and along recreational corridors (e.g. hunting/fishing walking trails). Invasive species may also be spread inadvertently through management activities such as timber operations (especially trenching for planting pine seedlings), roadside mowing, and right-of-way maintenance. All management activities should follow the Best Management Practices developed by the Wisconsin Council on Forestry (WDNR 2009b). Furthermore, early detection and rapid control of new and/or small infestations should be considered for higher prioritization in any invasive species management strategy (Boos et al. 2010).

**Table 11.** Non-native Invasive Species currently known at the Sugar River Planning Group

Chapter NR 40 classification codes in superscript: P = Prohibited, R = Restricted, PR = Proposed Restricted, NR = Non-Restricted

Site codes: Al=Albany WA; AnBr=Anthony Branch FA; AvBo=Avon Bottoms WA; BaCr=Badfish Creek WA; Br=Brooklyn WA; Ev=Evansville WA; Fo=Footville PHG; GrLa=Grass Lake WA; HoLa=Hook Lake WA; LiCr=Liberty Creek; MoFa=SIATA (Montrose/Fahey).

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Sites Where Present
		Open	Wooded	Open	Wooded		
<b>Plants</b>							
autumn-olive <sup>R</sup>	Elaeagnus umbellata	x					Al, AnBr, Br, LiCr, MoFa
black locust <sup>PR</sup>	Robinia pseudoacacia	x	x				Al, AvBo, Br, LiCr, MoFa
butter-and-eggs	Linaria vulgaris	x					Al, Br, MoFa
Canada bluegrass	Poa compressa	x					MoFa
Canada thistle <sup>R</sup>	Cirsium arvense	x		x			Al, AnBr, BaCr, Br, Ev
common buckthorn <sup>R</sup>	Rhamnus cathartica		x		x		Al, AnBr, AvBo, BaCr, Br, LiCr, MoFa
crown vetch	Coronilla varia	x					AnBr, AvBo, Br
curly-leaf pondweed <sup>R</sup>	Potamogeton crispus					x	Sugar River in Dane & Green Cos.
dame's rocket <sup>R</sup>	Hesperis matronalis		x		x		Al, Br, Ev, Fo, MoFa
Eurasian bush honeysuckle <sup>R</sup>	Lonicera sp. (L. x bella, L. morrowii, L. maackii)	x	x		x		Al, AnBr, AvBo, BaCr, Br, Ev, Fo, HoLa, LiCr, MoFa
Eurasian water-milfoil <sup>R</sup>	Myriophyllum spicatum					x	Sugar River in Dane Co.
European earthworms	Families of Acanthodrilida, Lumbricidae, Megascloedidae	x	x				Present throughout region.
garlic mustard <sup>R</sup>	Alliaria petiolata		x		x		Al, AnBr, AvBo, BaCr, Br, Fo, HoLa, MoFa
glossy buckthorn <sup>R</sup>	Rhamnus frangula			x	x		Ev
helleborine orchid <sup>R</sup>	Epipactis helleborine		x				Al
hemp nettle <sup>R</sup>	Galeopsis tetrahit		x		x		Ev
hound's tongue <sup>R</sup>	Cynoglossum officinale	x		x			MoFa
Japanese barberry <sup>PR</sup>	Berberis thunbergii		x				Al
Japanese hedge-parsley <sup>R</sup>	Torilis japonica		x				Al, BaCr, Br, Ev, MoFa
Japanese knotweed <sup>R</sup>	Polygonum cuspidatum	x		x			BaCr? Known in Badfish Creek.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Sites Where Present
		Open	Wooded	Open	Wooded		
Kentucky bluegrass	<i>Poa pratensis</i>	x					Al, AnBr, AvBo, Br, LiCr, MoFa
leafy spurge <sup>R</sup>	<i>Euphorbia esula</i>	x					GrLa
moneywort <sup>PR</sup>	<i>Lysimachia nummularia</i>				x		Al, AvBo
multiflora rose <sup>R</sup>	<i>Rosa multiflora</i>	x	x				Al, AnBr, AvBo, Br, Fo, LiCr, MoFa
narrow-leaf cattail	<i>Typha angustifolia</i>			x			HoLa
Phragmites <sup>R</sup>	<i>Phragmites australis</i>			x			AnBr, Ev
purple loosestrife	<i>Lythrum salicaria</i>			x			BaCr? Known in Badfish Creek.
quackgrass <sup>NR</sup>	<i>Elytrigia repens</i>	x					Al, BaCr, Br, Fo, MoFa
red clover	<i>Trifolium pratense</i>	x					Al, Br, Ev, Fo, LiCr, MoFa
reed canary grass <sup>NR</sup>	<i>Phalaris arundinacea</i>	x		x	x		Al, AnBr, LiCr, Br, Ev, AvBo, Fo, GrLa
smooth brome <sup>NR</sup>	<i>Bromus inermis</i>	x					Al, AvBo, BaCr, Br, Fo, MoFa
spotted knapweed <sup>R</sup>	<i>Centaurea biebersteinii</i>	x					Al, AvBo, Br, Fo, HoLa
sweet clover <sup>NR</sup>	<i>Melilotus spp.</i>	x					Al, AvBo, Ev, Fo, MoFa
watercress	<i>Nasturtium officinale</i>			x			AnBr, Ev
white mulberry <sup>PR</sup>	<i>Morus alba</i>	x	x	x	x		AvBo, BaCr, Ev, Fo, MoFa
wild parsnip <sup>R</sup>	<i>Pastinaca sativa</i>	x		x			Al, AvBo, Fo, Ev, LiCr
<b>Animals</b>							
rusty crayfish	<i>Orconectes rusticus</i>					x	Allen Creek in Dane & Green Cos., Sugar River in Dane & Green Cos.

**Table 12.** Non-native invasives to watch for in the Sugar River Planning Group  
 Chapter NR 40 codes in superscript: P = Prohibited, R = Restricted, PR = Proposed Restricted, NR = Non-Restricted

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
<b>Plants</b>							
celandine <sup>R</sup>	<i>Chelidonium majus</i>		x				Present in region.
crown vetch <sup>PR</sup>	<i>Coronilla varia</i>	x					Present in region.
cut-leaved teasel <sup>R</sup>	<i>Dipsacus laciniatus</i>	x					Spreading along Dane County roadsides.
hill mustard*	<i>Bunias orientalis</i>	x					Popn approx 5 mi. southwest of Albany WA.
Japanese hops <sup>P</sup>	<i>Humulus japonicus</i>	x		x	x		Known in Dane & Lafayette Counties.
Java Waterdropwort <sup>P</sup>	<i>Oenanthe javanica</i>			x			Population on southwest side of Brodhead controlled.
oriental bittersweet <sup>R</sup>	<i>Celastrus orbiculatus</i>	x	x				Known in Dane & Rock Counties.
poison hemlock <sup>P</sup>	<i>Conium maculatum</i>	x		x			Known in Dane, Green & Rock Counties.
purple loosestrife <sup>R</sup>	<i>Lythrum salicaria</i>			x			Known throughout state.
tansy	<i>Tanacetum vulgare</i>	x					Known throughout state.
wild chervil**	<i>Anthriscus sylvestris</i>	x	x				Known in Dane, Green & Rock Counties.
<b>Animals</b>							
Emerald ash borer <sup>P</sup>	<i>Agrilus planipennis</i>		x		x		Confirmed in Rock County, also Dodge and Sauk Counties.
New Zealand mud snail <sup>P</sup>	<i>Potamopyrgus antipodarum</i>					x	Found in Black Earth Creek in 2013.
<b>Fungus &amp; Other Pathogens</b>							
oak wilt	<i>Ceratocystis fagacearum</i>		x		x		Present in region.

\*Restricted in Lafayette & Green Counties, Prohibited elsewhere.

\*\*Restricted in Dane County, Prohibited elsewhere.

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR (<http://dnr.wi.gov/topic/Invasives/>) and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups:

- Dane County Chapter of Ice Age Trail Alliance. Andrew Bent, Chapter Coordinator. [afbent@wisc.edu](mailto:afbent@wisc.edu), (608) 333-9896.
- Friends of Badfish Creek Watershed (particularly active in Japanese knotweed control) - Lynne Diebel, [lsdiebel@gmail.com](mailto:lsdiebel@gmail.com). <http://www.rockrivercoalition.org/badfish/index.asp>
- Friends of Brooklyn Wildlife Area. (608) 835-5144.
- Invasives Removal Squad (Rock/Green/Jefferson Co.) – Jordan Rowe, [Jordan.Rowe@tallgrassrestoration.com](mailto:Jordan.Rowe@tallgrassrestoration.com), (847)925-9830.
- Southeastern Wisconsin Invasive Species Consortium (SEWISC) - Jill Hapner, [Jill.Hapner@sewisc.org](mailto:Jill.Hapner@sewisc.org). <http://sewisc.org/>.
- Rock County Chapter of Ice Age Trail Alliance. Mike Guisleman, Chapter Coordinator. [pomeroy3@frontier.net](mailto:pomeroy3@frontier.net), (608) 884-9272.
- South West Weed Management Area (Grant, Crawford, Lafayette, Iowa, Richland, Dane, Sauk) - Mark Horn, [mark.horn@monarda.biz](mailto:mark.horn@monarda.biz), (608)836-0054.

#### Emerald Ash Borer

The emerald ash borer (EAB) (*Agrilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008, and is now found in 12 counties. The beetle attacks all species of ash (*Fraxinus* spp.) in Wisconsin, and the risk to forests is high: models predict that a healthy forest could lose 98% of its ash trees in six years (<http://www.emeraldashborer.wi.gov>).

The lowland forests of the SRPG are vulnerable to the effects of emerald ash borer, as white ash (*Fraxinus americana*), green ash, and black ash (*Fraxinus nigra*) are important tree species within this ecosystem. Large-scale loss of ash in this area, whether through EAB-caused mortality or harvesting, could cause a cascade of negative impacts. Degradation of diverse, high-quality forests and loss of forest cover could further lead to diminishment of important habitat for rare plants and animals (especially forest interior birds), elevated water tables, and infestation of disturbance-loving invasives such as reed canary grass (WDNR 2010a). It is important to note that removal of all ash as a stopgap measure against EAB is not recommended (WDNR 2010c).

#### Reed canary grass

Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. Hatch and Bernthal (2008) determined that approximately 500,000 acres of wetlands in Wisconsin are infested with reed canary grass. In addition to incurring devastating impacts on native plants and animals, reed canary grass can also alter hydrology by trapping silt and constricting waterways, and reduce the carbon sequestration capacity of wetlands (Wisconsin Reed Canary Grass Management Working Group 2009). This species prefers disturbed areas, but can also move into intact native wetlands. Invasion is most often associated with disturbances including erosion, ditching, stream channelization, logging of forested wetlands, and planting. Nutrient inputs such as sedimentation, fertilizer or agricultural runoff also encourage invasion and proliferation of reed canary grass.

Reed canary grass is extremely difficult to eradicate due to a number of factors: 1) A formidable seed bank may persist on a restoration site for many years; 2) A dense network of persistent rhizomes are

difficult to eliminate; 3) Recolonization from proximal sites is likely, given the ubiquitous distribution of this species; and 4) Establishment of desirable native vegetation may be costly and difficult (especially in a riparian setting that is prone to flashy flooding). No single control method is universally applicable, and in fact a combination of approaches applied over many years may be necessary. Each site has to be evaluated based on agricultural history, hydrological alteration, landscape context, and invasion pattern. Development of a comprehensive restoration plan is recommended to address not just reed canary grass control but also rapid re-establishment of desirable native vegetation and long-term monitoring.

A working group of Wisconsin natural resource professionals with experience in reed canary grass control have been meeting since the fall of 2005 to develop guidelines for the control of this invasive grass in Wisconsin wetlands. Their management guide is an excellent reference for land managers (Wisconsin Reed Canary Grass Management Working Group 2009), and includes information on how to set up a management plan using a combination of practices and timing of treatments that's tailored to specific site conditions, a table of available control techniques, and a listing of native plant species and seed mixes that will compete with reed canary grass. Additionally, the herbicide Sethoxydim is showing great promise for reed canary grass control in Wisconsin (Annen et al. 2005, Annen 2008).



Japanese knotweed is an invasive of riparian corridors. Photos by Nisa Karimi (upper left) and Elizabeth J. Czarapata (lower left).



Japanese hops, not currently known from the SRPG, but a new invasive species to watch for along streams. Photo by David Eagan.

## Game Species

*The following information was provided by WDNR wildlife managers*

The properties in the SRPG are mostly managed as State Wildlife Areas or Public Hunting Grounds. Although Anthony Branch is a Fishery Area, it is managed by the WDNR Wildlife management program. All of the properties within the planning group are open for hunting and provide habitat for a diverse assemblage of game species.

The wetlands within the group contain high quality breeding and stopover habitat for waterfowl. Open wetlands within the group contain moderate densities of nesting mallards and blue-winged teal as well as high quality wood duck brood cover. The Floodplain Forests and associated sloughs contain very high densities of breeding wood ducks and lesser numbers of mallards and blue-winged teal. Lesser game species associated with the herbaceous wetlands include nesting Wilson's snipe, sora and virginia rail.

The forests, woodlands and savannas within this property group provide habitat for white-tailed deer and wild turkey as well as eastern gray squirrel and eastern cottontail rabbit. The fragmented nature of this landscape naturally leads to high densities of wild turkey and white-tailed deer. Current forest cover contains an abundance of older oak, hickory, walnut and other mast trees. Management activities for these game species will continue to emphasize the regeneration of important mast trees in the landscape.

Upland and wet grasslands within the property complex also support wild populations of ring-necked pheasant, bobwhite quail and mourning doves. Since 2007, the matrix of lands surrounding these publicly managed properties has seen large decreases in grassland cover. This, coupled with two years of extremely high precipitation, have resulted in severe declines in wild quail and pheasant populations. Mourning dove populations remain strong in the landscape with most public lands management focused on providing dove hunting opportunity rather than high quality dove nesting habitat.

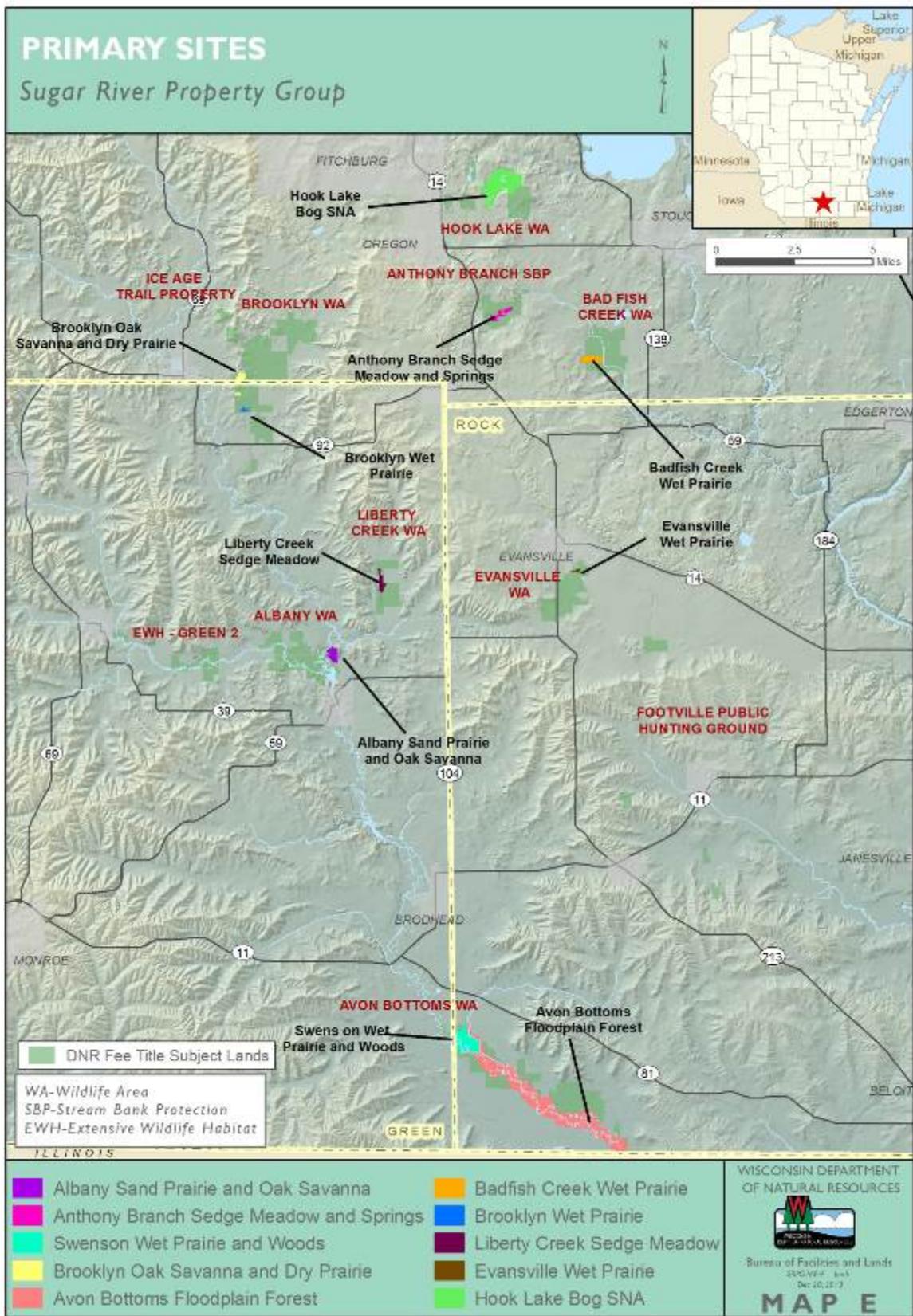
## Primary Sites: Site-specific Opportunities for Biodiversity Conservation

Ten ecologically important sites, or “Primary Sites,” were identified within the SRPG (Table 14 and Map E). Primary Sites are delineated because they generally encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration or connections. These sites warrant high protection and/or restoration consideration during the development of the property master plan. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process.

A complete description of the Primary Sites can be found in Appendix G. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations. Appendix H lists the rare species and high-quality natural communities currently known from these Primary Sites in the SRPG.

**Table 13.** Sugar River Planning Group Primary Sites.

<b>Code</b>	<b>Name</b>
SRPG01	Liberty Creek Sedge Meadow
SRPG02	Brooklyn Wet Prairie
SRPG03	Brooklyn Oak Savanna
SRPG04	Albany Sand Prairie
SRPG05	Evansville Wet Prairie
SRPG06	Avon Bottoms Floodplain Forest
SRPG07	Swenson Wet Prairie and Woods
SRPG08	Hook Lake Bog State Natural Area
SRPG09	Badfish Creek Wet Prairie
SRPG10	Anthony Branch Sedge Meadow and Springs



# Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for the Sugar River Planning Group. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species of the SRPG.

- A comprehensive invasive species inventory is needed, along with development of an invasive species management plan. This plan should include a monitoring strategy for detecting and rapidly responding to new invasive threats.
- Additional surveys for terrestrial invertebrates in open uplands would be beneficial. Though some surveys were conducted, they were relatively small in scope and time. Efforts should especially focus on butterflies and moths, grasshoppers, and beetles.
- Additional small mammal surveys are recommended throughout the planning group where dry prairie and sandy surrogate grasslands are present that could support uncommon prairie small mammals. Possible sites include Badfish Creek WA, Hook Lake WA (surrounding uplands), and other unsurveyed areas at Avon Bottoms WA, Brooklyn WA, Albany WA, and Footville Public Hunting Grounds.
- Qualitative mussel surveys of the Sugar River, Badfish Creek, and other warmwater rivers and streams found in the planning group should be considered.
- Expanded survey effort for northern cricket frogs (*Acris crepitans*), eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*), and ornate box turtle would be recommended. Monitoring for existing populations of herptiles identified during this inventory is also recommended.
- Fish surveys targeting backwaters of the Sugar River and non-game fishes throughout the SRPG is recommended.
- Complete forest cover type reconnaissance and mapping to aid in identifying various levels of forest management needs over time.
- A 17-acre block of oak forest in the far eastern part of Hook Lake Wildlife Area appears to be intact on 2010 air photos, but was not visited during 2013 surveys. Although too small to support forest interior birds, this sight could support rare plants such as yellow giant hyssop.
- At Liberty Creek Wildlife Area in the NE4NW4 of section 11 lies a 30+-acre area of open wetland that appears to have little reed canary grass based on air photos. Surveyors were unable to visit this area in 2013. It merits investigation.
- The 50-acre wetland complex at Albany Extensive Wildlife Habitat Area just south of the recreational trail and west of Schneeberger Road could use more survey work, especially for rare floodplain plants and frogs. In 2013, surveyors were only able to do a late-season plant survey in the eastern part of the area.
- The Wet Prairie at Badfish Creek was visited late in the season; it warrants addition inventory, targeting headwater springs in the western edge of the Primary Site and areas south of the unnamed stream that runs east through the site.

# Glossary

**Calciphile** – calcium-tolerant plants that favor wetland sites fed by carbonate-rich groundwater.

**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.

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

**Element occurrence** - an 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.

**Graminoid** - grasses and grasslike plants such as sedges and rushes.

**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.

**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.

**Representative** - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

**SGCN (or “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 2006a).

# Species List

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

Common Name	Scientific Name
<b>Plants</b>	
alder-leaved buckthorn	<i>Rhamnus alnifolia</i>
American hazelnut	<i>Corylus americana</i>
American pasqueflower	<i>Anemone patens</i>
arrowheads	<i>Sagittaria</i> spp.
basswood	<i>Tilia americana</i>
big bluestem	<i>Andropogon gerardii</i>
big-toothed aspen	<i>Populus grandidentata</i>
bishop's cap	<i>Mitella diphylla</i>
black ash	<i>Fraxinus nigra</i>
black cherry	<i>Prunus serotina</i>
black oak	<i>Quercus velutina</i>
black walnut	<i>Juglans nigra</i>
blue flag	<i>Iris virginica</i>
blue-joint grass	<i>Calamagrostis canadensis</i>
broad-leaved cat-tail	<i>Typha latifolia</i>
broad-leaved woolly sedge	<i>Carex pellita</i>
brook lobelia	<i>Lobelia kalmii</i>
bull-head pond-lily	<i>Nuphar variegata</i>
bulrushes	<i>Bulboschoenus fluviatilis</i> , <i>Schoenoplectus tabernaemontani</i>
burr oak	<i>Quercus macrocarpa</i>
bur-reeds	<i>Sparganium</i> spp.
buttonbush	<i>Cephalanthus occidentalis</i>
Canada goldenrod	<i>Solidago canadensis</i>
Canada moonseed	<i>Menispermum canadense</i>
Canada wild rye	<i>Elymus canadensis</i>
cardinal-flower	<i>Lobelia cardinalis</i>
cat-tails	<i>Typha</i> spp.
clearweed	<i>Pilea pumila</i>
common buckthorn	<i>Rhamnus cathartica</i>
common fox sedge	<i>Carex stipata</i>
common sneezeweed	<i>Helenium autumnale</i>
common woodreed	<i>Cinna arundinacea</i>
cottonwood	<i>Populus deltoides</i>
cowbane	<i>Oxypolis rigidior</i>
Culver's root	<i>Veronicastrum virginicum</i>
cutgrasses	<i>Leersia</i> spp.
cut-leaved coneflower	<i>Rudbeckia laciniata</i>
Dutchman's breeches	<i>Dicentra cucullaria</i>
eastern shooting-star	<i>Dodecatheon meadia</i>
edible valerian	<i>Valeriana edulis</i>
enchanter's night-shade	<i>Circaea lutetiana</i>

<b>Common Name</b>	<b>Scientific Name</b>
Eurasian bush honeysuckle	<i>Lonicera</i> spp.
fen grass-of-Parnassus	<i>Parnassia glauca</i>
fen panicled sedge	<i>Carex prairea</i>
flowering spurge	<i>Euphorbia corollata</i>
fowl manna grass	<i>Glyceria striata</i>
fringed brome	<i>Bromus ciliatus</i>
frostweeds	<i>Helianthemum</i> spp.
giant goldenrod	<i>Solidago gigantea</i>
glade mallow	<i>Napaea dioica</i>
goat's rue	<i>Tephrosia virginiana</i>
golden Alexanders	<i>Zizia aurea</i>
gooseberries/currants	<i>Ribes</i> spp.
grapes	<i>Vitis</i> spp.
gray dogwood	<i>Cornus racemosa</i>
green ash	<i>Fraxinus pennsylvanica</i>
hackberry	<i>Celtis occidentalis</i>
hairy hawkweed	<i>Hieracium longipilum</i>
hairy panic grass	<i>Dicanthelium acuminatum</i>
hop sedge	<i>Carex lupulina</i>
Joe Pye weed	<i>Eupatorium maculatum</i>
June grass	<i>Koeleria macrantha</i>
kitten tails	<i>Besseyia bullii</i>
leadplant	<i>Amorpha canescens</i>
leather-leaf	<i>Chamaedaphne calyculata</i>
Leonard's skullcap	<i>Scutellaria leonardii</i> var. <i>missouriensis</i>
little bluestem	<i>Schizachyrium scoparium</i>
long-branch frostweed	<i>Helianthemum canadense</i>
long-scaled tussock sedge	<i>Carex haydenii</i>
low water-parsnip	<i>Berula erecta</i>
marsh fern	<i>Thelypteris palustris</i>
marsh marigold	<i>Caltha palustris</i>
marsh muhly	<i>Muhlenbergia glomerata</i>
Michigan lily	<i>Lilium michiganense</i>
mountain mint	<i>Pycnanthemum virginianum</i>
multiflora rose	<i>Rosa multiflora</i>
needle grass	<i>Stipa spartea</i>
New England aster	<i>Aster novae-angliae</i>
New Jersey tea	<i>Ceanothus americanus</i>
northern bedstraw	<i>Galium boreale</i>
northern water-horehound	<i>Lycopus uniflorus</i>
obovate beak grass	<i>Diarrhena obovata</i>
old field goldenrod	<i>Solidago nemoralis</i>
orange jewelweed	<i>Impatiens capensis</i>
ostrich fern	<i>Matteucia struthiopteris</i>
panicled aster	<i>Aster lanceolatus</i> var. <i>simplex</i>
paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pennsylvanica</i>

<b>Common Name</b>	<b>Scientific Name</b>
poison sumac	<i>Toxicodendron vernix</i>
poison-ivy	<i>Toxicodendron radicans</i>
prairie blazing star	<i>Liatris pycnostachya</i>
prairie cordgrass	<i>Spartina pectinata</i>
prairie dock	<i>Silphium terebinthinaceum</i>
prairie drop-seed	<i>Sporobolus heterolepis</i>
prairie phlox	<i>Phlox pilosa</i>
purple meadow-parsnip	<i>Thaspium trifoliatum</i> var. <i>flavum</i>
purple pitcher plant	<i>Sarracenia purpurea</i>
raspberries/blackberries	<i>Rubus</i> spp.
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red-osier dogwood	<i>Cornus stolonifera</i>
reed canary grass	<i>Phalaris arundinacea</i>
Riddell's goldenrod	<i>Solidago riddellii</i>
river birch	<i>Betula nigra</i>
royal fern	<i>Osmunda regalis</i>
sawtooth sunflower	<i>Helianthus grosseserratus</i>
sensitive fern	<i>Onoclea sensibilis</i>
shagbark hickory	<i>Carya ovata</i>
shrybby cinquefoil	<i>Pentaphylloides floribunda</i>
side-oats grama	<i>Bouteloua curtipendula</i>
silky dogwood	<i>Cornus amomum</i>
silver maple	<i>Acer saccharinum</i>
skunk cabbage	<i>Symplocarpus foetidus</i>
slippery elm	<i>Ulmus rubra</i>
small-spike false nettle	<i>Boehmeria cylindrica</i>
smooth brome	<i>Bromus inermis</i>
spotted Joe Pye weed	<i>Eupatorium maculatum</i>
spotted knapweed	<i>Centaurea biebersteinii</i>
St. John's-wort	<i>Hypericum sphaerocarpum</i>
stiff goldenrod	<i>Solidago rigida</i>
stinging nettle	<i>Urtica dioica</i>
sugar maple	<i>Acer saccharum</i>
swamp aster	<i>Aster puniceus</i>
swamp lousewort	<i>Pedicularis lanceolata</i>
swamp milkweed	<i>Asclepias incarnata</i>
swamp saxifrage	<i>Saxifraga pennsylvanica</i>
swamp thistle	<i>Cirsium muticum</i>
swamp white oak	<i>Quercus bicolor</i>
sycamore	<i>Platanus occidentalis</i>
tall meadow-rue	<i>Thalictrum dasycarpum</i>
tamarack	<i>Larix laricina</i>
trembling aspen	<i>Populus tremuloides</i>
trout lily	<i>Erythronium albidum</i>
tussock sedge	<i>Carex stricta</i>
Virginia bluebells	<i>Mertensia virginica</i>

<b>Common Name</b>	<b>Scientific Name</b>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
Virginia waterleaf	<i>Hydrophyllum virginianum</i>
Virginia wild-rye	<i>Elymus virginicus</i>
water sedge	<i>Carex aquatilis</i>
water-plantains	<i>Alisma</i> spp.
water-shield	<i>Brasenia schreberi</i>
water-willow	<i>Decodon verticillata</i>
western sunflower	<i>Helianthus occidentalis</i>
white ash	<i>Fraxinus americana</i>
white meadowsweet	<i>Spiraea alba</i>
white oak	<i>Quercus alba</i>
white snakeroot	<i>Eupatorium rugosum</i>
white water-lily	<i>Nymphaea odorata</i>
wild calla	<i>Calla palustris</i>
wild chervil	<i>Chaerophyllum procumbens</i>
wild geranium	<i>Geranium maculatum</i>
wild rose	<i>Rosa</i> spp.
yellow giant hyssop	<i>Agastache nepetoides</i>
yellow lady's-slipper	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>
<b>Animals</b>	
American bullfrog	<i>Lithobates catesbeianus</i>
American woodcock	<i>Scolopax minor</i>
Bell's vireo	<i>Vireo bellii</i>
black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
buckhorn	<i>Tritogonia verrucosa</i>
cerulean warbler	<i>Dendroica cerulea</i>
common raccoon	<i>Procyon lotor</i>
dark rubyspot	<i>Hetaerina titia</i>
eastern massasauga rattlesnake	<i>Sistrurus catenatus catenatus</i>
eastern meadowlark	<i>Sturnella magna</i>
elktoe	<i>Alsmidonta marginata</i>
emerald ash borer	<i>Agrilus planipennis</i>
field sparrow	<i>Spizella pusilla</i>
grasshopper sparrow	<i>Ammodramus savannarum</i>
gravel chub	<i>Erimystax x-punctatus</i>
Henslow's sparrow	<i>Ammodramus henslowii</i>
hooded warbler	<i>Wilsonia citrina</i>
Kentucky warbler	<i>Oporornis formosus</i>
mourning dove	<i>Zenaida macroura</i>
mucket	<i>Actinonaias ligamentina</i>
North American racer	<i>Coluber constrictor</i>
northern bobwhite	<i>Colinus virginianus</i>
northern cricket frog	<i>Acris crepitans</i>
northern leopard frog	<i>Lithobates pipiens</i>
ornate box turtle	<i>Terrapene ornata</i>

<b>Common Name</b>	<b>Scientific Name</b>
ovenbird	<i>Seiurus aurocapillus</i>
painted turtle	<i>Chrysemys picta</i>
pheasant	<i>Sylvilagus floridanus</i>
pickerel frog	<i>Lithobates palustris</i>
plains clubtail	<i>Gomphus externus</i>
plains gartersnake	<i>Thamnophis radix</i>
prairie deer mouse	<i>Peromyscus maniculatus</i>
prairie vole	<i>Microtus ochrogaster</i>
prothonotary warbler	<i>Protonotaria citrea</i>
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
red-shouldered hawk	<i>Buteo lineatus</i>
river redhorse	<i>Moxostoma carinatum</i>
skillet clubtail	<i>Gomphurus ventricosus</i>
small square-gilled mayfly	<i>Cercobrachys lillieii</i>
snapping turtle	<i>Chelydra serpentina</i>
spiny softshell turtle	<i>Apalone spinifera</i>
star-headed topminnow	<i>Fundulus dispar</i>
striped skunk	<i>Mephitis mephitis</i>
swift river cruiser	<i>Macromia illinoensis</i>
veery	<i>Catharus fuscescens</i>
vesper sparrow	<i>Pooecetes gramineus</i>
western harvest mouse	<i>Reithrodontomys megalotis</i>
white-tailed deer	<i>Odocoileus virginianus</i>
wild turkey	<i>Meleagris gallopavo</i>
Winnebago small square-gilled mayfly	<i>Cercobrachys winnebago</i>
wood thrush	<i>Hylocichla mustelina</i>
woodland vole	<i>Microtus pinetorum</i>
worm-eating warbler	<i>Helmitheros vermivorus</i>
yellow-billed cuckoo	<i>Coccyzus americanus</i>
yellow-crowned night-heron	<i>Nyctanassa violacea</i>
yellow-throated warbler	<i>Dendroica dominica</i>

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# Additional Resources

Numerous online resources are available for learning more about the rare species, natural communities, and ecological concepts contained within this report. These are just a few of the resources that we recommend.

## 1. WDNR Natural Heritage Conservation Webpages for Animals, Plants, and Communities

Information for plants, animals, and natural communities on the Wisconsin Working List, as well as Species of Greatest Conservation Need from the Wisconsin Wildlife Action Plan. For reptiles and amphibians, information for more common species is also provided here. At this time, the level of detail available varies among species; some have detailed factsheets while others have only a short paragraph or a map. These pages will continue to evolve as more information becomes available and are the Bureau of Natural Heritage Conservation's main source of information for species and communities. [dnr.wi.gov](http://dnr.wi.gov) keyword "*biodiversity*"

## 2. Wisconsin Natural Heritage Inventory Working List

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. [dnr.wi.gov](http://dnr.wi.gov) keyword "*working list*"

## 3. Ecological Landscapes of Wisconsin Handbook

Wisconsin's 16 Ecological Landscapes have unique combinations of physical and biological characteristics such as climate, geology, soils, water, or vegetation. This handbook will contain a chapter for each of these landscapes with detailed information about their ecology, socioeconomics, and ecological management opportunities. An additional introductory chapter will compare the 16 landscapes in numerous ways, discuss Wisconsin's ecology on the statewide scale, and introduce important concepts related to ecosystem management in the state. The full handbook is in development as of this writing, and chapters will be made available online as they are published. Currently, a set of Web pages provide brief Ecological Landscape descriptions, numerous maps, and other useful information, including management opportunities for natural communities and Species of Greatest Conservation Need. [dnr.wi.gov](http://dnr.wi.gov) keyword "*landscapes*"

## 4. The Wisconsin Wildlife Action Plan

This plan is the result of a statewide effort to identify native Wisconsin animal species of greatest conservation need. The plan also presents priority conservation actions to protect the species and their habitats. The plan itself is available online, and there are several online tools to explore the data within the plan. The Web pages are closely integrated with the pages provided in items #1 and #3 above. The Wildlife Action Plan Web pages are quite numerous, so we recommend the following links as good starting points for accessing the information.

- the plan itself: [dnr.wi.gov](http://dnr.wi.gov) keyword "*wildlife action plan*"
- explore Wildlife Action Plan data by County:  
[dnr.wi.gov/topic/WildlifeHabitat/county.asp](http://dnr.wi.gov/topic/WildlifeHabitat/county.asp)
- Wildlife Action Plan Implementation: [dnr.wi.gov](http://dnr.wi.gov) keyword "*wap implementation*"

5. **Wisconsin's Biodiversity as a Management Issue - A Report to Department of Natural Resources Managers**

This now out-of-print report presents a department strategy for conserving biological diversity. It provides department employees with an overview of the issues associated with biodiversity and provides a common point of reference for incorporating the conservation of biodiversity into our management framework. The concepts presented in the report are closely related to the material provided in this report, as well as the other resources listed in this section.

[dnr.wi.gov/files/PDF/pubs/rs/rs0915.pdf](http://dnr.wi.gov/files/PDF/pubs/rs/rs0915.pdf)

6. **Wisconsin's Statewide Forest Strategy**

Wisconsin's Statewide Forest Strategy is a collection of many strategies and actions designed to address major issues and priority topics over the next five to ten years. It provides a long-term, comprehensive, coordinated approach for investing resources to address the management and landscape priorities identified in the Statewide Forest Assessment. Several of the strategies contain issues related to biodiversity and ecosystem management.

[dnr.wi.gov](http://dnr.wi.gov) keyword "*forest strategy*"

7. **2010 Wisconsin's Statewide Forest Assessment**

The goal of this project was to assess the "state of affairs" of Wisconsin's public and private forests and analyze the sustainability of our forested ecosystems. The Statewide Forest Assessment helps to explain trends, identify issues, and present an updated view of the status of forests in Wisconsin. The first chapter deals with biological diversity in Wisconsin's forests, and the major conclusions from this assessment were used to develop the strategies in # 6 above.

[dnr.wi.gov](http://dnr.wi.gov) keyword "*forest assessment*"

8. **Oak Savanna State Natural Area Management Guide (Oak Opening, Oak Woodland, Oak Barrens). Chapter 100.60 of WDNR State Natural Areas Handbook.**

This management guide contains the Wisconsin Department of Natural Resources' format for addressing actions on State Natural Areas where the primary feature is oak savanna (more specifically, Oak Opening, Oak Woodland and Oak Barrens). The guide was developed in consultation with Department of Natural Resources savanna management specialists and property managers, and further supported by an analysis of peer-reviewed literature, and leads the reader through the process of developing a detailed management plan. An overview of management techniques is provided, along with pertinent regulations.

9. **Species Guidance Documents.**

Species guidance documents are peer-reviewed publications with comprehensive information for rare species tracked by the Natural Heritage Inventory or identified in the Wisconsin Wildlife Action Plan as a Species of Greatest Conservation Need (SGCN). They contain identification, life history, management guidelines, screening guidance and avoidance measures and are intended for a wide variety of users, including resource managers, private landowners, contractors, students and the general public.

[dnr.wi.gov](http://dnr.wi.gov) keyword "*species guidance*"

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## Appendix A

### Natural Heritage Inventory Overview and General Methodology

This biotic inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program. 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 standardized methods for collecting, processing, and managing data for rare species, natural communities, and certain other natural features (e.g., bird rookeries). NatureServe, an international non-profit organization, coordinates the network. This appendix provides a general overview of the methodology we use for these projects. Please see the NatureServe Web site for more detailed information about standard methods used by the Heritage Network ([www.NatureServe.org](http://www.NatureServe.org)) for locating, documenting, and ranking rare species and natural community occurrences.

#### General Process Used when Conducting Biotic Inventories for Master Planning

The Wisconsin NHI Program typically uses a "coarse filter-fine filter" approach to conducting biotic inventory projects for master planning. This approach begins with a broad assessment of the natural communities and aquatic features present, along with their relative quality and condition. The area's landforms, soils, topography, hydrology, current land uses, and the surrounding matrix are also evaluated using Geographic Information Systems (GIS) and other electronic and hardcopy data sources. Data that describe conditions for the area prior to Euro-American settlement are often used during this step and at other times to further understand the ecological capabilities of the area. Often, we consult with local managers, biologists, or others familiar with the ecology of the area when preparing for an inventory project. The goals for this step are to identify the important ecological attributes and biological processes present, as well as to focus our inventory efforts.

The level of survey intensity varies based on the size and ecological complexity of the property or group of properties, as well as the resources available. For larger properties such as state forests, biotic inventory efforts typically take more than one year. Ideally, taxa surveys are conducted following a coarse-filter analysis that sometimes include extensive natural community surveys. There is often time for "mop-up work" during the year following the completion of the main survey effort, whereby additional surveys are conducted for areas that could not be reached the first year or for which new information has become available. For smaller properties, a "Rapid Ecological Assessment" often takes the place of a full-scale biotic inventory. The level of effort for these projects varies based on the needs of the study area, although surveys are almost always completed during one field season. Coarse filter work for rapid assessments is often done based on GIS data, aerial photos, data acquired from previous efforts, and information from property managers and others knowledgeable about the area.

Taxa-specific surveys can be costly and intensive and sometimes must be completed during a very narrow period of time. For example, bird surveys must be completed within an approximately one-month time window. For this and several other reasons, ***our surveys cannot locate every rare species occurrence within a given area.*** Therefore, it is important to use resources as efficiently as possible, making every effort to identify the major habitats present in the study area from the start. This approach concentrates inventory efforts on those sites most likely to contain target species to maximize efficient use of resources. Communication among biologists during the field season can help identify new areas of interest or additional priorities for surveys. The goal is to locate species populations with the highest conservation value whenever possible.

After all of the data are collected, occurrences of rare species, high-quality natural communities, and certain other features are documented, synthesized, and incorporated into the NHI Database. The NHI program refers to this process as “mapping” the data and uses a tabular and spatial database application designed specifically for the Heritage Network. Other secondary databases are also used by the Wisconsin NHI Program for storing additional species and community information such as species lists, GPS waypoints, photos, and other site documentation.

Once the data mapping and syntheses are completed, the NHI Program evaluates data from the various department biologists, contractors, and other surveyors. This information is examined along with many other sources of spatial and tabular information including topographic maps, various types of aerial photography, digital soil and wetland maps, hydrological data, forest reconnaissance data, and land cover data. Typically, GPS waypoints and other spatial information from the various surveys are superimposed onto these maps for evaluation by NHI biologists.

In addition to locating important rare species populations and high-quality natural community occurrences, the major products culminating from all of this work are the “Primary Sites.” These areas contain relatively undisturbed, high-quality, natural communities; provide important habitat for rare species; offer opportunities for restoration; could provide important ecological connections; or some combination of the above factors. The sites are meant to highlight, based on our evaluation, the best areas for conserving biological diversity for the study area. They often include important rare species populations, High Conservation Value Forests, or other ecologically important areas.

The final report describes the Primary Sites, as well as rare or otherwise notable species, and other ecological opportunities for conserving or enhancing the biological diversity of the study area. The report is intended for use by department master planning teams and others and strives to describe these opportunities at different scales, including a broad, landscape context that can be used to facilitate ecosystem management.

### **Select Tools Used for Conducting Inventory**

The following are descriptions of standard tools used by the NHI Program for conducting biotic inventories. Some of these may be modified, dropped, or repeated as appropriate to the project.

**File Compilation:** Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the NHI Database. Other databases with potentially useful information may also be queried, such as: forest reconnaissance data; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; the Wisconsin Breeding Bird Atlas; other NHI “atlas” and site databases; museum/herbarium collections for various target taxa; soil surveys; geological surveys; and the department's fish distribution database.

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources, including the State Natural Area files, often contain information on a variety of subjects relevant to the inventory of natural features for an area.

**Literature Review:** Field biologists involved with a given project consult basic references on the natural history and ecology of the area, as well as any documented rare species. This sometimes broadens and/or sharpens the focus of the inventory efforts.

**Target Elements:** Lists of target elements including natural communities, rare plants and animals, and aquatic features are developed for the study area. Field inventory is then scheduled for the times when these

elements are most identifiable or active. Inventory methods follow accepted scientific standards for each taxon.

**Compilation of Maps and Other Spatial Data:** USGS 7.5 minute topographic quadrangles, most often in digital form, serve along with aerial photos as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features. These are used in conjunction with numerous GIS layers, which are now a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth. These polygons have been digitized for most counties, and the resulting GIS layers can be superimposed onto other maps.

Ecoregion GIS layers are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. Ecological Landscapes provide the broad framework most often used in Wisconsin; however smaller units, including Landtype Associations, can be very helpful for evaluating ecoregions at finer scales.

**Aerial photographs:** These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. The Wisconsin NHI Program uses several different types of both color and black and white air photos. Typically, these are in digital format, although paired photos in print format can be valuable for stereoscopic viewing. High-resolution satellite imagery is often cost-prohibitive but is available for some portions of the state and is desirable for certain applications.

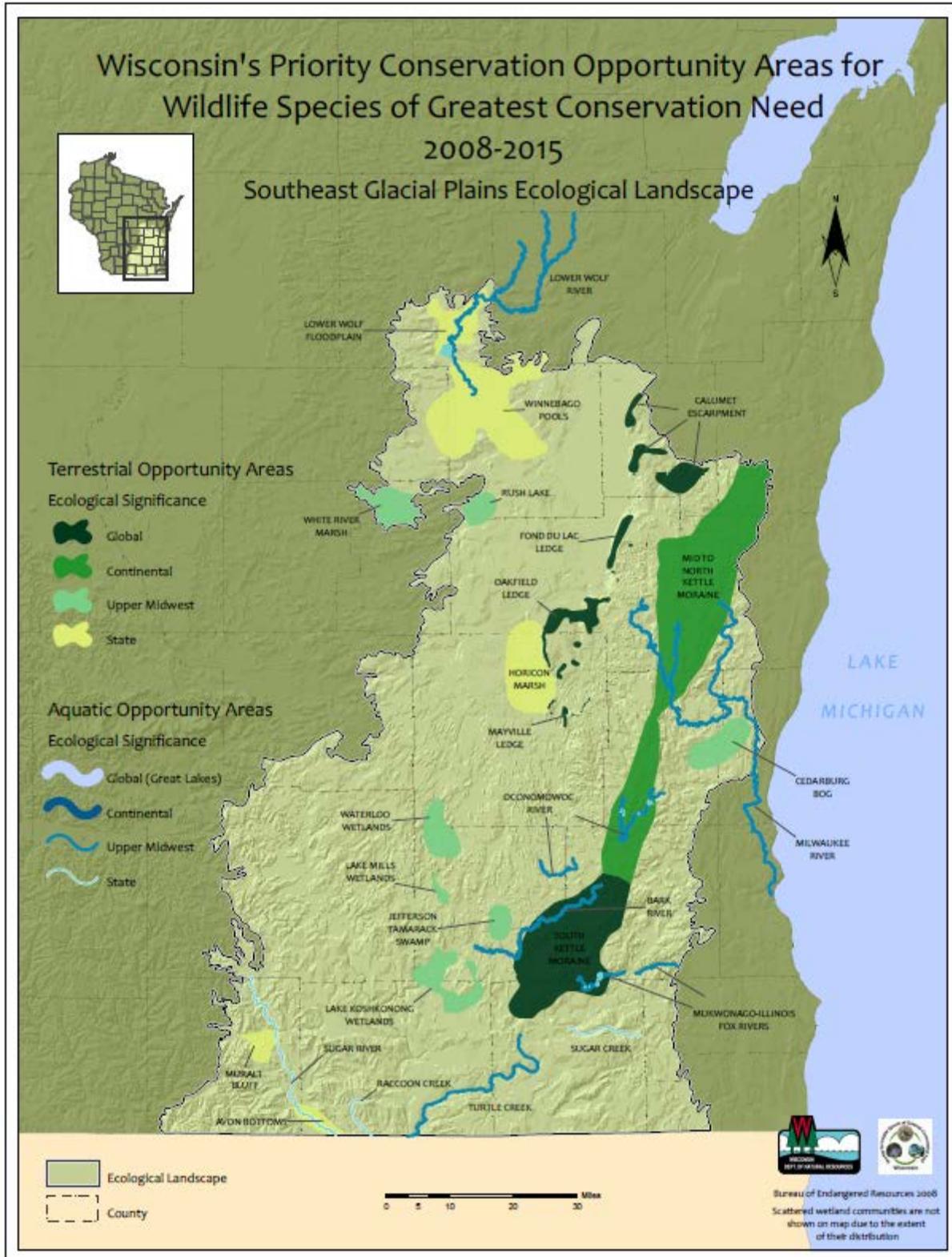
**Original Land Survey Records:** The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. Their notes also included general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns. The tree data are available in GIS format as raw points or interpreted polygons, and the notes themselves can provide helpful clues regarding the study area's potential ecological capabilities.

**Interviews:** Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield invaluable information.

**Global Positioning Systems (GPS):** Small, portable GPS units are now a routine piece of field equipment used for virtually all NHI survey work. Collecting coordinates (waypoints) facilitates mapping and makes it easy to quickly communicate specific locations among biologists. Often waypoints are paired with photos and/or other information and stored in a waypoint tracking database.

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

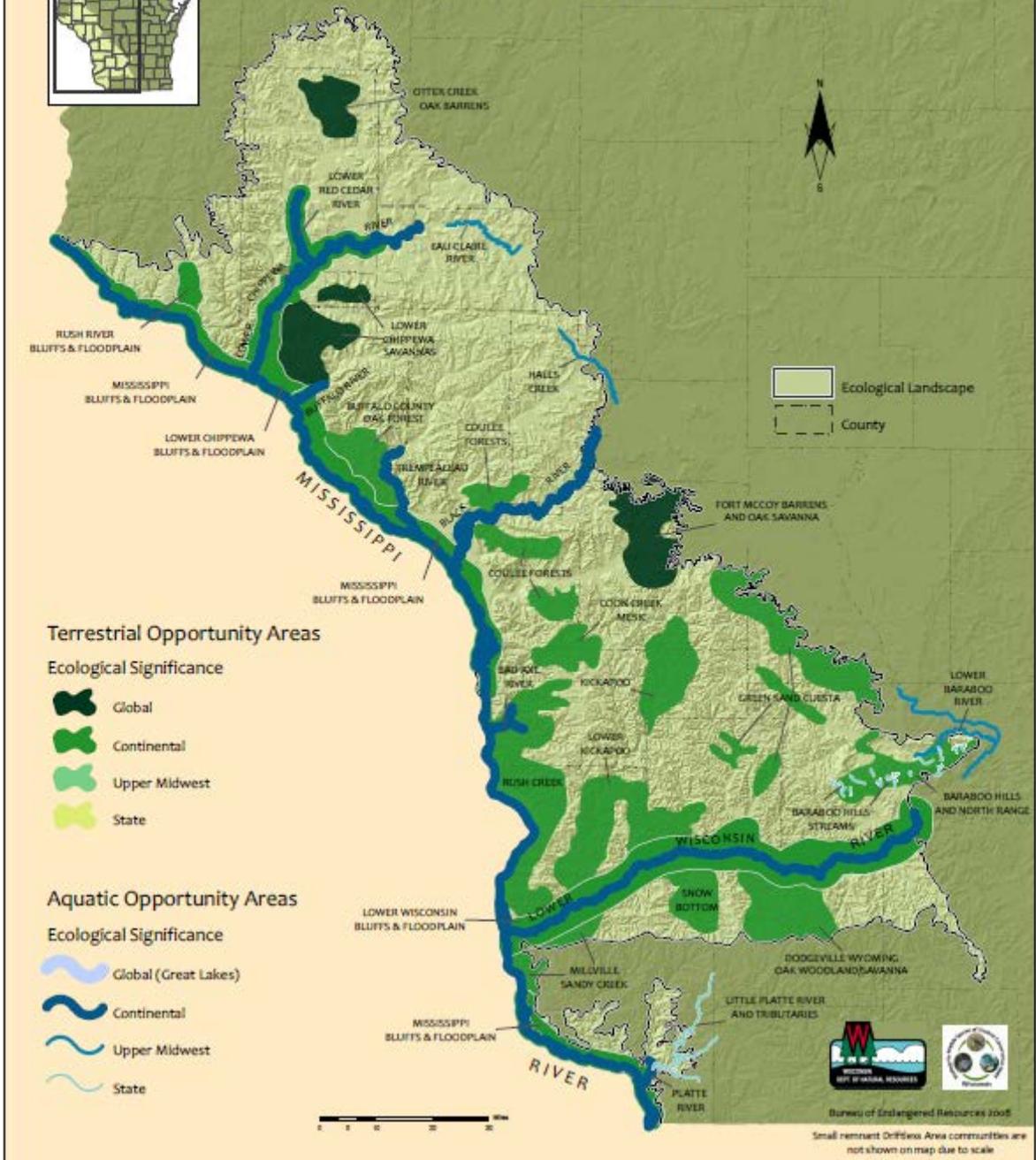
# Appendix B



# Wisconsin's Priority Conservation Opportunity Areas for Wildlife Species of Greatest Conservation Need

2008-2015

## Western Coulee and Ridges Ecological Landscape



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## Appendix C

### Rare Species and High Quality Natural Communities of the Sugar River Planning Group by Property

DUE TO SENSITIVITY OF RARE SPECIES INFORMATION, THIS INFORMATION IS NOT PROVIDED IN THIS VERSION.

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## Appendix D

### Descriptions of Rare Species and High Quality Natural Communities Documented at Sugar River Planning Group

The following paragraphs give brief summary descriptions for some of the rare species documented within the Sugar River Planning Group and mapped in the NHI Database. More information can be found on the Endangered Resources Web site ([dnr.wi.gov](http://dnr.wi.gov), keyword “ER”) for several of these species. Not all species documented on the properties have descriptive paragraphs available.

#### **Rare Animals**

##### **Acadian Flycatcher**

Acadian Flycatcher (*Empidonax virescens*), a State Threatened bird, prefers lowland deciduous forests and heavily wooded hillsides in large blocks of southern forests. Recommended avoidance period for this species is May 1 - August 31.

##### **American Bullfrog**

American Bullfrog (*Rana catesbeiana*), a State Special Concern frog, may be found throughout Wisconsin in any permanent body of water - lakes, ponds, rivers, and creeks, although they have a very patchy distribution. In Wisconsin, bullfrogs appear to favor oligotrophic to mesotrophic waters, often breeding where dense submergent vegetation filters out the majority of the suspended solids. Adult bullfrogs overwinter in water to avoid freezing. Bullfrogs are active from April through mid-October. They breed from mid-May through late July or later. Larvae overwinter before transforming the following year or, in rare situations, in their second full year.

##### **American Bittern**

American bittern (*Botaurus lentiginosus*), a bird listed as Special Concern, preferred breeding habitat is thick marsh grass, sometimes adjacent to stands of willow and tamarack, and usually within 6 meters of water. Habitat degradation is the greatest threat to its survival. The most urgent management need is the preservation of grasslands and large, shallow, freshwater wetlands with dense emergent growth. The breeding season extends from mid-May through mid-July.

##### **American Eel**

American eel (*Anguilla rostrata*), a State Special Concern fish, prefers large streams, rivers and lakes with muddy bottoms and still waters. To reach these conditions the eel has to traverse a wide variety of less suitable habitat including swift-flowing waters with a wide variety of substrates. Spawning occurs in the Sargasso Sea.

##### **Bald Eagle**

Bald Eagle (*Haliaeetus leucocephalus*), a bird listed as Special Concern in Wisconsin and Federally protected by the Bald & Golden Eagle Protection Act, prefers large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. In southern

Wisconsin, the recommended avoidance period extends from February 15 - July 1. In northern Wisconsin, the recommended avoidance period is from March 15 - August 1.

### **Bell's Vireo**

Bell's Vireo (*Vireo bellii*), a bird listed as Threatened in Wisconsin, prefers dense shrubby areas within an open prairie landscape. The recommended avoidance period is from May 25 - August 15.

### **Black Buffalo**

Black Buffalo (*Ictiobus niger*), a fish listed as Threatened in Wisconsin, prefers strong currents of large rivers, sloughs, backwaters and impoundments. Spawning occurs from April through mid-June.

### **Black-billed Cuckoo**

Black-billed cuckoo (*Coccyzus erythrophthalmus*) is a Special Concern species in Wisconsin. They typically nest in deciduous and mixed deciduous-coniferous woodlands near lakes or streams, and less often in coniferous forests. Their breeding season occurs from mid-May to late August.

### **Black-crowned Night-heron**

Black-crowned Night-heron (*Nycticorax nycticorax*), a bird listed as Special Concern, prefers freshwater wetlands dominated by bulrush and cattail with small groves of alder, willow, or other brush. The recommended avoidance period is from April 15 - July 31.

### **Black Tern**

Black Tern (*Chlidonias niger*), a bird listed as Special Concern, prefers large shallow marshes with abundant vegetation adjacent to open water. The recommended avoidance period is from May 15 to July 31.

### **Blanding's Turtle**

Blanding's turtles (*Emydoidea blandingii*) are listed as a Threatened species in Wisconsin. They utilize a wide variety of aquatic habitats including deep and shallow marshes, shallow bays of lakes and impoundments where areas of dense emergent and submergent vegetation exists, sluggish streams, oxbows and other backwaters of rivers, drainage ditches (usually where wetlands have been drained), and sedge meadows and wet meadows adjacent to these habitats. This species is semi-terrestrial and individuals may spend a good deal of time on land. They often move between a variety of wetland types during the active season, which can extend from early March to mid-October. They overwinter in standing water that is typically more than 3 feet in deep and with a deep organic substrate but will also use both warm and cold-water streams and rivers where they can avoid freezing. Blanding's generally breed in spring, late summer or fall. Nesting occurs from about mid-May through June depending on spring temperatures. They strongly prefer to nest in sandy soils and may travel well over a mile to find suitable soils. This species appear to display nest site fidelity, returning to its natal site and then nesting in a similar location annually. Hatching occurs from early August through early September but hatchlings can successfully overwinter in the nest, emerging the following late April or May. This species takes 17 to 20 years or more to reach maturity.

### **Blue-winged Teal**

Blue-winged teal (*Anas discors*), a Special Concern bird, prefers idle grasslands, wet meadows, and alfalfa fields during breeding season. They typically build their nests in upland habitats with residual cover from the previous year. Their breeding season occurs from mid April to mid July.

**Blue-winged Warbler**

Blue-winged Warbler (*Vermivora pinus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers early- to mid-successional habitats with dense vegetation, especially young trees, shrubs, and thickets. Its nesting season occurs from early May to mid June.

**Bobolink**

Bobolink (*Dolichonyx oryzivorus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers open grasslands with a moderate litter layer and standing residual vegetation, including hay fields, pastures, idle grasslands, old fields, mesic prairies, and sedge meadows. Their breeding season occurs from mid May to mid July.

**Brown Thrasher**

Brown Thrasher (*Toxostoma rufum*) is a bird of Special Concern in Wisconsin. This species nests in hedgerows and in brushy edges of fields and forests. Breeding occurs from early May to mid July.

**Cerulean Warbler**

Cerulean Warbler (*Dendroica cerulea*), a bird listed as Threatened in Wisconsin, prefers lowland deciduous forests dominated by mature stands of American elm, cottonwood, and green ash and large upland blocks of mature dry-mesic to mesic forests. The recommended avoidance period is from May 1 - August 24.

**Dark Rubyspot**

Dark Rubyspot (*Hetaerina titia*), a State Special Concern damselfly, has been found in large streams with permanent current. The flight period occurs in early September.

**Dicksissel**

Dicksissel (*Spiza americana*), a bird of Special Concern in Wisconsin. This species prefers open pasture and fields of clover and alfalfa. Grasslands, meadows, and savanna are also important nesting areas. This bird requires vegetation with medium to tall height-density and a significant component of forbs, some stiff-stemmed. Breeding occurs from late May to early August.

**Eastern Meadowlark**

Eastern Meadowlark (*Sturnella magna*) is a bird of Special Concern in Wisconsin. This species nests in mesic to dry grasslands of moderate to low height with few shrubs. Breeding occurs from early May to late July.

**Eastern Massasauga Rattlesnake**

Eastern Massasauga Rattlesnakes (*Sistrurus catenatus*), are a State Endangered Species and a Federal Candidate Species. This snake is strongly associated with floodplain habitats along medium to large rivers, especially near river confluences, where they primarily occupy open canopy wetlands, such as sedge meadows, fresh wet meadows, scrub carr and adjacent upland prairies and old fields. Overwintering usually occurs in terrestrial crayfish burrows or rotted out root channels in open canopy wetlands, shrub-carr and lowland hardwood forests. Massasaugas begin to emerge in spring, usually in early to mid-April when soil temperatures average 510 F, at 15 cm depth, within overwintering habitats. They remain active into early or mid-October, depending on air temperatures. This species breeds primarily in August and females give birth in late July through August the following year.

**Field Sparrow**

Field Sparrow (*Spizella pusilla*) is a Special Concern species in Wisconsin. This species prefers dry, moderately brushy or early successional upland habitats such as dry prairies and old fields, idle

grasslands, pastures, areas that have recently been cut and burned, pine barrens, young plantations, and oak savannas. Their breeding season occurs from late April to late August.

### **Grasshopper Sparrow**

Grasshopper Sparrow (*Ammodramus savannarum*), a bird listed as Special Concern, prefers prairies, retired cropland, unmowed highway right-of-ways, pastures (Kentucky bluegrass and timothy), shrub-carr wetlands, northern sedge meadows, and managed grasslands maintained for duck production. This bird will nest in areas of 5-25 cm height-density that has bare patches and a diverse structure with stiff forbs for song perches. The recommended avoidance period is from early May through mid-August.

### **Gravel Chub**

Gravel Chub (*Erimystax (Hybopsis) x-punctata*) a fish listed as Endangered in Wisconsin, prefers the strong currents of riffles and fast runs in shallow medium to large rivers over pea-gravel substrate. Spawning occurs from mid May to Mid June.

### **Henslow's Sparrow**

Henslow's Sparrow (*Ammodramus henslowii*) a bird listed as Threatened in Wisconsin, prefers old fields, open grasslands, wet meadows, unmowed highway right-of-ways, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds. The recommended avoidance period is from May 20 - August 15.

### **Hooded Warbler**

Hooded Warbler (*Wilsonia citrina*), a bird listed as Threatened in Wisconsin. This species is found in large upland forest tracts in southern Wisconsin, where they occur in pockets of dense understory near small or partial canopy openings. The recommended avoidance period is from May 1 - August 15.

### **Kentucky Warbler**

Kentucky Warbler (*Oporornis formosus*), a bird listed as Threatened in Wisconsin. This species is found in large tracts of hardwood forest in southern Wisconsin, especially along Mississippi and Wisconsin rivers and their bluffs, and the Baraboo Hills. They breed in sites that are moist, with heavy undergrowth, thickets and ground vegetation. The recommended avoidance period is from May 16 - August 15.

### **Lark Sparrow**

Lark Sparrow (*Chondestes grammacus*), a bird listed as Special Concern, prefers old field, prairie and upland shrub-carr areas. The recommended avoidance period is from May 10 - September 25.

### **Least Darter**

Least Darter (*Etheostoma microperca*), a fish listed as Special Concern, prefers clear, warm, quiet waters of overflow ponds, pools, lakes and streams over substrates of gravel, silt, sand, boulders, mud or clay with dense vegetation or filamentous algal beds. Spawning occurs from late April into July.

### **Least Flycatcher**

The Least Flycatcher (*Empidonax minimus*) is a State Special Concern species that is found in almost every major type of deciduous and mixed forest, although less commonly in conifers. Although Least Flycatcher historically bred throughout Wisconsin, the breeding range shifted mostly to the northern part of the state as deciduous forest cover was lost in the south. Nesting occurs from mid-May to mid-July.

### **Loggerhead Shrike**

Loggerhead Shrike (*Lanius ludovicianus*), a bird listed as Endangered in Wisconsin, prefers open country with scattered trees and shrubs (usually hawthorne and red cedar), and edge habitat such as open areas in forests. The recommended avoidance period is from April 16 - August 15.

### **Northern Bobwhite**

The Northern Bobwhite (*Colinus virginianus*) is a species of Special Concern in Wisconsin. A medium-sized quail, it has a small head with a round body covered by reddish-brown plumage that is spotted with many white patches on its breast. Its head is white with a black crown and eye stripe stretching to its nape. The Northern Bobwhite prefers a wide variety of vegetated habitats, particularly those at an early successional stage, like grasslands, hayfields, fallow fields, dry-mesic prairies, brushy forest edges and oak savanna. During the avoidance period from late April to late September, the females will lay, on average, 12-14 eggs in nests on the ground that are lined with grasses and other dead vegetation. Incubation is done by one or both sexes, for an average of 23 days. The Northern Bobwhite has a very high mortality rate due to low survival during severe winter weather conditions. Most individuals live less than one year, with adult females suffering from higher mortality than adult males. Loss of nesting and brood-rearing cover is also a limiting factor for this species.

### **Northern Harrier**

Northern Harrier (*Circus cyaneus*), a bird listed as Special Concern, prefer retired cropland (timothy/quackgrass), old field habitat, sedge meadow, and restored prairies. The recommended avoidance period is from early April through late August.

### **Northern Leopard Frog**

The Northern Leopard Frog (*Lithobates pipiens*) is a Special Concern species in Wisconsin. They are light-green to greenish-brown with circular dark spots on their back, sides, and legs. There is generally a white or yellow color that borders the spots. Most notably, the species has white dorsolateral folds that run from the back of each eye to the end of the body. Northern leopard frogs are found in a variety of wetland habitats, especially in fishless waters including springs, ponds, bogs, marshes, and lakes. The species may forage a far distance from water in old fields and prairies.

### **Ornate Box Turtle**

Ornate Box Turtles (*Terrapene ornata*), listed as Endangered in Wisconsin, prefer dry sand prairies, oak savannas with sandy soils and in sandy open oak woods. They overwinter in deep sand in open canopy habitat in microhabitats supporting sparse vegetation and in areas of disturbed soils such as the edges of sand blows. Ornates are active from late-March or early April through mid-October. Breeding primarily occurs in August but can happen throughout the active season. Nesting occurs from late-May through early July and hatching occurs in August or early September. Hatchlings may remain in nests and emerge the following spring.

### **Pickerel Frog**

Pickerel frogs (*Lithobates palustris*) are a Species of Special Concern in Wisconsin. It has a rather complex habitat range as it prefers to overwinter in cold water streams, seepage pools or spring holes, often taking advantage of water cress for cover. It moves to warmer water ponds to breed and lay eggs from April through mid-June. Adults spend most of the active season foraging on land in riparian habitats along streams and rivers. This species is active from late March to early November but can remain semi-active in winter under water. Larvae metamorphose from mid-July to mid-August.

**Prothonotary Warbler**

Prothonotary Warbler (*Protonotaria citrea*) is a bird of Special Concern in Wisconsin. This species breeds in floodplain hardwoods in the southern 2/3 of the state, typically in truncated snags among flooded timber. The recommended avoidance period is from May 8 to September 1.

**Red-headed Woodpecker**

Red-headed Woodpecker (*Melanerpes erythrocephalus*) is a bird of Special Concern in Wisconsin. They are common in the southern and central part of the state and fairly common in the north. This species prefers oak savanna or other habitats with scattered trees, as well as floodplain forest; they can also make their home in residential areas. The Red-headed Woodpecker typically nests in dead trees or dead limbs of live trees, but it also uses natural cavities, telephone poles, and other structures. The recommended avoidance period is during their breeding season from May 10 to August 15.

**Red-shouldered Hawk**

Red-shouldered Hawk (*Buteo lineatus*), a bird listed as Threatened in Wisconsin. This species prefers larger stands of medium-aged to mature lowland deciduous forests, dry-mesic and mesic forest with small wetland pockets. The recommended avoidance period is from March 15 to July 31 in southern Wisconsin, and April 1 to July 31 north of Highway 64.

**Silver Chub**

Silver Chub (*Macrhybopsis (Hybopsis) storeriana*), a fish listed as Special Concern, prefers large, low gradient rivers. This species is found in moderate to strong currents, riffles, pools and sloughs with or without vegetation over substrates of sand, mud, silt or gravel. Spawning occurs in June and July.

**Starhead Topminnow**

Starhead Topminnow (*Fundulus dispar*), a fish listed as Endangered in Wisconsin, prefers quiet, clear-slightly turbid, shallow backwaters with an abundance of submerged aquatic plants. Spawning occurs from June through July.

**Vesper Sparrow**

The Vesper Sparrow (*Poocetes gramineus*) is a Special Concern species in Wisconsin. It prefers dry, open habitats with short, sparse vegetation, some bare ground, and short to moderate shrub or tall forb cover. In Wisconsin, this includes Dry to Dry-mesic Prairie, short to medium height idle grasslands, shrubby grasslands, dry old fields, pastures, hay fields, small grain fields, weedy fence lines and roadsides, orchards, woodland edges, and shelterbelts. Nesting occurs from late April to mid-July.

**Weed Shiner**

Weed Shiner (*Notropis texanus*), a fish listed as Special Concern, prefers sloughs, lakes, and still to sluggish sections of medium streams to large rivers, over substrates of sand, mud, clay, silt, detritus, gravel or boulders. Spawning occurs from late June through July at approximately 18 degrees Celsius.

**Western Harvest Mouse**

Western Harvest Mouse (*Reithrodontomys megalotis*), a mammal listed as Special Concern, prefers dry and dry-mesic prairies, more or less open grassy places and neglected fields overgrown with grasses or sedges. It is restricted in Wisconsin to the Driftless region and its borders. Breeding occurs throughout the year with the most activity occurring from April to October.

**Western Meadowlark**

The Western Meadowlark (*Sturnella neglecta*), a Special Concern species, is medium-sized bird that is a chunkier equivalent to a robin. It is distinguishable by its bright yellow throat and breast marked by a

black "V". The rest of the body is intricately patterned with a multitude of brown, black spots and stripes. The species is typically found in open landscapes like pastures and hay fields, grasslands, prairies and meadows where there is a mix of short to medium-high grasses. During the avoidance period from April 20 - August 15, nests are constructed by the females from weaving grass and shrub stems in a 7-8 inch wide depression in the soil. Five to six eggs are laid that are white with brown, rust and lavender spots. Incubation lasts 13-16 days. The Western Meadowlark has suffered from significant population decline over the past three decades, likely due to loss of habitat caused by fragmentation, land use conversion and succession from grasslands to brush or forests.

### **Willow Flycatcher**

Willow Flycatcher (*Empidonax traillii*) is a Special Concern species that prefers shrubby wetlands and uplands. They commonly nest in elderberry, dogwood, honeysuckle, and willow, which are often placed over water. Nesting occurs from early June to early July.

### **Wood Thrush**

The Wood Thrush (*Hylocichla mustelina*) is a Special Concern species that prefers large blocks of upland moist forests with mature trees, moderate to dense canopy cover, moderate undergrowth, and ample leaf litter. Nesting occurs from mid-May to late July.

### **Yellow-billed Cuckoo**

The Yellow-billed Cuckoo (*Coccyzus americanus*) is a Special Concern species that prefers forested uplands and wetlands, oak woodlands, Shrub-carr, shrubby woodland edges, and dense willow or dogwood thickets, often near streams or lakes. Nesting occurs from late May to early August.

### **Yellow-breasted Chat**

The Yellow-breasted Chat (*Icteria virens*) is a Special Concern species in Wisconsin. It is a medium-sized bird with a long tail, distinguished by its bright yellow chest and throat. Its back is olive-green with a white belly and undertail. The avoidance period is from May 1 to late July, during which the species nests in second growth habitats, old pastures, thickets and brush, particularly near streams and ponds. The nest cups are constructed from plant material like grasses and strips of bark, and are lined with fine grasses. One to six eggs are laid that are white and covered with dark speckles.

### **Yellow-crowned Night-heron**

Yellow-crowned Night-heron (*Nyctanassa violacea*), a bird listed as Threatened in Wisconsin, is found in swamps and river bottomlands. The recommended avoidance period is from April to July.

### **Yellow-throated Warbler**

The Yellow-throated Warbler (*Dendroica dominica*), is a State Endangered species. This species breeds in floodplain forest within the southern tier of counties along the Mississippi and Sugar Rivers, often where sycamore trees occur. The recommended avoidance period is from April 16 - August 15.

## **Rare Plants**

### **Azure Bluets**

Azure Bluets (*Houstonia caerulea*), a State Special Concern plant, is found in dry prairies and woodlands, as well as damp meadows. Blooming occurs late April through early July; fruiting occurs late May through early August. The optimal identification period for this species is late April through late June.

**Beak Grass**

Beak Grass (*Diarrhena obovata*), a State Endangered plant, is found in moist streamside deciduous forests. Blooming occurs early August through early September; fruiting occurs early September through early October. The optimal identification period for this species is early August through early October.

**Glade Mallow**

Glade Mallow (*Napaea dioica*), a State Special Concern plant, is found in alluvial meadows, ditches, and forest margins near large rivers. Blooming occurs early June through early August; fruiting occurs early August through late September. The optimal identification period for this species is early July through late August.

**Kentucky Coffee-tree**

Kentucky Coffee-tree (*Gymnocladus dioica*), a State Special Concern plant, is found in rich alluvial or mesic forests. Blooming occurs throughout June; fruiting occurs early July through early September. This species can be identified year-round.

**Kitten Tails**

Kitten Tails (*Besseyia bullii*), a State Threatened plant, is found commonly in small woodland openings, or near bluff edges. Blooming occurs late May through late June; fruiting occurs late June through late August. The optimal identification period for this species is late May through late August.

**Nodding Rattlesnake-root**

Nodding Rattlesnake-root (*Prenanthes crepidinea*), a State Endangered plant, is found often in openings in mesic to dry-mesic hardwoods, particularly along creeks and in seepage areas. Blooming occurs early August through late September; fruiting occurs throughout September. The optimal identification period for this species is early August through late September.

**Pale Purple Coneflower**

Pale Purple Coneflower (*Echinacea pallida*), a State Threatened plant, is found in prairies and prairie remnants along roadsides and railroads. Blooming occurs early June through late July; fruiting occurs early July through late August. The optimal identification period for this species is early June through early August.

**Prairie Indian-Plantain**

Prairie Indian-Plantain (*Cacalia tuberosa*), a State Threatened plant, is found in a variety of deep-soiled prairies. Blooming occurs early May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through late July.

**Prairie Milkweed**

Prairie Milkweed (*Asclepias sullivantii*), a State Threatened plant, is found in moist prairies. Blooming occurs early June through early July; fruiting occurs throughout July. The optimal identification period for this species is early June through early July.

**Prairie Straw Sedge**

Prairie Straw Sedge (*Carex suberecta*), a State Special Concern plant, is found in fens and moist to wet calcareous meadows and prairies. Blooming occurs late May through early June; fruiting occurs throughout June. The optimal identification period for this species is throughout June.

**Purple Meadow-parsnip**

Purple Meadow-parsnip (*Thaspium trifoliatum* var. *flavum*), a State Special Concern plant, is found in moist prairies and woodlands, but is naturalized on roadsides and embankments. Blooming occurs late May through late June; fruiting occurs early July through early October. The optimal identification period for this species is early July through late September.

**Rough Rattlesnake-root**

Rough Rattlesnake-root (*Prenanthes aspera*), a State Endangered plant, is found in dry prairies, usually on the lower slopes of hills. Blooming occurs late August through early October; fruiting occurs throughout September. The optimal identification period for this species is late August through early October.

**Round-fruited St. John's-wort**

Round-fruited St. John's-wort (*Hypericum sphaerocarpum*), a State Threatened plant, is found in wet prairies and moist sites subject to disturbance. Blooming occurs late June through early August; fruiting occurs late July through late August. The optimal identification period for this species is late June through late August.

**Short's Rock-cress**

Short's Rock-cress (*Arabis shortii*), a State Special Concern plant, is found in mesic alluvial floodplain forests, on very steep, usually cool slopes in southern mesic forests and moist sandstone cliffs. It is often found in areas with little competition such as moss-covered cliffs, boulders, or bases of large trees, or in areas with exposed soils like steep, eroding forested slopes or areas adjacent to trails. Blooming occurs throughout May; fruiting occurs throughout June. The optimal identification period for this species is early May through early June.

**Small White Lady's-slipper**

Small White Lady's-slipper (*Cypripedium candidum*), a State Threatened plant, is found in calcareous fens and moist prairies. Blooming occurs late May through early June; fruiting occurs throughout September. The optimal identification period for this species is late May through early June.

**Smooth Black-haw**

Smooth Black-haw (*Viburnum prunifolium*), a State Special Concern plant, is found in rich, hardwood forests, often with dolomite near the surface. Blooming occurs late May through late June; fruiting occurs early July through early September. The optimal identification period for this species is late May through early September.

**Spreading Chervil**

Spreading Chervil (*Chaerophyllum procumbens*), a State Special Concern plant, is found in rich alluvial deciduous forests. Blooming occurs late April through late May; fruiting occurs throughout May. The optimal identification period for this species is late April through early May.

**Sycamore**

Sycamore (*Platanus occidentalis*), a State Special Concern plant, is found in floodplain forests. Blooming occurs throughout May; fruiting occurs early June through early September. This species can be identified year-round.

**Wafer-ash**

Wafer-ash (*Ptelea trifoliata*), a State Special Concern plant, is found on dry, dolomite ledges in oak forests, in dry prairies, along railroad grades, and along rivers. Blooming occurs late May through early

June; fruiting occurs throughout July. The optimal identification period for this species is late May through late September.

### **Yellow Giant Hyssop**

Yellow Giant Hyssop (*Agastache nepetoides*), a State Threatened plant, is found in oak woodlands and forest edges, thickets, and river margins. Blooming occurs early June through early October; fruiting occurs late July through early October. The optimal identification period for this species is late July through late September.

## **Natural Communities**

### **Bog Relict**

These boggy, acidic, weakly minerotrophic peatlands occur south of the Tension Zone within a matrix of "southern" vegetation. Bog relicts are isolated from the more extensive, better-developed and much more widespread stands of this community found in the northern part of the state. Acidophiles present can include sphagnum mosses (*Sphagnum* spp), sedges (e.g., few seeded sedge, *Carex oligosperma*), ericaceous shrubs, and insectivorous herbs. Tamarack (*Larix laricina*) is usually the most common tree and poison-sumac (*Toxicodendron vernix*) is often formidably abundant in the understory, especially in the moat (or "lagg") at the upland/wetland interface. Examples in southeastern Wisconsin are all somewhat alkaline and may resemble "shrub-fen" communities described in other states.

### **Calcareous Fen**

An open wetland found in southern Wisconsin, often underlain by a calcareous substrate, through which carbonate-rich groundwater percolates. The flora is typically diverse, with many calciphiles. Common species are several sedges (*Carex sterilis* and *C. lanuginosa*), marsh fern (*Thelypteris palustris*), shrubby cinquefoil (*Potentilla fruticosa*), shrubby St. John's-wort (*Hypericum kalmianum*), Ohio goldenrod (*Solidago ohioensis*), grass-of-parnassus (*Parnassia glauca*), twig-rush (*Cladium mariscoides*), brook lobelia (*Lobelia kalmii*), boneset (*Eupatorium perfoliatum*), swamp thistle (*Cirsium muticum*), and asters (*Aster* spp.). Some fens have significant prairie or sedge meadow components, and intergrade with those communities.

### **Dry Prairie**

This grassland community occurs on dry, often loess-derived soils, usually on steep south or west facing slopes or at the summits of river bluffs with sandstone or dolomite near the surface. Short to medium-sized prairie grasses: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), and prairie dropseed (*Sporobolus heterolepis*), are the dominants in this community. Common shrubs and forbs include lead plant (*Amorpha canescens*), silky aster (*Aster sericeus*), flowering spurge (*Euphorbia corollata*), purple prairie-clover (*Petalostemum purpureum*), cylindrical blazing-star (*Liatis cylindracea*), and gray goldenrod (*Solidago nemoralis*). Stands on gravelly knolls in the Kettle Moraine region of southeastern Wisconsin and along the St. Croix River on the Minnesota - Wisconsin border may warrant recognition, at least at the subtype level.

### **Dry-mesic Prairie**

This grassland community occurs on slightly less droughty sites than Dry Prairie and has many of the same grasses, but taller species such as big bluestem (*Andropogon gerardii*) and Indian-grass (*Sorghastrum nutans*) dominate. Needle grass (*Stipa spartea*) may also be present. The herb component is more diverse than in Dry Prairies, including many species that occur in both Dry and Mesic Prairies.

### **Emergent Marsh**

These open, marsh, lake, riverine and estuarine communities with permanent standing water are dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include cat-tails (*Typha* spp.), bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds (*Sparganium* spp.), giant reed (*Phragmites australis*), pickerel-weed (*Pontederia cordata*), water-plantains (*Alisma* spp.), arrowheads (*Sagittaria* spp.), and the larger species of spikerush such as (*Eleocharis smallii*).

### **Floodplain Forest**

This is a lowland hardwood forest community that occurs along large rivers, usually stream order 3 or higher, that flood periodically. The best-development occurs along large rivers in southern Wisconsin, but this community is also found in the north. Canopy dominants may include silver maple (*Acer saccharinum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis occidentalis*), swamp white oak (*Quercus bicolor*), and cottonwood (*Populus deltoides*). Northern stands are often species poor, but balsam-poplar (*Populus balsamifera*), bur oak (*Quercus macrocarpa*), and box elder (*Acer negundo*) may replace some of the missing "southern" trees. Buttonbush (*Cephalanthus occidentalis*) is a locally dominant shrub and may form dense thickets on the margins of oxbow lakes, sloughs and ponds within the forest. Nettles (*Laportea canadensis* and *Urtica dioica*), sedges, ostrich fern (*Matteuccia struthiopteris*) and gray-headed coneflower (*Rudbeckia laciniata*) are important understory herbs, and lianas such as Virginia creepers (*Parthenocissus* spp.), grapes (*Vitis* spp.), Canada moonseed (*Menispermum canadense*), and poison-ivy (*Toxicodendron radicans*) are often common. Among the striking and characteristic herbs of this community are cardinal flower (*Lobelia cardinalis*) and green dragon (*Arisaema dracontium*).

### **Oak Opening**

As defined by Curtis, this is an oak-dominated savanna community in which there is less than 50% tree canopy. Historically, oak openings occurred on wet-mesic to dry sites. The few extant remnants are mostly on drier sites, with the mesic and wet-mesic openings almost totally destroyed by conversion to agricultural or residential uses, and by the encroachment of other woody plants due to fire suppression. Bur, white, and black oaks (*Quercus macrocarpa*, *Q. alba* and *Q. velutina*) are dominant in mature stands as large, open-grown trees with distinctive limb architecture. Shagbark hickory (*Carya ovata*) is sometimes present. American hazelnut (*Corylus americana*) is a common shrub, and while the herb layer is similar to those found in oak forests and prairies, with many of the same grasses and forbs present, there are some plants and animals that reach their optimal abundance in the "openings".

### **Oak Woodland**

This "forest" community is structurally intermediate between Oak Openings and Southern Dry Forest. The tree canopy cover is high, but frequent low-intensity fires and possibly (in pre-settlement times) browsing by herbivores such as elk, bison, and deer kept the understory relatively free of shrubs and saplings. Much additional information is needed but it appears that at least some plants (certain legumes, grasses, and composites among them) reached their highest abundance here.

### **Sand Prairie**

This dry grassland community is composed of little bluestem (*Schizachyrium scoparium*), junegrass (*Koeleria macrantha*), panic grass (*Panicum* spp.), and crab grass (*Digitaria cognata*). Common herbaceous species are western ragweed (*Ambrosia psilostachya*), the sedges (*Carex muhlenbergii* and *C. pennsylvanica*), poverty-oat grass (*Danthonia spicata*), flowering spurge (*Euphorbia corollata*), frostweed (*Helianthemum canadense*), common bush-clover (*Lespedeza capitata*), false-heather (*Hudsonia tomentosa*), long-bearded hawkweed (*Hieracium longipilum*), stiff goldenrod (*Solidago rigida*), horsebalm (*Monarda punctata*), and spiderwort (*Tradescantia ohioensis*). At least some stands are

Barrens remnants now lacking appreciable woody cover, though extensive stands may have occurred historically on broad level terraces along the Mississippi, Wisconsin, Black, and Chippewa Rivers.

### **Shrub-carr**

This wetland community is dominated by tall shrubs such as red-osier dogwood (*Cornus stolonifera*), meadow-sweet (*Spiraea alba*), and various willows (*Salix discolor*, *S. bebbiana*, and *S. gracilis*). Canada bluejoint grass (*Calamagrostis canadensis*) is often very common. Associates are similar to those found in Alder Thickets and tussock-type Sedge Meadows. This type is common and widespread in southern Wisconsin but also occurs in the north.

### **Southern Sedge Meadow**

Widespread in southern Wisconsin, this open wetland community is most typically dominated by tussock sedge (*Carex stricta*) and Canada bluejoint grass (*Calamagrostis canadensis*). Common associates are water-horehound (*Lycopus uniflorus*), paniced aster (*Aster simplex*), blue flag (*Iris virginica*), Canada goldenrod (*Solidago canadensis*), spotted joe-pye-weed (*Eupatorium maculatum*), broad-leaved cat-tail (*Typha latifolia*), and swamp milkweed (*Asclepias incarnata*). Reed canary grass (*Phalaris arundinacea*) may be dominant in grazed and/or ditched stands. Ditched stands can succeed quickly to Shrub-Carr.

### **Tamarack (rich) Swamp**

This forested wetland community type is a variant of the Tamarack Swamp, but occurs south of the Tension Zone within a matrix of "southern" vegetation types. Poison-sumac (*Toxicodendron vernix*) is often a dominant understory shrub. Successional stages and processes are not well understood but fire, windthrow, water level fluctuations, and periodic infestations of larch sawfly are among the important dynamic forces influencing this community. Groundwater seepage influences the composition of most if not all stands. Where the substrate is especially springy, skunk cabbage (*Symplocarpus foetidus*), marsh marigold (*Caltha palustris*), sedges, and a variety of mosses may carpet the forest floor. Drier, more acid stands may support an ericad and sphagnum dominated groundlayer.

### **Wet Prairie**

This is a rather heterogeneous tall grassland community that shares characteristics of prairies, Southern Sedge Meadow, Calcareous Fen and even Emergent Aquatic communities. The Wet Prairie's more wetland-like character can mean that sometimes very few true prairie species are present. Many of the stands assigned to this type by Curtis are currently classified as Wet-Mesic Prairies. The dominant graminoids are Canada bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina pectinata*), and prairie muhly (*Muhlenbergia glomerata*), plus several sedge (*Carex*) species including lake sedge (*C. lacustris*), water sedge (*C. aquatilis*), and woolly sedge (*C. lanuginosa*). Many of the herb species are shared with Wet-Mesic Prairies, but the following species are often prevalent: New England aster (*Aster novae-angliae*), swamp thistle (*Cirsium muticum*), northern bedstraw (*Galium boreale*), yellow stargrass (*Hypoxis hirsuta*), cowbane (*Oxypholis rigidior*), tall meadow-rue (*Thalictrum dasycarpum*), golden alexander (*Zizia aurea*), and mountain-mint (*Pycnanthemum virginianum*).

### **Wet-mesic Prairie**

This herbaceous grassland community is dominated by tall grasses including big bluestem (*Andropogon gerardii*), Canada bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina pectinata*), and Canada wild-rye (*Elymus canadensis*). The forb component is diverse and includes azure aster (*Aster oolentangiensis*), shooting-star (*Dodecatheon meadia*), sawtooth sunflower (*Helianthus grosseserratus*), prairie blazing-star (*Liatris pycnostachya*), prairie phlox (*Phlox pilosa*), prairie coneflower (*Ratibida pinnata*), prairie docks (*Silphium integrifolium* and *S. terebinthinaceum*), late and stiff goldenrods (*Solidago gigantea* and *S. rigida*), and culver's-root (*Veronicastrum virginicum*).

## Appendix E

### The Sugar River Planning Group Species of Greatest Conservation Need

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on the Sugar River Planning Group in the Southeast Glacial Plains (Tables E1 and E2) and Western Coulee and Ridges (Table E2) Ecological Landscapes. A key to interpretation of the tables is provided below.

	<b>Major</b>									
	Bog Reelfoot	Cakareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest
<b>Species that are Significantly Associated with the Southeast Glacial Plains Landscape</b>										
Acadian Flycatcher						2				1
American Bittern					3				1	
American Golden Plover				2	2					
American Woodcock	2	2				1	1		3	1
Black Tern					3					
Black-billed Cuckoo						2	1		3	
Blanding's Turtle			3	2	3	2	3	2	2	
Blue-winged Teal			1	2	3	2				
Blue-winged Warbler	2					2	2	2	2	2
Bobolink		1		3			1			
Brown Thrasher			2	2			3			
Buff-breasted Sandpiper				2	2					

Natural communities that are present in the property group and that are identified as major or important opportunities in the Wildlife Action Plan.

Numbers indicate the degree to which each species is associated with a particular habitat type (3=significant association, 2=moderate association, and 1=low association). Animal-community combinations shown here that are assigned as either "3" or "2" are high conservation priorities.

SGCN with a moderate or high probability of occurring in the ecological landscape. Species that were detected during surveys are highlighted in yellow. Since there is a moderate or high probability that the non-highlighted species may also occur on the SRGP, they should be acknowledged as potential conservation targets by planners and managers.

#### Sample interpretations:

*Acadian flycatcher is significantly associated with the Southeast Glacial Plains Ecological Landscape. It has a moderate association with Floodplain Forest and a low association with Southern Dry Forest. Protecting this species and associated Floodplain Forest is a priority conservation action. This species was detected on the property group during surveys.*

*Buff-breasted sandpiper is also significantly associated with the Southeast Glacial Plains Ecological Landscape. It has a moderate association with Dry-mesic Prairie and Emergent Marsh. Protecting this species and associated prairie and marsh is a priority conservation action. Although it was not detected during surveys on the property group, this species represents a conservation target.*



**Table E14. Priority Species of Greatest Conservation Need of the Sugar River Planning Group Properties that are significantly associated with the Southeast Glacial Plains Ecological Landscape.**

	Major															Important				
	Bog Relict	Calcareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Sedge Meadow	Southern Tamarack Swamp	Surrogate Grasslands	Warmwater rivers	Warmwater streams	Wet-mesic Prairie	Coolwater streams	Submergent Marsh	Wet Prairie
<b>Species that are Significantly Associated with the Southeast Glacial Plains Landscape</b>																				
Acadian Flycatcher						2				1	3									
American Bittern					3				1			2		1						1
American Golden Plover				2	2							1		2			2			2
American Woodcock	2	2				1	1		3	1		2	1							1
Black Tern					3							1							2	
Black-billed Cuckoo						2	1		3			2								1
Blanding's Turtle			3	2	3	2	3	2	2		2	2	2		2	2	2	2	3	3
Blue-winged Teal			1	2	3	2						2		2	1		2		2	2
Blue-winged Warbler	2					2	2	2	2	2	2	2								
Bobolink		1		3			1					2		3			3			3
Brown Thrasher			2	2			3							2						1
Buff-breasted Sandpiper				2	2									2			2			2
Butler's Garter Snake		3		3	3	2			3			3					3			3
Canvasback					1										3				3	
Cerulean Warbler						3		2		1	3									
Common Tern					2														1	
Dickcissel			1	3			1							3			1			
Dunlin					2										2					
Eastern Massasauga Rattlesnake		3	3	3	3	3			3			3					3			3
Eastern Meadowlark		1	2	3			2					2		3			2			1

	Major															Important				
	Bog Relict	Calcareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Sedge Meadow	Southern Tamarack Swamp	Surrogate Grasslands	Warmwater rivers	Warmwater streams	Wet-mesic Prairie	Coolwater streams	Submergent Marsh	Wet Prairie
<b>Species that are Significantly Associated with the Southeast Glacial Plains Landscape</b>																				
Field Sparrow			3	2			3							2			2			
Forster's Tern					3						1								2	
Four-toed Salamander	3				3	3			3			2	2					2		
Franklin's Ground Squirrel			1	3			3	2						2			2			1
Grasshopper Sparrow			3	3			1							3						
Gravel Chub															3					
Greater Redhorse															2	3				
Henslow's Sparrow				3			2				1			3			2			2
Hooded Warbler											3									
Hudsonian Godwit					3														1	
King Rail					3							2								
Lake Chubsucker															1	1				
Lake Sturgeon															3					
Least Darter															2	2				
Least Flycatcher						2		1	1	1										
Lesser Scaup					1										2					3
Longear Sunfish															2	2				
Louisiana Waterthrush											3							3		
Northern Harrier		1	2	2	1				1			2		3			3			2
Northern Ribbon Snake	3								2											
Ornate Box Turtle			3	2			3	3		3	3									
Ozark Minnow																3				
Pickereel Frog		2			3	2			2			3			3	3	3	3	3	3
Prothonotary Warbler						3														

	Major															Important				
	Bog Relict	Calcareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Sedge Meadow	Southern Tamarack Swamp	Surrogate Grasslands	Warmwater rivers	Warmwater streams	Wet-mesic Prairie	Coolwater streams	Submergent Marsh	Wet Prairie
<b>Species that are Significantly Associated with the Southeast Glacial Plains Landscape</b>																				
Queen Snake					3				3			3			3	3		2	3	3
Redfin Shiner															3	2		1		
Redhead					3														3	
Red-headed Woodpecker						2	3	3		2	2									
Red-necked Grebe					3														2	
Redside Dace															2		2			
River Redhorse														2						
Rusty Blackbird	2	2			2	3			2			2								
Short-billed Dowitcher					3														1	
Short-eared Owl			2	2	1				2			2		3			3			2
Slender Madtom															3					
Starhead Topminnow															3	3				
Vesper Sparrow			3	2			2							1						
Western Meadowlark			2	3										3						1
Whooping Crane					3							2							3	
Willow Flycatcher	2	2	1	2		1	1		3			2	1	2			2			2
Wood Thrush						2		2		2	3		1							
Yellow-billed Cuckoo						3		1	2	1	2		1							

**Table E2. Priority Species of Greatest Conservation Need of the Sugar River Planning Group Properties that are moderately associated with the Southeast Glacial Plains Ecological Landscape.**

	Major															Important				
	Bog Relict	Calcareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Sedge Meadow	Southern Tamarack Swamp	Surrogate Grasslands	Warmwater rivers	Warmwater streams	Wet-mesic Prairie	Coolwater streams	Submergent Marsh	Wet Prairie
<b>Species that are Moderately Associated with the Southeast Glacial Plains Landscape</b>																				
Banded Killifish															1					
Bell's Vireo			2	2			1		2					2			2			2
Black Buffalo														2						
Eastern Red Bat	2	2			2	2	2	2	2	2	2	1		2	2		3	2		
Golden-winged Warbler	1								3	1	1	1								
Hoary Bat	2	2			2	2	1	1	2	1	1	2	1		2	2		3	2	
Lark Sparrow			2																	
Loggerhead Shrike			2	2			1							3			1			
Marbled Godwit				2	3									2			2		1	2
Mudpuppy														3				1		
Northern Bobwhite			2	2			2	1						3			2			
Northern Long-eared Bat	2	2			2	2	1	2	2	2	2	2			2	2		3	2	
Prairie Vole			3	3			2							2						
Pugnose Shiner															2					
Red-shouldered Hawk						3					2		1							
Silver-haired Bat	2	2			2	2	1	1	2	1	1	2	1		2	2		3	2	
Snowy Egret					3														2	
Solitary Sandpiper					3	3			1			1				2		2		
Upland Sandpiper			3	3			1					1		3			2			2
Veery						2		1	3		2		1							
Western Sand Darter															2					

	Major														Important						
	Bog Relict	Calcareous Fen	Dry Prairie	Dry-mesic Prairie	Emergent Marsh	Floodplain Forest	Oak Opening	Oak Woodland	Shrub Carr	Southern Dry Forest	Southern Dry-mesic Forest	Southern Sedge Meadow	Southern Tamarack Swamp	Surrogate Grasslands	Warmwater rivers	Warmwater streams	Wet-mesic Prairie	Coolwater streams	Submergent Marsh	Wet Prairie	
<b>Species that are Moderately Associated with the Southeast Glacial Plains Landscape</b>																					
Whimbrel					2																
Whip-poor-will	2					1		3		3	3										
Wilson's Phalarope					3							1							2	1	
Woodland Vole						1	3	3		3	3										
Yellow-bellied Racer			3	2						2	2										
Yellow-crowned Night-Heron					2	3			2						2				2		
Yellow-throated Warbler						3					2										

**Table E3. Priority Species of Greatest Conservation Need of the Sugar River Planning Group Properties that are significantly associated with the Western Coulee and Ridges Ecological Landscape.** *Note: There are no SGCN that are 'moderately' associated with the natural communities present.*

	Major		
	Dry Prairie	Southern Dry-mesic Forest	Surrogate Grasslands
<b>Species that are Significantly Associated with the Western Coulee and Ridges Landscape</b>			
Vesper Sparrow	3		1
Wood Thrush		3	

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## Appendix F

### Wisconsin Natural Heritage Working List Explanation

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. Most of the species and natural communities on the list are actively tracked and we encourage data submissions on these species. This list is meant to be dynamic - it is updated as often as new information regarding the biological status of species becomes available. See the Endangered Resources Program web site for the most recent Natural Heritage Inventory Working List (<http://dnr.wi.gov/topic/NHI/WList.html>).

#### Key

**Scientific Name:** Scientific name used by the Wisconsin Natural Heritage Inventory Program.

**Common Name:** Standard, contrived, or agreed upon common names.

**Global Rank:** Global element rank. See the rank definitions below.

**State Rank:** State element rank. See the rank definitions below.

**US Status:** Federal protection status in Wisconsin, designated by the Office of Endangered Species, U.S. Fish and Wildlife Service through the U.S. Endangered Species Act. LE = listed endangered; LT = listed threatened; XN = non-essential experimental population(s); LT,PD = listed threatened, proposed for de-listing; C = candidate for future listing.

**WI Status:** Protection category designated by the Wisconsin DNR. END = endangered; THR = threatened; SC = Special Concern.

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are SC/P = fully protected; SC/N = no laws regulating use, possession, or harvesting; SC/H = take regulated by establishment of open closed seasons; SC/FL = federally protected as endangered or threatened, but not so designated by WDNR; SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

## **Global & State Element Rank Definitions**

### **Global Element Ranks:**

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU = Possibly in peril range-wide, but their status is uncertain. More information is needed.

GX = Believed to be extinct throughout its range (e.g. Passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? = Not ranked.

Species with a questionable taxonomic assignment are given a "Q" after the global rank.

Subspecies and varieties are given subranks composed of the letter "T" plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

### **State Element Ranks**

S1 = Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in Wisconsin because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in Wisconsin (21 to 100 occurrences).

S4 = Apparently secure in Wisconsin, with many occurrences.

S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly although not every year); a few of these species (typically long-distance migrants such as some birds and butterflies) may have even bred on one or more of the occasions when they were recorded.

SE = An exotic established in the state; may be native elsewhere in North America.

SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SN = Regularly occurring, usually migratory and typically non-breeding species for which no significant or effective habitat conservation measures can be taken in Wisconsin. This category includes migratory birds and bats that pass through twice a year or, may remain in the winter (or, in a few cases, the summer) along with certain lepidoptera which regularly migrate to Wisconsin where they reproduce, but then completely die out every year with no return migration. Species in this category are so widely and unreliably distributed during migration or in winter that no small set of sites could be set aside with the hope of significantly furthering their conservation.

SZ = Not of significant conservation concern in Wisconsin, invariably because there are no definable occurrences in the state, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long-distance migrants whose occurrence during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. Typically, the SZ rank applies to a non-breeding population.

SR = Reported from Wisconsin, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports that are hard to dismiss because the habitat is now destroyed.

SRF = Reported falsely (in error) from Wisconsin but this error is persisting in the literature.

SU = Possibly in peril in the state, but their status is uncertain. More information is needed.

SX = Apparently extirpated from the state.

### **State Ranking of Long-Distance Migrant Animals:**

Ranking long distance aerial migrant animals presents special problems relating to the fact that their non-breeding status (rank) may be quite different from their breeding status, if any, in Wisconsin. In other words, the conservation needs of these taxa may vary between seasons. In order to present a less ambiguous picture of a migrant's status, it is necessary to specify whether the rank refers to the breeding (B) or non-breeding (N) status of the taxon in question. (e.g. S2B, S5N).